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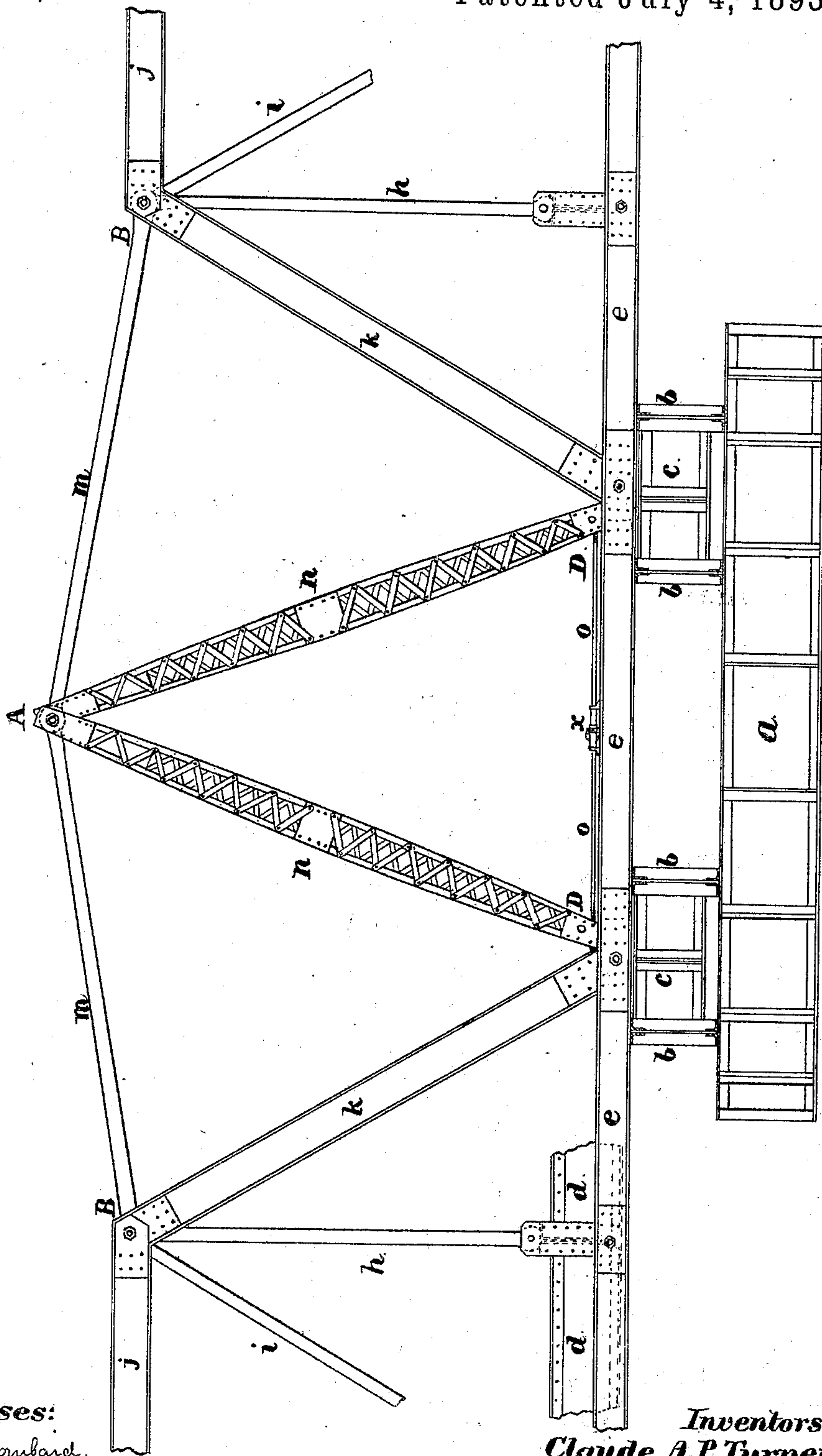
2 Sheets—Sheet 1.

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

No. 500,633.

Patented July 4, 1893.

FIG. 1.



Witnesses:
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(No Model.)

