

(No Model.)

3 Sheets—Sheet 1.

C. A. P. TURNER & P. A. WARNER.
DRAWBRIDGE.

No. 503,273.

Patented Aug. 15, 1893.

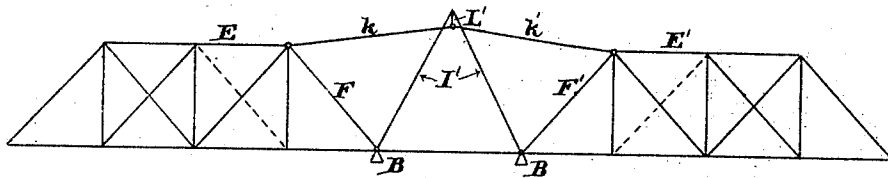


Fig. 1.

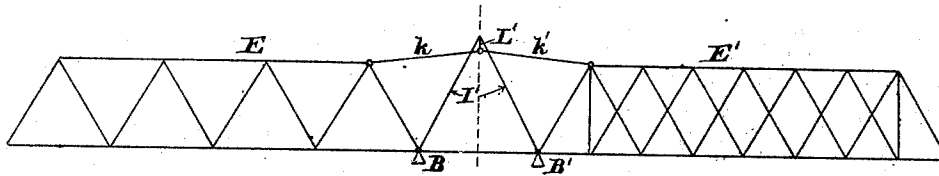


Fig. 2.

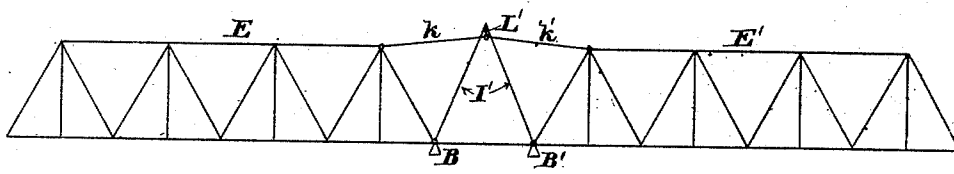


Fig. 3.

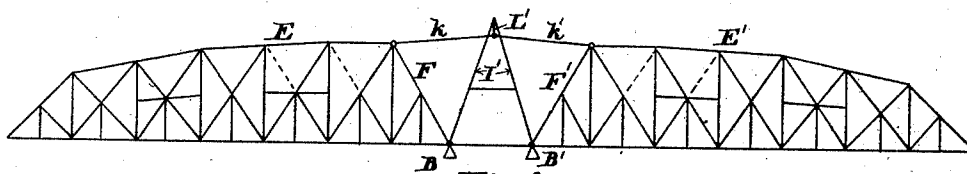


Fig. 4.

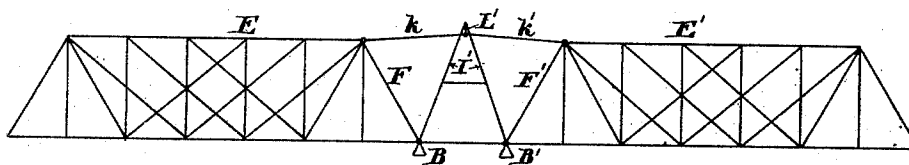


Fig. 5.

