No. 615,824. Patented Dec. 13, 1898.

J. EDWARDS.

SWIVEL DRAWBRIDGE.

(Application filed June 22, 1898.)

(No Model.) 6 Sheets—Sheet 1.

FIG. 1.

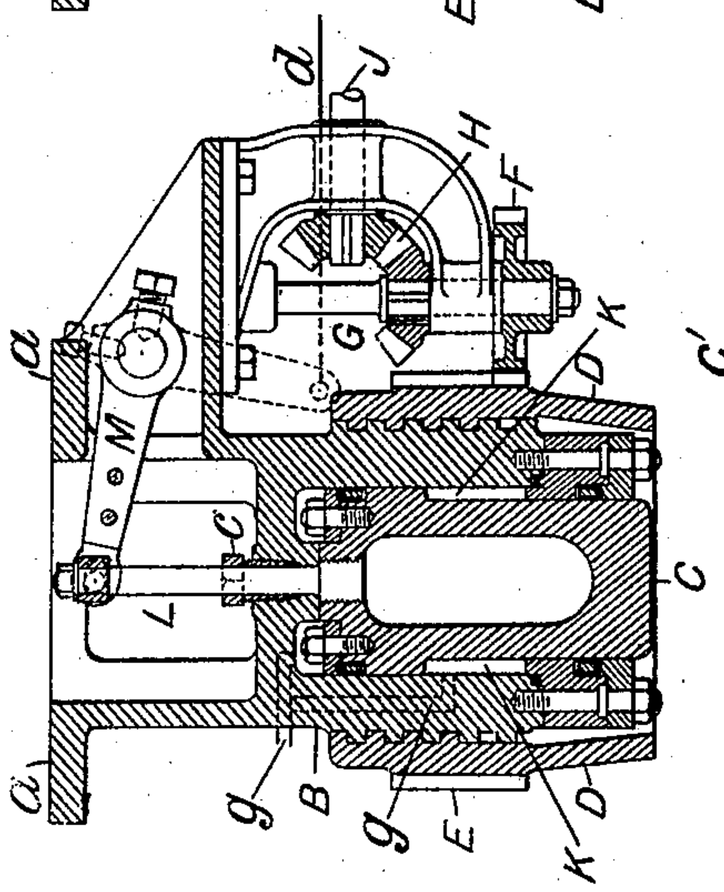

FIG. 2.

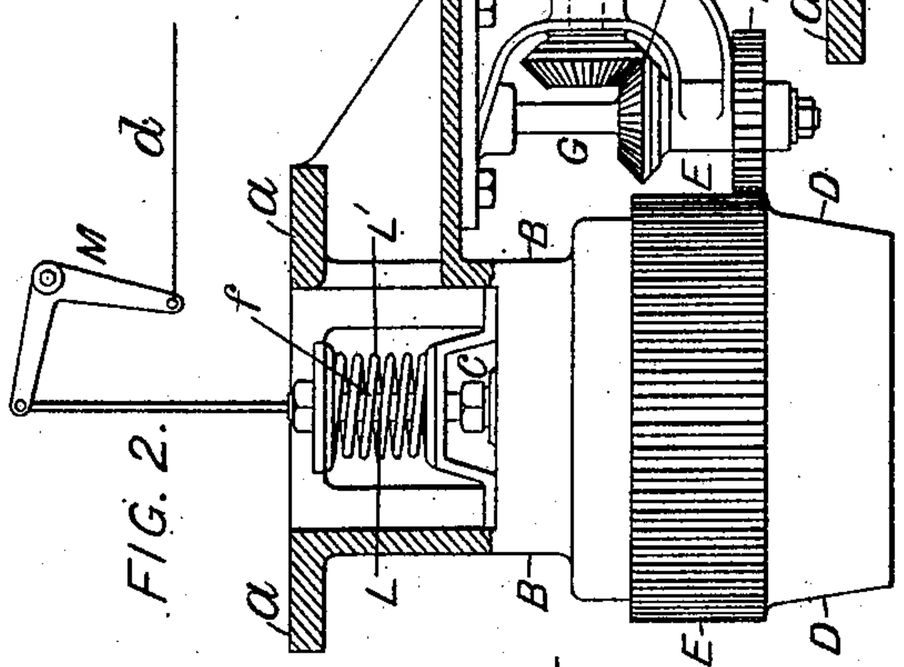

FIG. 3.