2 Sheets—Sheet 2.

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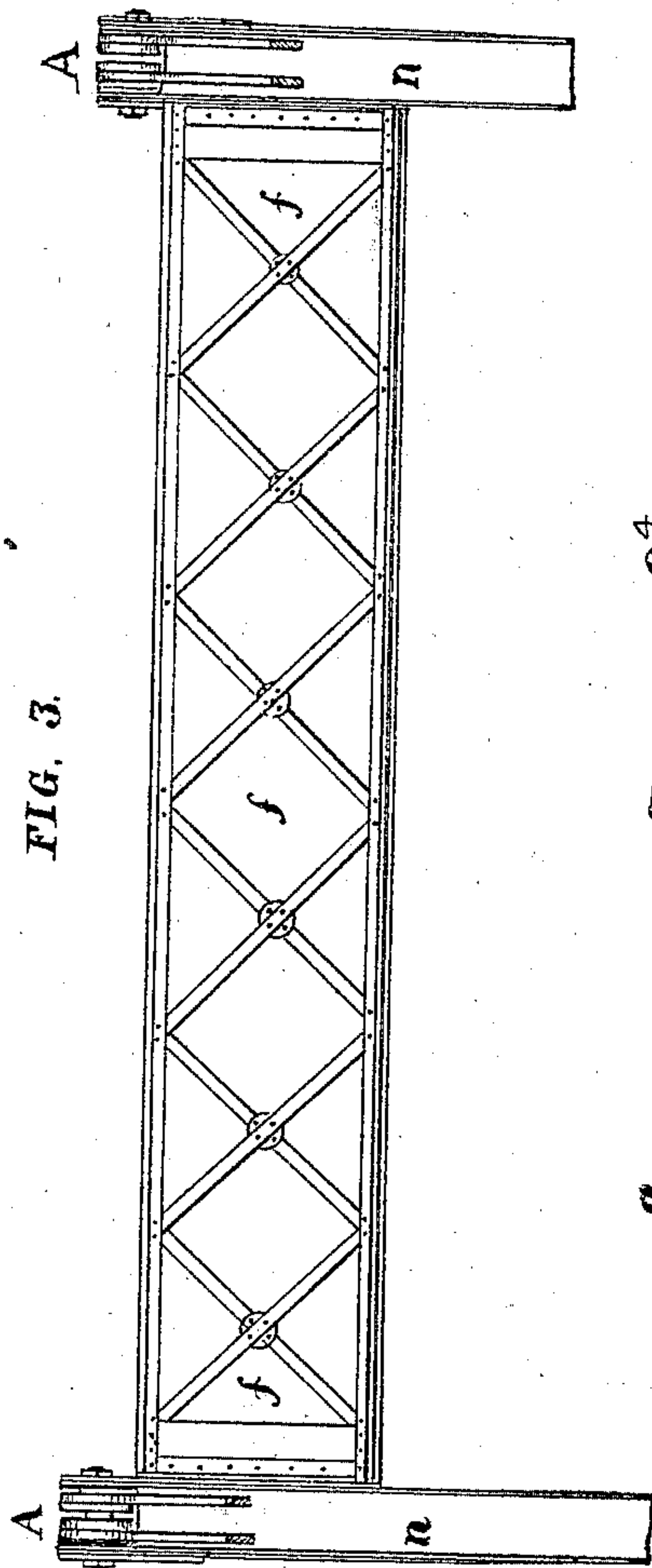


FIG. 3.