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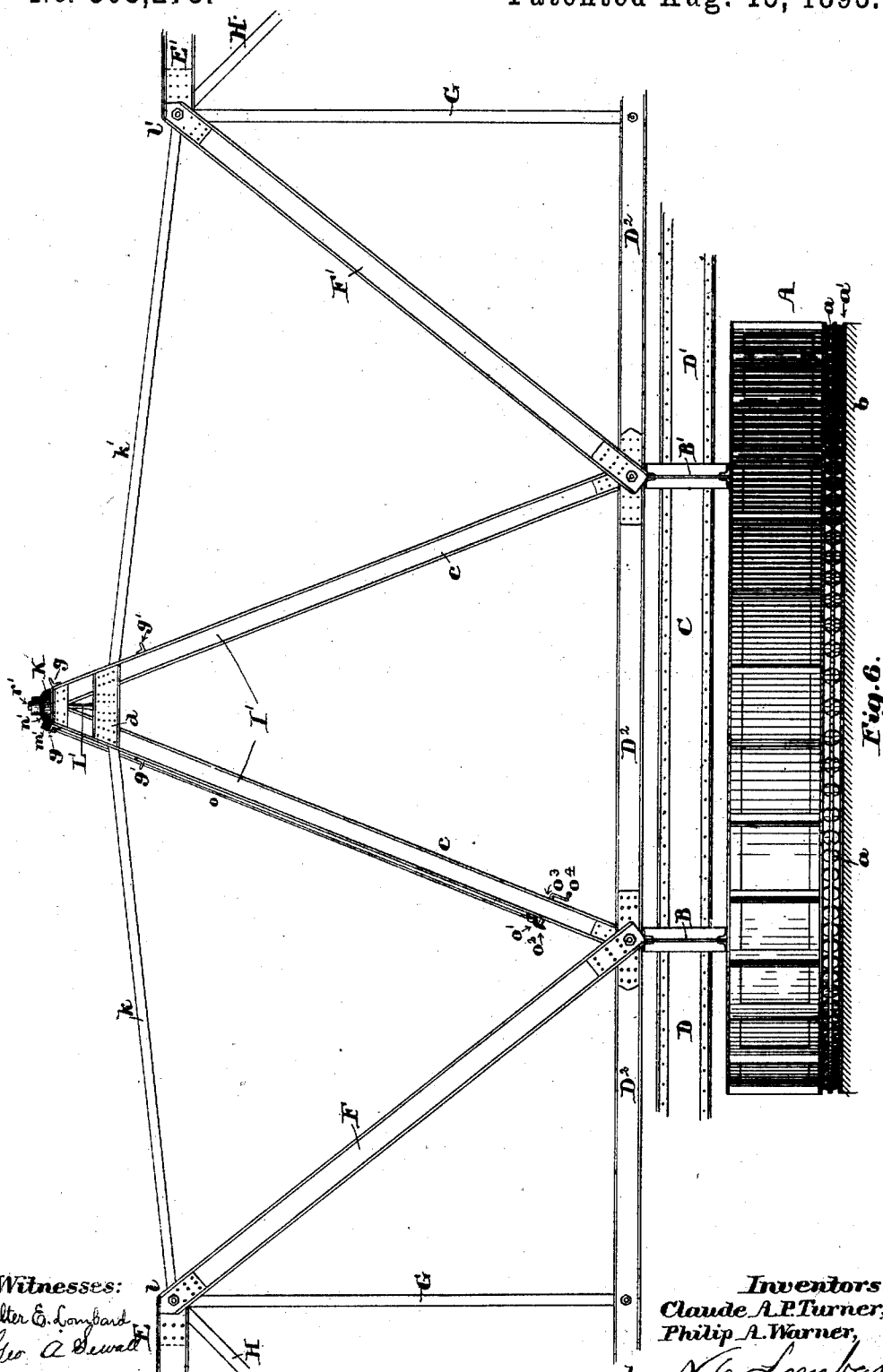


Fig. 6.

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3 Sheets—Sheet 3.

C. A. P. TURNER & P. A. WARNER.
DRAWBRIDGE.

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Patented Aug. 15, 1893.

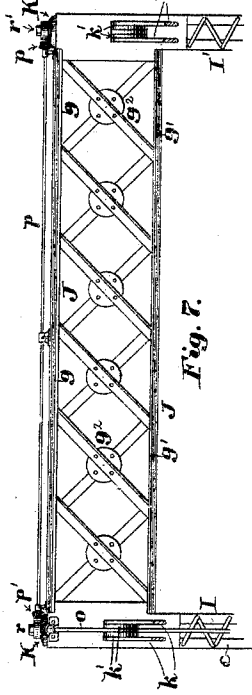


Fig. 7.