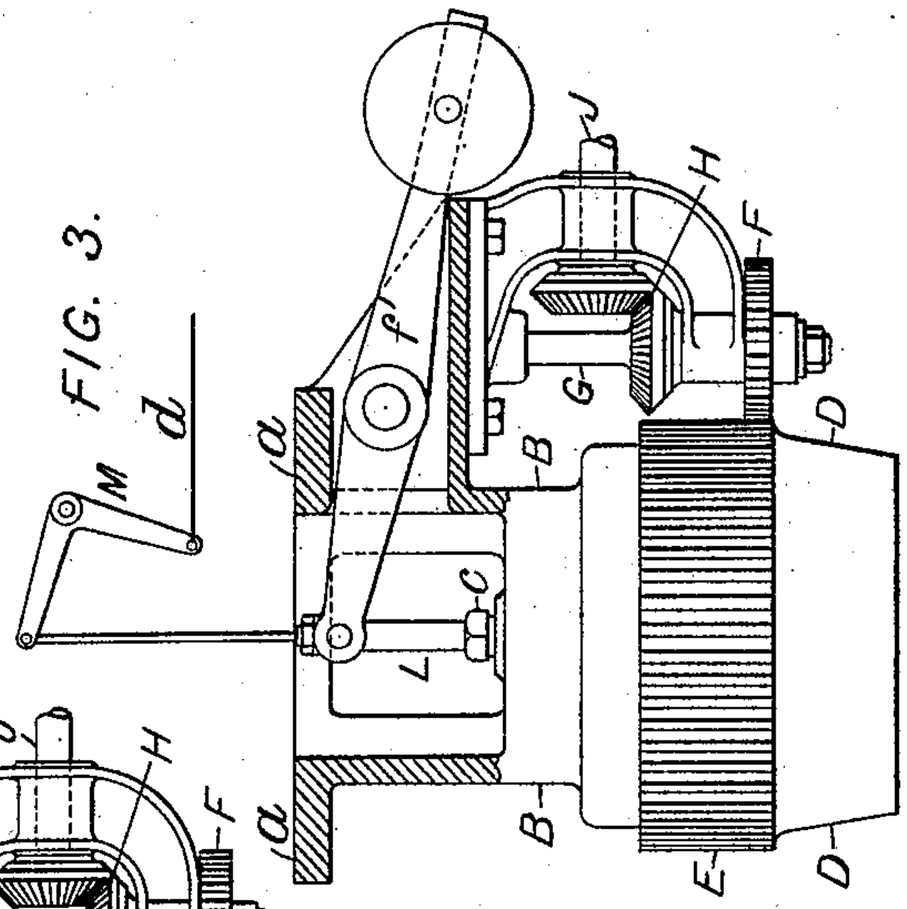

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FIG. 4.

