

No. 707,044.

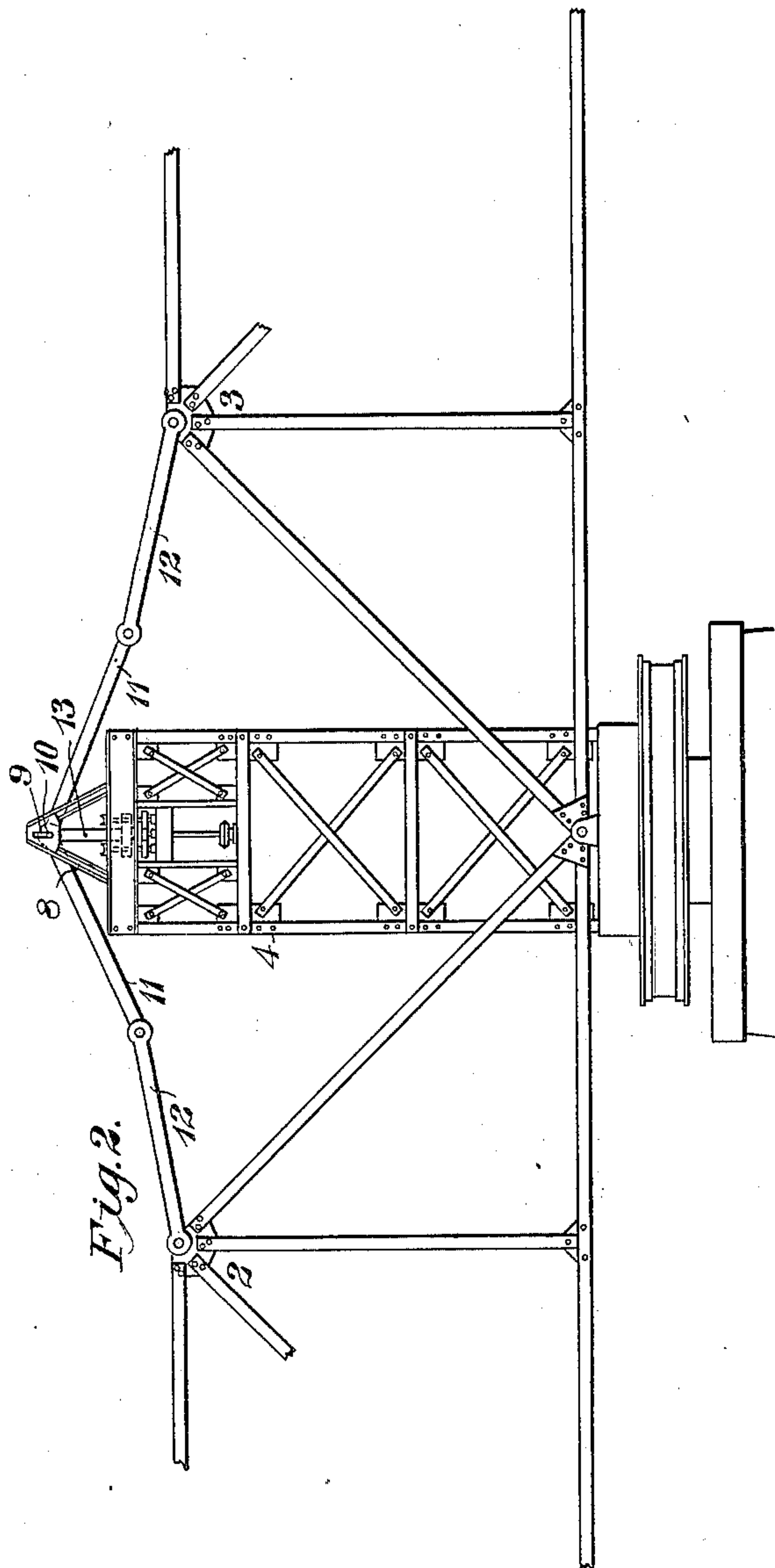
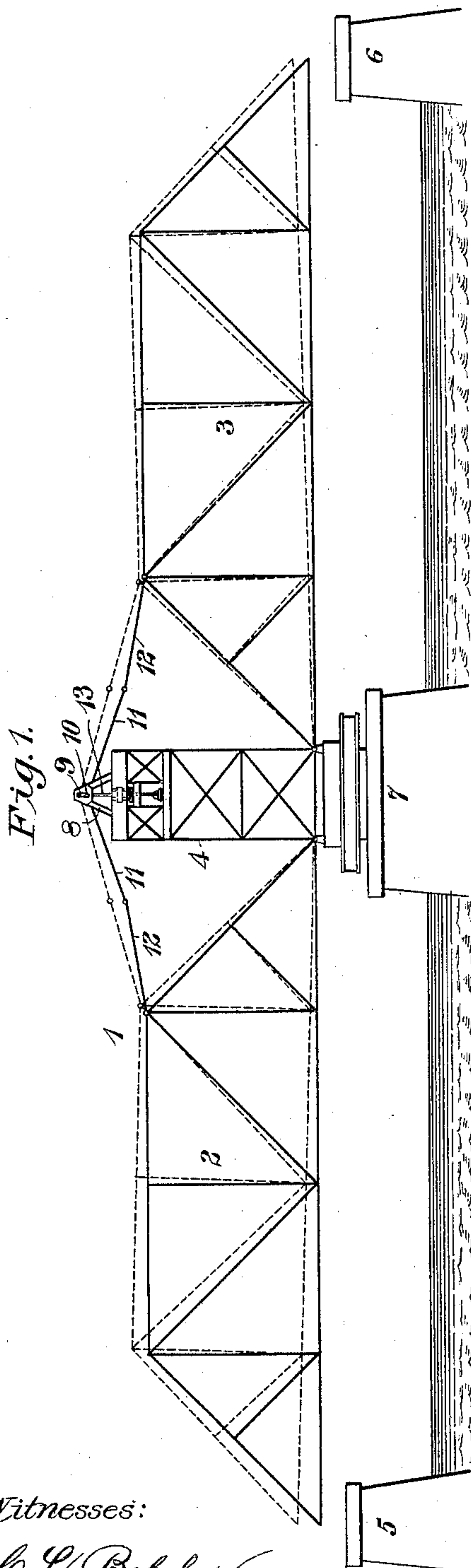
Patented Aug. 12, 1902.