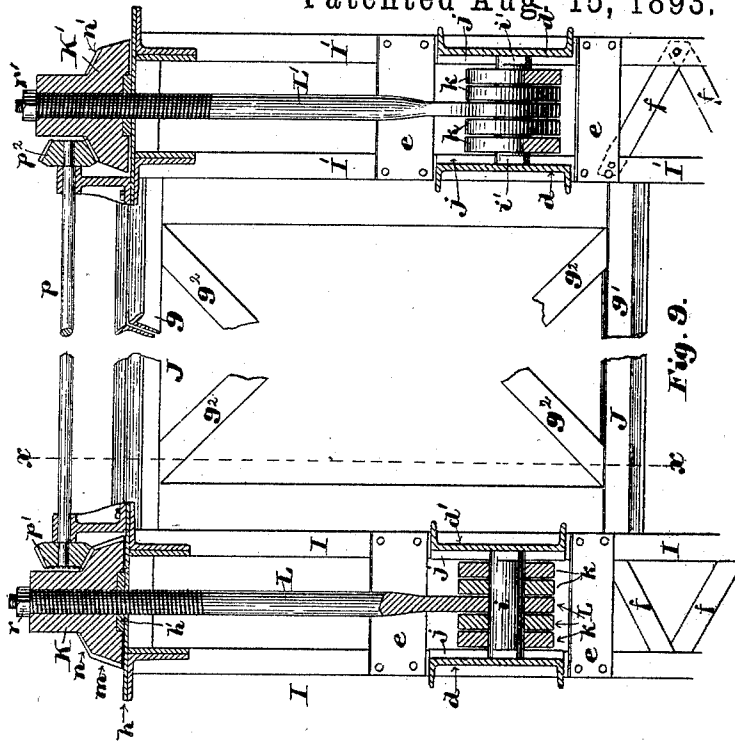


Fig. 9.

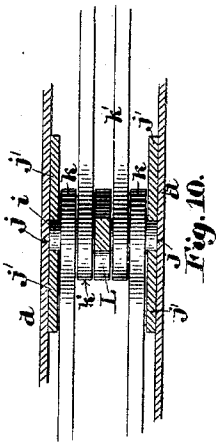


Fig. 10.

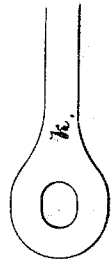


Fig. 12.

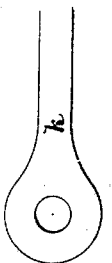


Fig. 11.

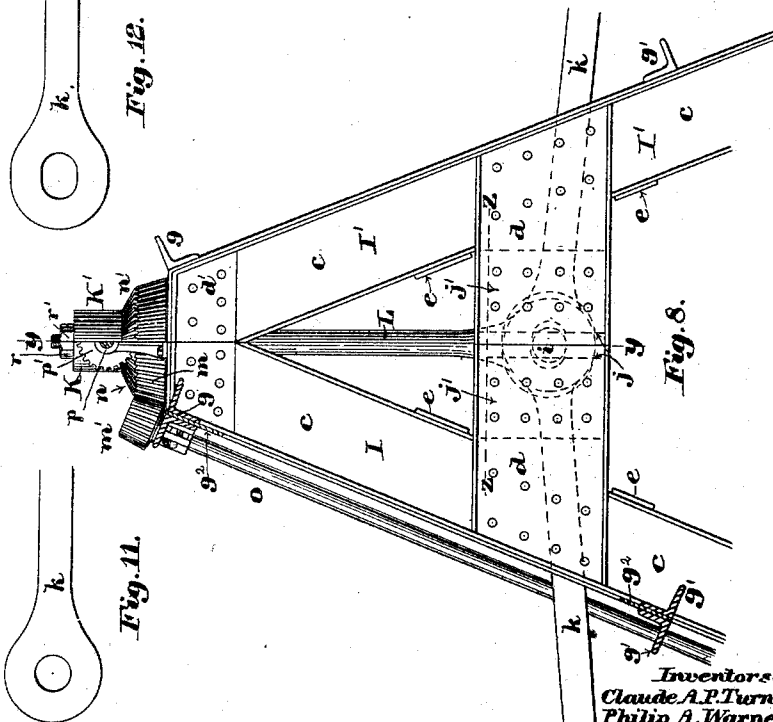


Fig. 8.