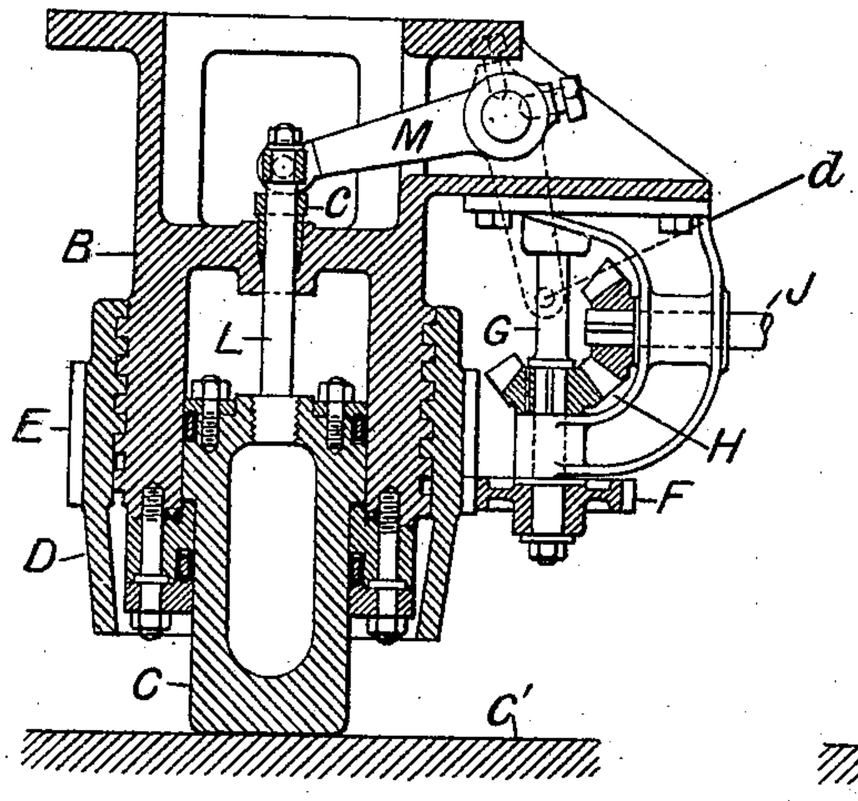


FIG. 5.

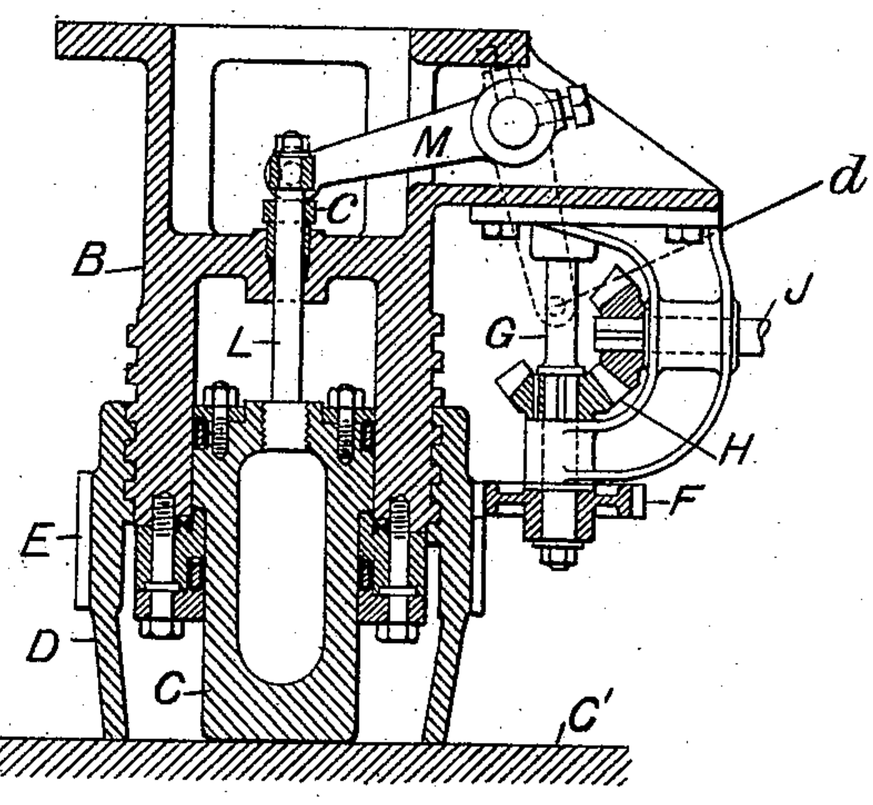
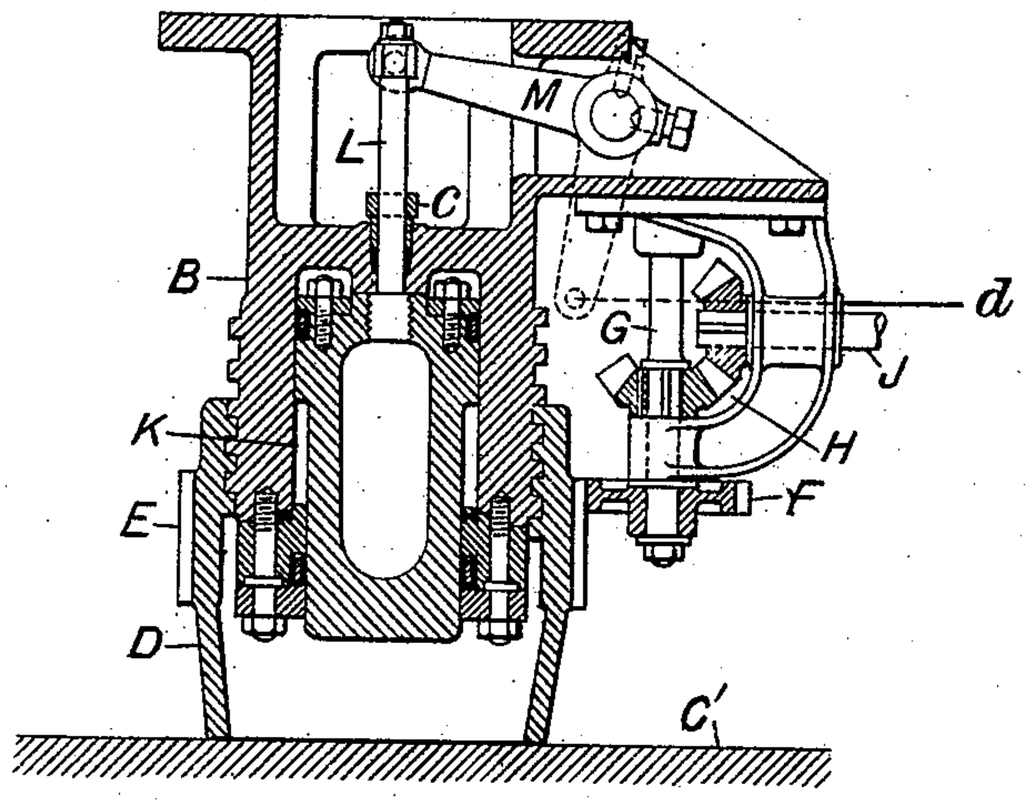