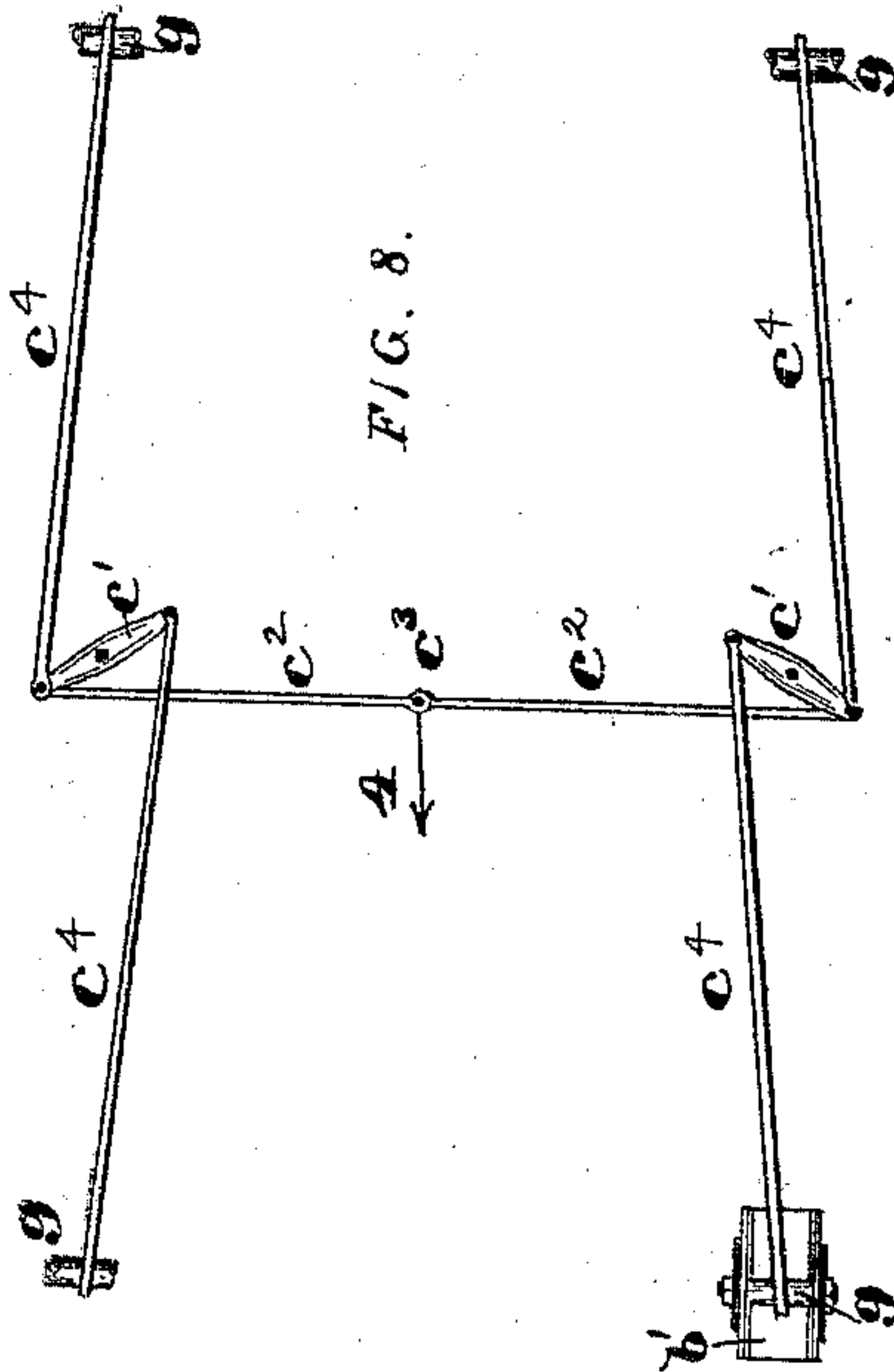


FIG. 8.

FIG. 7.

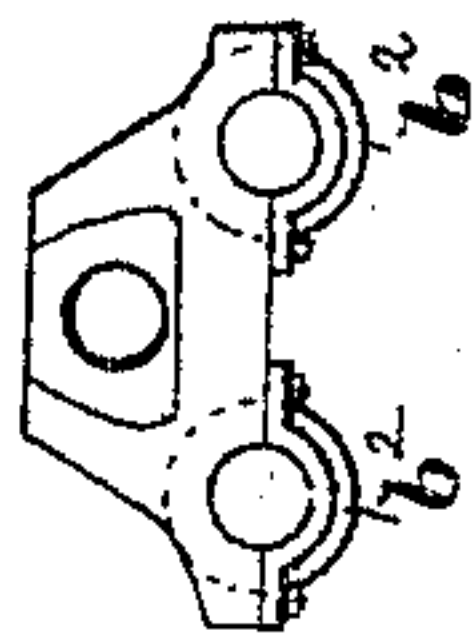


FIG. 2.