C. WORTHINGTON.
SWING BRIDGE.

(Application filed Oct. 28, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

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2 Sheets—Sheet 2.

Fig. 3.

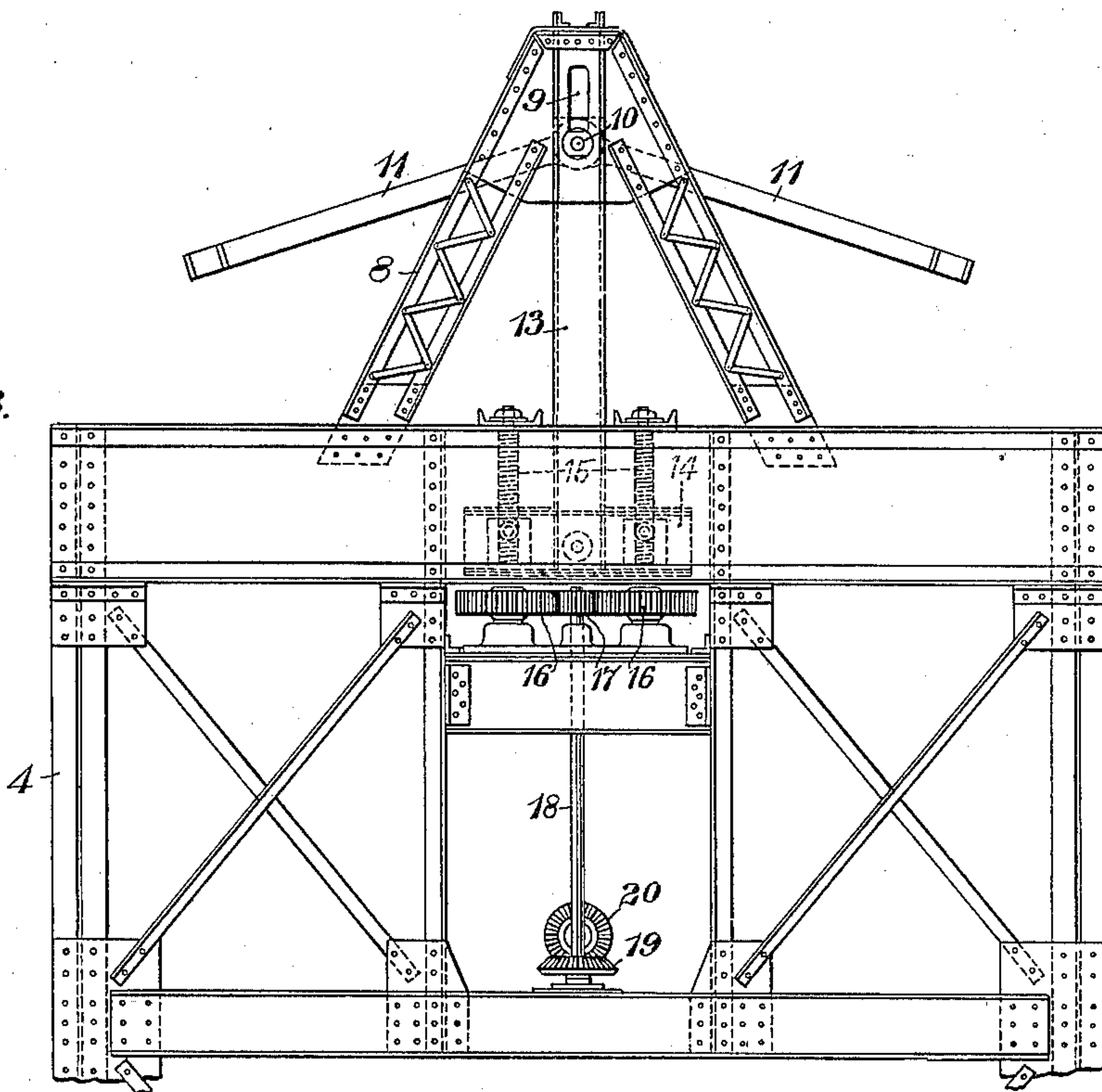
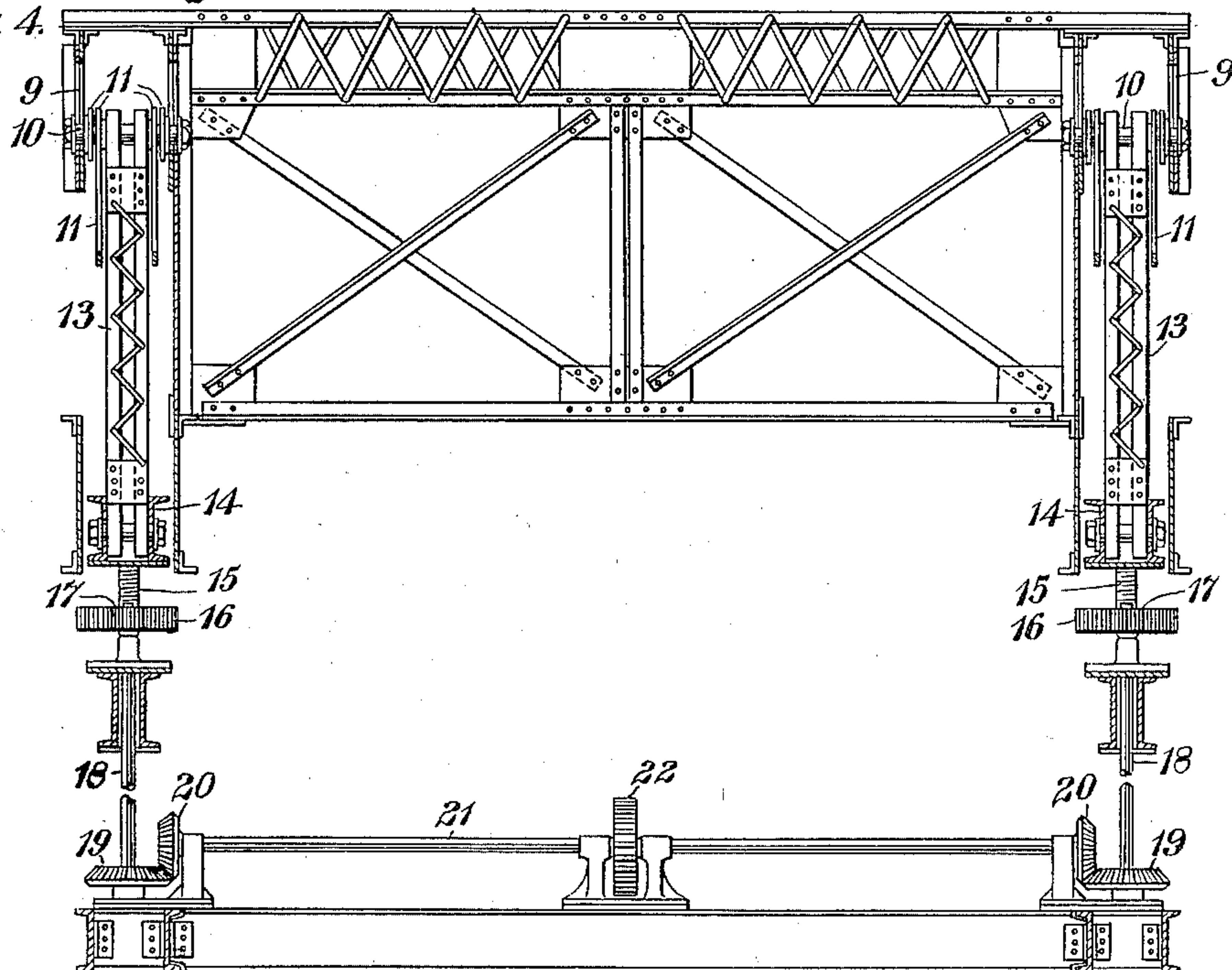


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES WORTHINGTON, OF PITTSBURG, PENNSYLVANIA.