FIG. 6.



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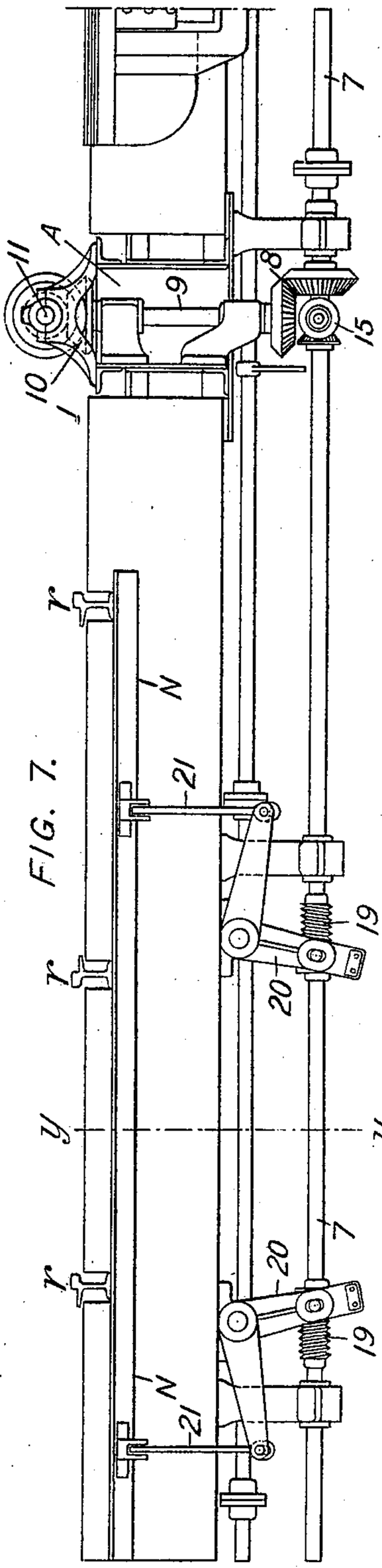

FIG. 7.