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UNITED STATES PATENT OFFICE.

CLAUDE A. P. TURNER, OF ASHTON, RHODE ISLAND, AND PHILIP A. WARNER,
OF WEST NEWTON, MASSACHUSETTS.

DRAWBRIDGE.

SPECIFICATION forming part of Letters Patent No. 503,273, dated August 15, 1893.

Application filed March 7, 1891. Serial No. 384,085. (No model.)

To all whom it may concern:

Be it known that we, CLAUDE A. P. TURNER, of Ashton, in the county of Providence and State of Rhode Island, and PHILIP A. WARNER, of West Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Drawbridges, of which the following, taken in connection with the accompanying drawings, is a specification.

Our invention relates to draw-bridges, has for its object the production of a convenient and ready means of raising and lowering the ends of the drawbridge before and after opening and closing the same, and it consists in certain novel features of construction, arrangement and combination of parts which will be readily understood by reference to the description of the drawings and to the claims hereinafter given, and in which our invention is clearly pointed out.

Figures 1, 2, 3, 4 and 5 of the drawings represent diagrams illustrating the application of our invention to drawbridges in which six different forms of trusses are employed. Fig. 6 is a side elevation of the central portion of a drawbridge with our invention applied thereto. Fig. 7 is an elevation of the transverse strut connecting the upper portions of the central frames or supports, portions of said frames, and the shafting and gearing for operating the toggles to raise the ends of the drawbridge. Fig. 8 is a sectional elevation of the upper portions of the central frames or supports, the cutting plane of the left half of said figure being through the transverse strut on line *x x* on Fig. 9. Fig. 9 is a transverse sectional elevation of same, on line *y, y*, on Fig. 8. Fig. 10 is a partial horizontal section of one of said supports on line *z, z*, on Fig. 8. Fig. 11 is an elevation of a portion of the inner end of one of the toggle links, as formed for use in connection with a continuous truss bridge, and Fig. 12 is a similar elevation of a portion of such link, as formed for use in connection with a discontinuous truss bridge.

In carrying out our invention we introduce into the upper chord of each of the bridge trusses, a toggle joint at the center of the bridge; sections of the upper chord themselves forming the toggle links, the inner ends of

which are connected together and to a vertical screw eye bolt provided with a nut, and suitable gearing and shafting for revolving the said nut whereby the center of said chord may be raised thus causing the outer ends of the bridge arms to be raised from their bearings on the abutments, as will be further described.

In the drawings, forming a part of this specification, A is the turn-table mounted upon a series of trucks *a a* arranged to roll upon an annular track plate *a'* supported upon the central pier *b*, in a well known manner.

B and B' are two transverse girders or beams resting upon said turn-table and connected together by the longitudinal girders or central sections C of the stringers.

D and D' are the end sections of the stringers, the inner ends of which are supported by, but not rigidly connected to, the girders B and B' respectively, said stringers extending therefrom to the abutments or end supports of the bridge.

D², D², are the lower chord sections of the trusses resting at their inner ends upon the girders B, B'.

E and E' are the ends of the upper chords of the trusses which constitute parts of the two arms of the bridge which span the two channels.

F and F' are the main diagonal struts, G are the vertical hangers and H the diagonal tension rods.

So far the bridge shown is of ordinary or well known construction, and the trusses forming the two arms of the bridge that span the channels when closed may be of any of the forms shown in Figs. 1, 2, 3, 4, and 5 or of any other well known form without affecting the principles of our invention.