SWING-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 707,044, dated August 12, 1902.

Application filed October 28, 1901. Serial No. 80,241. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WORTHINGTON, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Swing-Bridges, of which the following is a specification.

My invention relates to swing or draw bridges of the type which rest upon three piers when in use and which are swung horizontally upon a middle support in order to permit of the passage of vessels between the middle and end piers of the structure.

The object of my invention is to provide a simple, relatively inexpensive, and durable construction wherein the stresses in all members are determinate regardless of unequal settling of the piers and in which all tendency of either end of the bridge to "kick up" when the load is on the opposite end is avoided, to reduce the total live load to be supported by the mechanism on the middle pier, to reduce the amount of material required in the trusses or girders, to concentrate the mechanism for turning the bridge at a single point, to make such mechanism simple in construction and positive in action, and to minimize the risk of accidents by insuring satisfactory operation of the mechanism.

As generally constructed swing bridges comprise continuous girders or trusses which rest upon a plurality of supports and when closed have their ends raised a certain distance by means of wedges, toggles, or other suitable devices on which they are supported during the passage of trains, vehicles, &c., whereas bridges constructed in accordance with my invention have non-continuous trusses or girders, and the outer end of each truss or girder rests directly upon the corresponding pier or abutment and without strain upon the other truss or girder or the lifting mechanism, whatever may be the live load which it supports or the variations that may occur in the height of its supporting-piers with reference to those which support the other truss or girder.

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

Figure 1 is a diagrammatic side elevation of a bridge embodying my invention. Fig.

2 is a side elevation of a bridge of slightly-modified construction, the ends of the trusses being broken away. Fig. 3 is a side elevation of the upper portion of the tower and operating mechanism which are located upon the central pier of the bridge structure. Fig. 4 is a transverse sectional view of the portion of the tower which is shown in Fig. 3.

Each of the trusses or girders 2 and 3 of the bridge 1 has hinge connections with the tower structure 4 and when in operative position the outer ends of the respective trusses or girders 2 and 3 rest directly upon the end piers or abutments 5 and 6, and the tower and inner ends of the trusses rest upon the middle pier 7.

The tower 4, which is a skeleton structure built up of steel beams, columns, &c., in the usual manner, supports a structure 8, having vertical guideways 9, in which operate pins 10, to which are connected the upper and inner ends of links 11, the outer ends of these links being pivotally connected to the inner ends of similar links 12, which have their outer ends also pivotally connected, respectively, to the upper and inner portions of the trusses 2 and 3, the combined length of each pair or set of links being greater than the distance between their extreme ends, so that the ends of the trusses may be independently supported by their respective piers. The pins 10 are supported and moved up and down by vertical struts 13, which are in turn supported by horizontal girders 14, the latter being respectively mounted upon two screws 15, each of which is provided with a gear-wheel 16 at its lower end. Mounted upon the upper end of a vertical shaft 18, so as to mesh with both of the gear-wheels 16, is a pinion 17, the shaft being provided at its lower end with a bevel gear-wheel 19. Both of the bevel gear-wheels 19 are driven by bevel-pinions 20, which are mounted upon the outer ends of a horizontal shaft 21, the latter being driven by any suitable engine or other source of power, which may be operatively geared to the shaft by means of a gear-wheel 22 or in any other suitable manner.

In Fig. 2 I have shown a construction in which the two girders have hinge connections with the tower at the center line of the middle pier instead of having independent con-

nections at the edges of the tower 4, as shown in the other figures.

It will be readily seen that when the shaft 21 is rotated by means of the engine employed for that purpose or by manually-operated gearing the gearing driven thereby will operate to turn the screws 15 so as to either raise or lower the struts 13 and with them the pins 10, according to the direction of rotation of the shaft. The raising of the struts 13 and the pins 10, supported thereby, will serve to lift the ends of the trusses 2 and 3 from the piers 5 and 6 through the medium of the links 11 and 12 after completing the lost motion provided for by the sagging connections, and when a sufficient elevation of the ends of the trusses has been effected the bridge may be rotated through the desired angle by any suitable mechanism. No mechanism is shown for effecting this result, for the reason that it does not constitute any part of my present invention, except in so far as my invention contemplates the employment of suitable mechanism for this purpose which may in part at least be also employed in conjunction with the lifting mechanism.