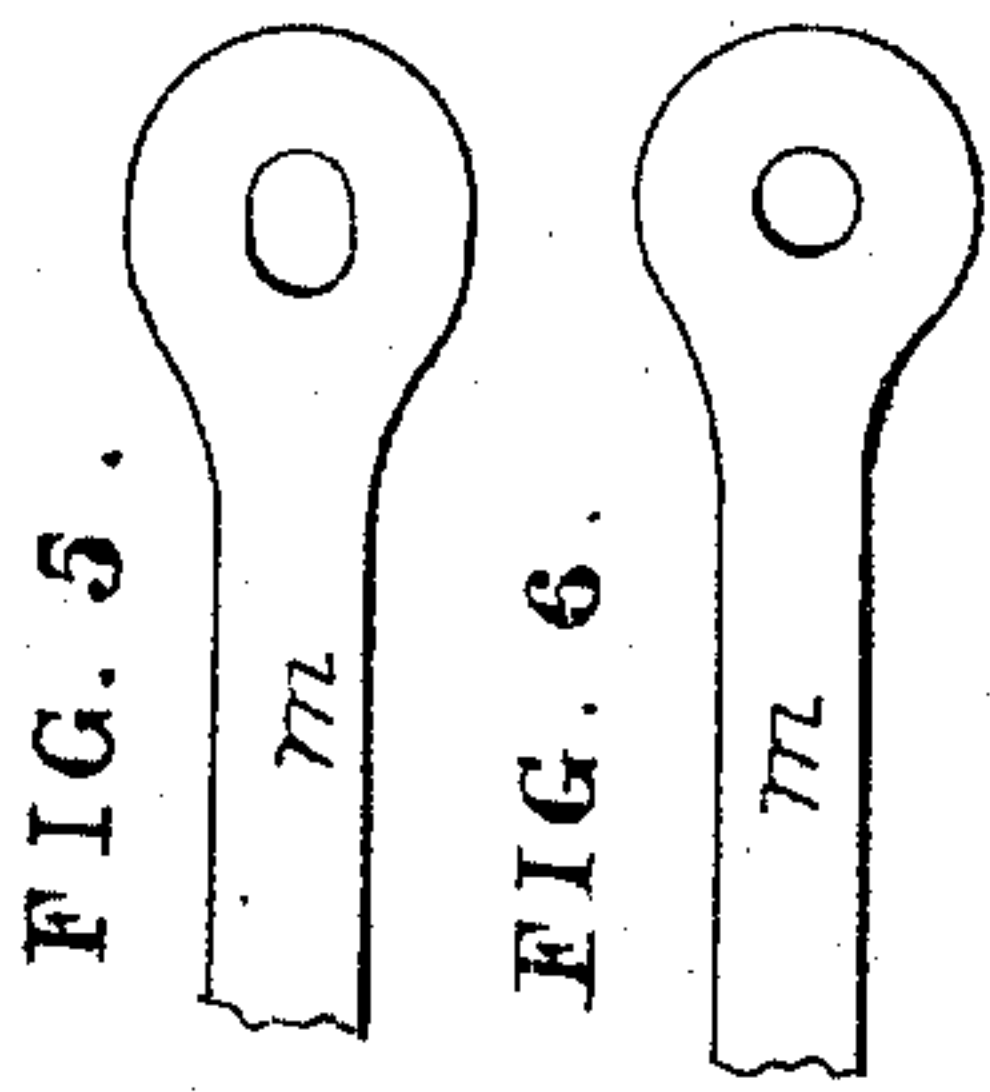