At the center of the bridge, directly over the turn-table A, we erect two triangular struts I and I', one at each side of the bridge in line with the trusses, and each composed of two pairs of standards *c c* inclined toward each other and connected together by suitable tie pieces *d d'* and *e* and diagonal bars *f f* as shown, the tops of said triangular struts I and I' being connected together by the transverse struts J, J, composed of upper and lower

chords g and g' and the diagonal lacing g^2 as shown in Fig. 7. The upper ends of the triangular struts I and I' are covered by cap plates h having secured centrally thereon the circular plates or bosses h' upon which are mounted so as to be revoluble thereon the nuts K and K' respectively which nuts are provided with suitable square female threads to fit corresponding male threads on the suspension eye bolts L and L' , the lower ends of which are provided with eyes to receive the toggle pins i and i' respectively, the ends of which pins are flattened on opposite sides and fit into vertical guideways j j formed by riveting to the inner faces of the tie pieces d the plates j' , j' , as shown in Figs. 8, 9, and 10. Each of the pins i and i' has fitted thereon one end of each of four toggle links or rods k k' the opposite ends of which are pivoted two at l and two at l' to the inner ends of the upper chord bars E and E' respectively as shown in Fig. 6.

The nut K has formed thereon two sets of bevel gear teeth m and n with the former of which the bevel pinion m' secured upon the upper end of the inclined shaft o engages to impart to said nut K a rotary motion about the screw suspension eye bolt L thus raising and lowering said screw eye bolt, and with it the inner ends of the toggle links k k' . The shaft o is mounted in suitable bearings on one pair of the inclined standards c c of the triangular strut I , and is provided at its lower end with suitable gearing for revolving it by hand as the bevel or miter gears o' o^2 the short shaft o^3 and the crank o^4 ; or power may be applied to it in any other well known manner. A horizontal shaft p is mounted in suitable bearings secured upon the cap-plates h , and has secured upon one end the bevel gear wheel p' which engages with and is driven by the gear teeth n on the nut K , and also has secured upon its other end the bevel gear wheel p^2 which engages with the bevel gear teeth n' formed on the nut K' , so as to revolve said nut about its screw eye bolt L' thus raising and lowering said eye bolt and with it the inner ends of the toggle links k k' on that side of the bridge. The screw bolt L and its nut K are provided with right hand threads and the screw bolt L' and its nut K' are provided with left hand threads or "vice versa" so that both eye bolts will be raised or lowered together, and the distance between the inner ends of the upper chord bars E and E' will be increased or diminished alike on both sides of the bridge.

When discontinuous trusses are used, the eyes in the inner ends of the toggle links are slotted or made oblong as shown in Fig. 12 and in dotted lines in Fig. 8, but when continuous trusses are employed the eyes in said links will be made to fit the toggle pin as shown in Fig. 11.

The operation of our invention is as follows: The draw being closed, the ends of the bridge rest upon the abutments with such force as

to render it impractical to open the draw until its ends are lifted so as to relieve the pressure on the abutments. To accomplish this, the shaft o is revolved, either by the hand gearing shown, or by steam or other power applied thereto in any well known manner, in such a direction as to revolve the nuts K K' in the desired direction to raise the eye bolts L and L' thereby raising the centers of the toggles K K' , which being connected at their outer ends to the inner end struts F and F' act to draw their upper ends toward the center of the draw and thus cause the outer ends of the arms of the draw to be raised from their bearings on the abutments. The draw can then be easily opened and closed, and when it has been closed the shaft o is again revolved, but in the reverse direction, thus lowering the centers of the toggles and consequently the ends of the draw until they again rest upon the abutments with sufficient pressure to maintain the draw in its proper position. The screw eye bolts L and L' are provided at their upper ends with check nuts r and r' respectively, for the purpose of limiting the downward movement of the eye-bolts, and consequently of the centers of the toggles. The general arrangement of the members forming the central struts or frames and the toggles is the same irrespective of the kind of truss used for the arms of the draw. Our arrangement of the central toggles interposed in the upper chords of the bridge, with the nuts and screws for operating the same, form one of the most powerful systems of mechanism for the work in hand viz. the raising of a great weight a very short distance and is operated from the most convenient point, the center of the bridge. With this arrangement, each arm of the draw-bridge may be made to act, when closed, as a simple bridge not only for dead weight but also for the full live load. This is effected by virtue of the oblong eyes in the inner ends of the toggle-links, which when the ends of the draw are lowered to bearings on the abutments will permit the eye bolts and toggle-pins to be lowered somewhat farther, thereby allowing sufficient play of the toggle-links on the pins to compensate for the deflection of the arms of the draw when loaded.