An important feature of the construction here shown and described is the jointed or flexible connection between the vertical lifting-struts and each of the trusses or girders, which is so constructed and arranged as to hang loosely with considerable sag when the bridge is closed, and thus permit the trusses or girders to act independently of each other as separate non-continuous spans. The flexibility of the lifting connections may be produced by making a plurality of joints like those shown instead of one, if desired, or it may be effected by otherwise modifying the structural characteristics of such connections without departing from my invention. It will also be seen that while the mechanism shown is effective for raising the ends of the trusses or girders when it is desired to move the bridge for the passage of boats it also permits the ends of the trusses or girders to rest securely upon the beams or abutments when in position for use without any strains being brought upon the lifting mechanism and in such manner that the spans will be securely supported independently of each other irrespective of any variation in the height of the two end piers or abutments and so as to avoid any movement of either end of the bridge by reason of a load coming onto the opposite end.

As I have indicated in the foregoing description, the illustration of trusses is not intended to exclude the employment of plate-girders as the hinged members of the bridge, both being well known in the art.

While I have shown and described specific mechanism for lifting the ends of the trusses, I desire it to be understood that this mechanism is merely illustrative and that changes may be made therein without departing from my invention. I therefore do not desire or

intend to limit the invention to the details shown and described, except in so far as limitations may be imposed by the state of the art and specifically set forth in the claims.

I claim as my invention—

1. In a swing-bridge, the combination with a central tower and two girders or trusses hinged to said tower at their inner ends, of lifting mechanism and flexible connections between said mechanism and each of the girders or trusses.

2. The combination with end and middle piers, and trusses or girders supported thereby, of lifting mechanism on the middle pier and flexible connections between the same and the trusses or girders, said connections having lost motion in operation whereby each truss or girder is independently supported when in use.

3. In a swing-bridge, the combination with two trusses or girders independently supported in alinement and a structure to which their inner ends are hinged, of lifting mechanism and jointed connections between said mechanism and the respective trusses or girders, said connections having lost motion when said mechanism is operated.

4. In a swing-bridge, the combination with a central structure and two trusses or girders hinged thereto in alinement, of vertical struts, connections between the upper ends of said struts and the hinged trusses or girders, means for raising and lowering the struts and guides for insuring ease and accuracy of movement.

5. In a swing-bridge, the combination with a central structure and two trusses or girders hinged thereto in alinement, of a strut and two lifting-screws at each side of the structure, means for rotating the screws in unison and flexible connections between the struts and the hinged trusses or girders.

6. In a swing-bridge, the combination with a central structure and two trusses or girders hinged thereto in alinement, of two vertically-movable girders provided with struts, connections between the struts and the hinged trusses or girders, guides for the free ends of the struts and means for raising and lowering the girders on which the struts are mounted.

7. In a swing-bridge, the combination with a central structure and two trusses or girders hinged thereto in alinement, of two vertically-movable girders each having a vertical strut projecting upwardly therefrom and two stationary nuts, connections between the free ends of the struts and the hinged trusses or girders, guides for said free ends, screws operating in said nuts and means for rotating all of said screws in unison to effect the desired movement of the hinged trusses or girders.

8. In a swing-bridge, the combination with a central structure and two trusses or girders hinged thereto in alinement, of vertically-movable girders at the respective sides of the central structure each having a pair of stationary nuts and an intermediate strut, guides for the free ends of the struts, connections between

said free ends and the hinged trusses or girders, screws cooperating with said nuts and gearing for rotating said screws in unison from a single source of power.

5 9. In a swing-bridge, the combination with a central structure and two trusses or girders hinged thereto in alinement, of a vertically-movable member at each side of said structure, means for preventing lateral and rota-
10 tive movement of said members, connections between the upper ends of said members and the hinged trusses or girders and means for raising and lowering said members in unison.

15 10. In a swing-bridge, the combination with a central structure and trusses or girders

hinged thereto in alinement, of two vertically-movable members, means for preventing lateral and rotative movement of said members, connections between said members and the hinged trusses or girders, a plurality of raising and lowering screws for each of said members, and mechanism for rotating all of said screws in unison.

In testimony whereof I have hereunto subscribed my name this 23d day of October, 1901. 25

CHAS. WORTHINGTON.

Witnesses:

J. V. McCORMICK,
F. BRANNAGAN.