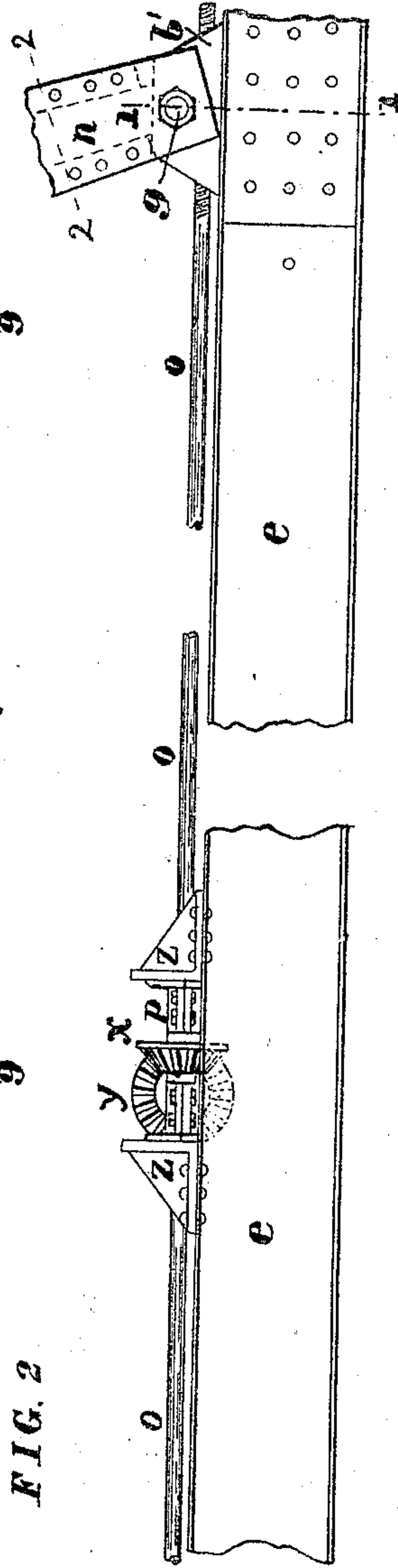
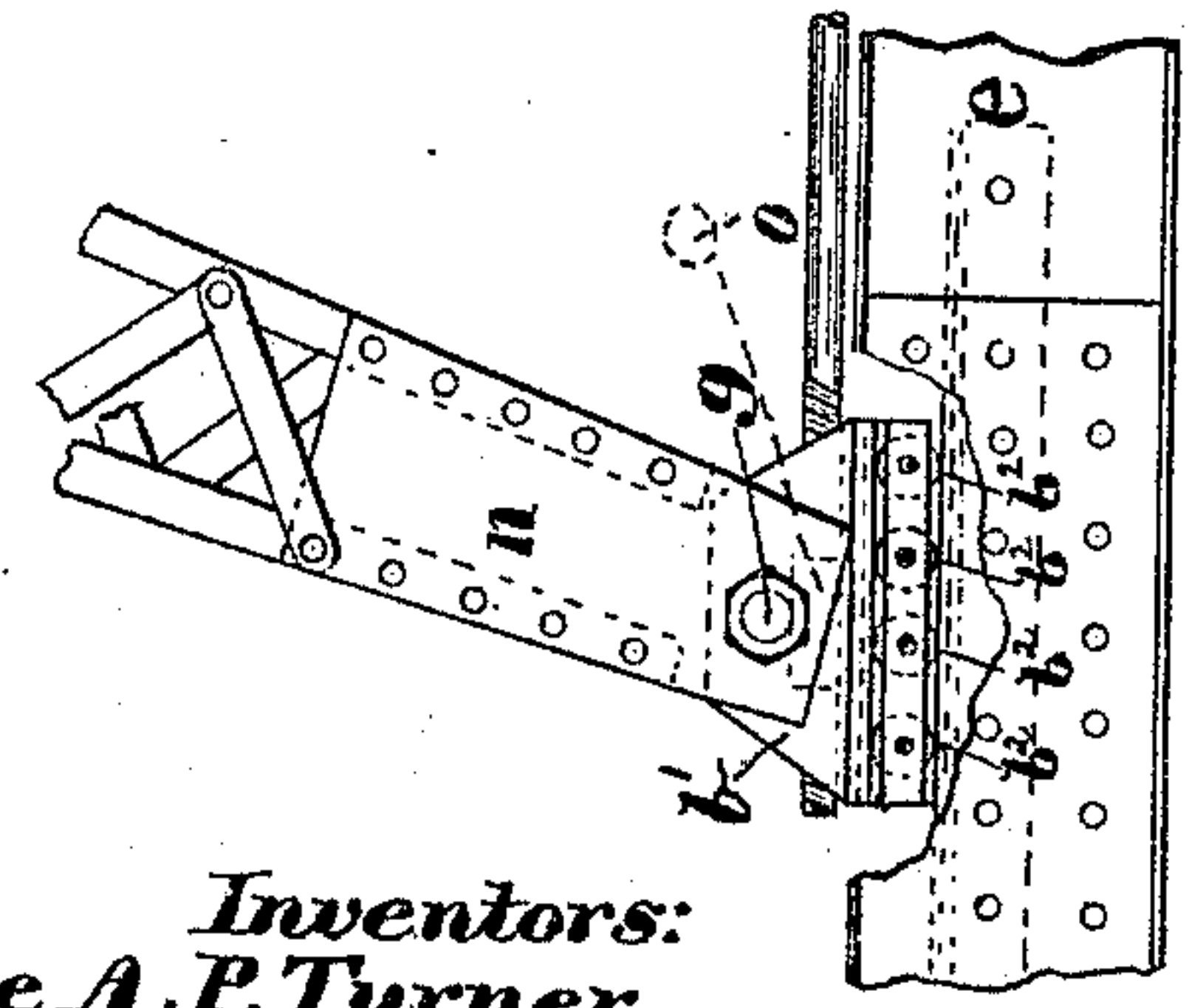