The arrangement is simple, comparatively inexpensive, and the friction is reduced to a minimum.

The bridge may be made continuous, allowing the arms to act as simple bridges for dead load and as a continuous bridge for live load, the live load "kick" for a highway bridge being obviated by the action of the arms as simple bridges for dead load.

The strains for this kind of a draw-bridge would be unaffected by slight differences of level of its supports, (unlike the common form) since the arms adjust themselves to the level of their supports.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. As a means of adjusting the ends of a drawbridge to its bearings upon the abutments a system of toggle links forming the central portions of the upper chords of the trusses of said bridge in combination with screw eye bolts connected to the centers of said toggles,—nuts fitted to revolve on said screws,—and suitable gears and shafting connecting said nuts whereby said nuts may be revolved in unison to raise or lower the centers of said toggles substantially as described.

2. In a drawbridge the combination with the trusses of the two arms of the bridge of a system of toggle links at each side of the bridge, each toggle forming the connecting link between the upper chords of the trusses of said two arms,—a triangular strut or frame at each side of the bridge over the turn-table,—a screw eye bolt connected to and extending upward from the center of each toggle,—a nut fitted to each of said screw bolts and supported upon the upper end of said triangular struts or frames,—gears and shafting connecting said nuts so that they may be revolved in unison,—a driving shaft and suitable gears connecting the same to one of said nuts,—and means substantially as described for applying power to said shafting to revolve said nuts whereby the ends of the bridge may be raised or lowered.

3. In a drawbridge, the combination with the trusses of the two arms of the bridge of a system of toggle links forming the central portions of the upper chords of the trusses of said bridge, a triangular strut or frame at each side of the bridge over the turn-table,—a screw threaded eye-bolt connected to and extending upward from the center of each toggle,—a nut fitted to each of said screw bolts and revolvable thereon, and supported upon the upper end of said triangular strut or frame,—gears and shafting for rotating said nuts in unison,—and a stop or check nut on the upper end of each of said screw eye-bolts above the gear

operated nuts for limiting the downward movement of the center of said toggles.

4. In a drawbridge, the combination with the trusses of the two arms of the bridge, of the triangular struts or frames I and I' provided with the vertical guideways *j j*,—the toggle links *k k'* pivoted at their outer ends to the upper ends of the inner inclined struts F and F' respectively of the arm trusses, and at their inner ends connected together,—the vertical screw eyebolts L and L',—the geared nuts K and K',—the toggle pins *i* and *i'* fitted to be movable vertically in the guideways *j j* and connecting the inner ends of the toggle links and the vertical screw eye bolts,—the shafts *o* and *p*,—and the gears *m*, *m' n*, and *n'* all constructed, arranged and operating substantially as and for the purposes described.

5. In a drawbridge, the combination with the trusses of the two arms of the bridge of the toggle links *k* and *k'* pivoted at their outer ends to the upper ends of the inclined struts F and F' of the arm trusses respectively, and provided at their inner ends with eyes made oblong in the direction of the length of said links,—the triangular struts or frames I and I',—the vertical screw-eye-bolts L and L',—the toggle pins *i* and *i'* connecting said bolts and toggle links,—the nuts K and K',—the gears *m*, *m' n* and *n'*,—and the shafts *o* and *p*, all constructed, arranged and operating substantially as and for the purposes described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, on this 19th day of February, A. D. 1891.

CLAUDE A. P. TURNER.
PHILIP A. WARNER.

Witnesses:

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