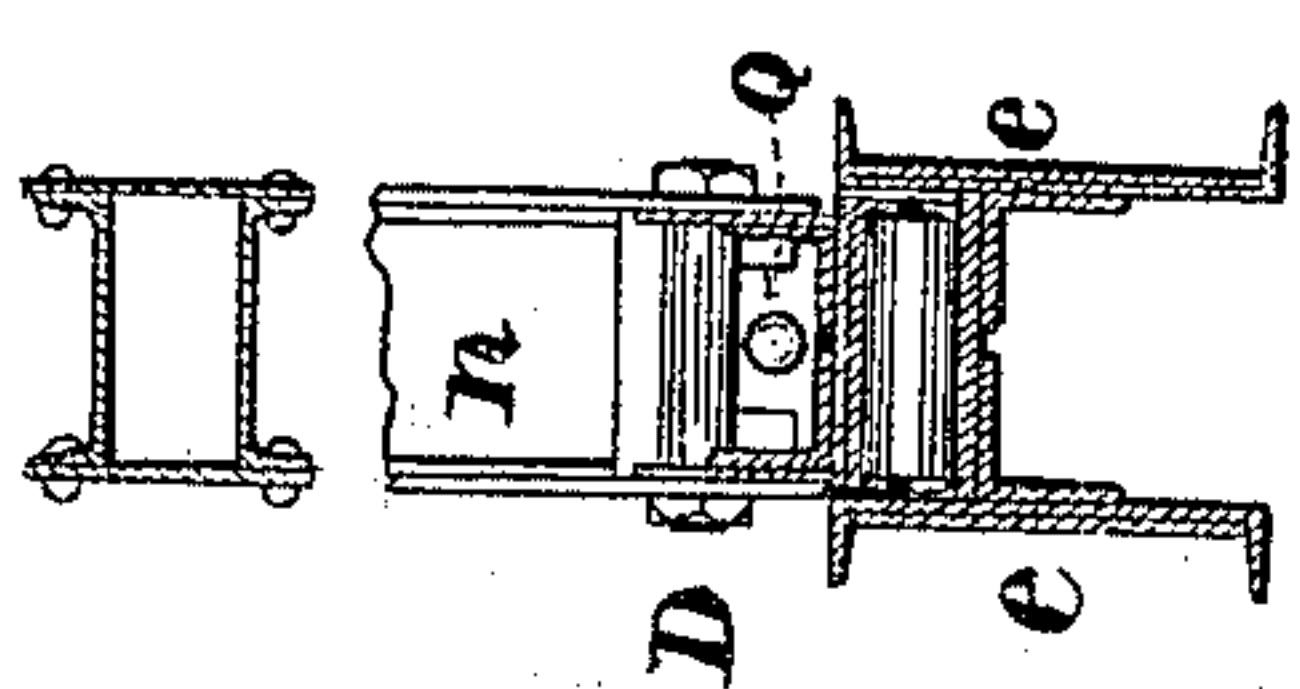


FIG. 5.

FIG. 6.

FIG. 4*

FIG. 4.



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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. 500,633, dated July 4, 1893.

Application filed March 30, 1891. Serial No. 386,912. (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 jointly invented new and useful Improvements in Draw-bridges, of which the following, taken in connection with the accompanying drawings, is a specification.

Our invention relates to draw-bridges and to that particular class of such bridges which are termed swing bridges and it consists in a novel construction, arrangement and combination of devices for adjusting the ends of such bridges that are applicable to a continuous or a discontinuous draw, all of 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.

Figure 1 of the drawings is a side elevation of the central portion of a draw-bridge embodying our invention. Fig. 2 is a side elevation of the central portion of the lower chord, the lower ends of the movable inclined struts, the shoes or carriages for supporting the same, and the screw shafts and gearing for adjusting the same drawn to an enlarged scale. Fig. 3 is an elevation of the upper portions of two pairs of said movable struts and the lateral strut connecting them. Fig. 4 represents a vertical section through the lower chord and the shoe or carriage on line 1. 1. on Fig. 2 and shows a portion of the lower end of one of the movable inclined struts in elevation and Fig. 4* represents a transverse section of said movable strut on line 2 2 on Fig. 2. Fig. 5 is an elevation of one end of a toggle link to be used when the arms of the bridge are intended to act as simple bridges. Fig. 6 is a similar view of an end of a toggle link to be used in a continuous draw. Fig. 7 is an elevation of a modified form of shoe or carriage, and Fig. 8 represents an arrangement of levers and rods for moving the strut supporting shoes or carriages toward and from each other.

In the drawings *a* is the drum of the bearing turn-table.

b b are the main cross girders, in pairs. *c c* are the supporting girders connecting said

main girders and serving as beds for the shoes or carriages *b' b'*.

d d are the longitudinal stringers; *e e* the lower chord.

The chords *e e* with the ports *h i j* and *k* are the truss members which make up the arms of the bridge.

The central portion of the upper chord of the combined truss is composed of two links or rods *m m* pivoted together at A and each pivoted at its other end to the inner end of the upper chord of one of the bridge arms at B and forming a movable toggle joint at A which joint is connected to the pivot pin which connects the upper ends of the two inclined struts *n n*, the lower ends D of said struts *n n* being pivoted at *g* to the shoes or carriages *b' b'* which carriages rest upon a nest of rollers *b²*, see Fig. 2.

The shoes or carriages *b' b'* are each provided with a nut Q shown in Fig. 4 and in dotted lines in Fig. 2 in which work the threaded ends of the screw shaft *o o* mounted in fixed bearings Z, Z, and provided with thrust collars P P and the bevel gear wheel X with which the bevel gear wheel Y engages to impart rotary motion thereto.

The movable apex of truss members is at A made up of chord sections *m m* and struts *n n*. The screw shaft *o o* has formed thereon a right hand thread at one end and a left hand thread at the other end.

The gear wheel Y is secured upon a cross shaft, not shown, to which power is applied for working the mechanism for both trusses, the arrangement of screws and gears for the opposite truss being the same except that the arrangement of the gears or the relative positions of the right and left screw threads must be so modified that both screw shafts will act in unison to move the shoes or carriages, and the lower ends of the struts *n n* of both trusses toward each other at the same time or in like manner move them from each other at the same time.

The arrangement of the chord packing or means of connecting the chord sections *m, m*, to the struts *n, n*, is shown at A in Fig. 3 and *f* is the lateral strut connecting the upper ends of the struts *n n*. A modified form of shoe or carriage for supporting the struts *n n* is shown in Fig. 7 which is applicable where

the lower ends of the struts have to be moved through a considerable distance which will occur when the inclination of the links m to a horizontal plane is small.

5 The roll bearing of the shoes may be dispensed with in light bridges the shoe in such case being arranged to slide upon the bed without the intervention of rolls.

10 In some cases instead of the screw shafts o and nuts Q and gears X and Y we connect to each of the shoes b' one end of a rod c^4 , c^4 the opposite ends of which are connected to the levers $c' c'$ and we connect to the outer ends of said levers the outer ends of the toggle
15 links $c^2 c^2$ the inner ends of which are pivoted together at c^3 so that by applying power to the joint c^3 to move it in the direction indicated by the arrow 4, the struts n, n , will be moved toward each other.

20 The arrangement of screws and gears or levers for moving the shoes and the lower ends of the struts $n n$ will necessarily have to be modified somewhat to suit the peculiar varying arrangements of the floor system for each
25 particular case, but the main features and general arrangement will remain the same.

The operation of our invention is as follows: The bridge being closed and the outer ends of the arms resting on the abutments,
30 the shaft carrying the gears Y is revolved in the proper direction to revolve the shafts $o o$ in such a manner as to draw the shoes $b' b'$ and the ends D of the struts $n n$ toward each other by virtue of the action of the threaded
35 ends of the shafts $o o$ upon the nuts Q attached to the shoes $b b$, thereby moving the apex A upward and drawing the inner ends B of the upper chords of the arm trusses nearer together and raising the ends of the
40 arms from contact with the abutments, when the bridge may be swung open, and after it has again been swung to or closed the shaft carrying gear Y is revolved in the opposite direction to move the lower ends of the struts
45 outward or farther from each other thereby lowering the apex A and thus permitting the ends of the arms of the bridge to fall by the force of gravity to their bearings upon the abutments. If we provide the oblong eyes in
50 heads A or B of bars m , and, after the outer ends of the arms have come to their bearings spread the lower ends of the struts $n n$ still farther we cause each arm to act as a simple bridge for live load as well as dead weight.

55 The advantages of our invention are simplicity and cheapness of construction, a saving of material in the trusses of short span draw-bridges by the action of the arms as simple bridges, thereby requiring lighter truss
60 members in the center, and ease and certainty in the computation of strains in the last mentioned class of draw-bridges.

In continuous structures the strains are unaffected by difference of level of supports.

65 Another advantage is the avoidance of live load "kick."

We claim—

1. In combination with the two arms of a swing draw-bridge, a pair of toggle links connecting the inner ends of the upper chords of
70 the two arms and forming the central portion of the upper chord of the main bridge truss, a pair of movable inclined struts pivoted together and to said toggle links at the center of the bridge, and a system of mechanism sub-
75 stantially as described for moving the bases of said struts toward or from each other, whereby the apex of the central truss members may be raised or lowered thus moving
80 the inner ends of upper chords of the arms toward or from each other and raising or lowering the outer ends of said arms.

2. In combination with the two arms of a swing draw-bridge, a pair of inclined struts pivoted together at their upper ends and each
85 pivoted at its lower end to a shoe or carriage resting upon a bed and movable thereon, a pair of toggle links connecting the inner ends of the upper chords of the two bridge arms
90 and the upper ends of said inclined struts, and a system of screws, nuts, gears and shafting for moving said shoes and the lower ends of said struts toward and from each other,
95 whereby the apex of said struts and toggle may be raised or lowered, the upper chords of the two arms of the bridge be moved toward or from each other and the outer end of said arms be raised or lowered.

3. In combination with the two arms of a swing draw-bridge, a pair of movable inclined
100 struts pivoted together at their upper ends, a pair of toggle links each provided in one end with an oblong eye said links being connected together and to the pivotal connection of the
105 said struts and each pivoted at its other end to the inner end of the upper chord of one of the arms of said bridge, and a system of screws, nuts, gear and shafting for moving the lower ends of said struts toward and from
110 each other substantially as and for the purposes described.

4. In combination with the two arms of a swing draw-bridge a pair of inclined struts pivoted together at their upper ends and each
115 pivoted at its lower end to a shoe, a nest of rollers interposed between said shoe and the bed support, a pair of toggle links connecting the inner ends of the upper chords of the arm trusses and the pivotal connection of said
120 struts, and a system of mechanism substantially as described for moving said shoes and the lower ends of said struts toward and from each other as described.

In testimony whereof we have signed our names to this specification, in the presence of
125 two subscribing witnesses, on this 23d day of March, A. D. 1891.

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

Witnesses:

N. C. LOMBARD,
WALTER E. LOMBARD.