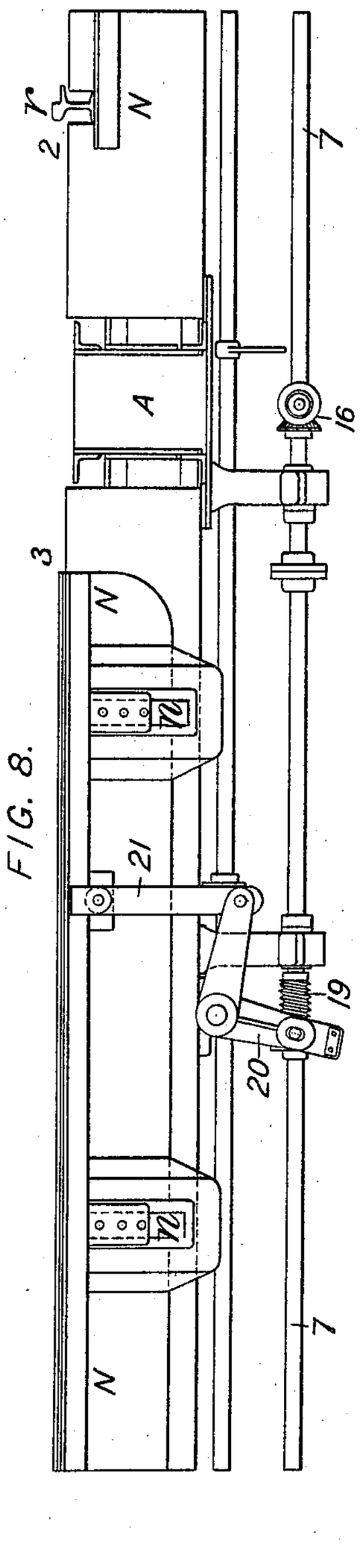

FIG. 8.

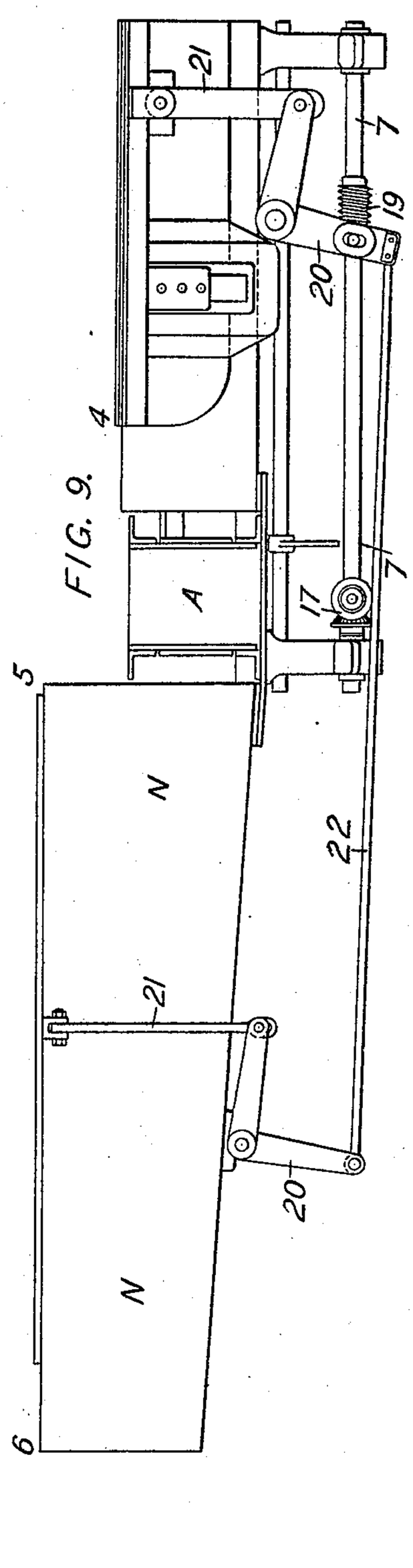

FIG. 9.

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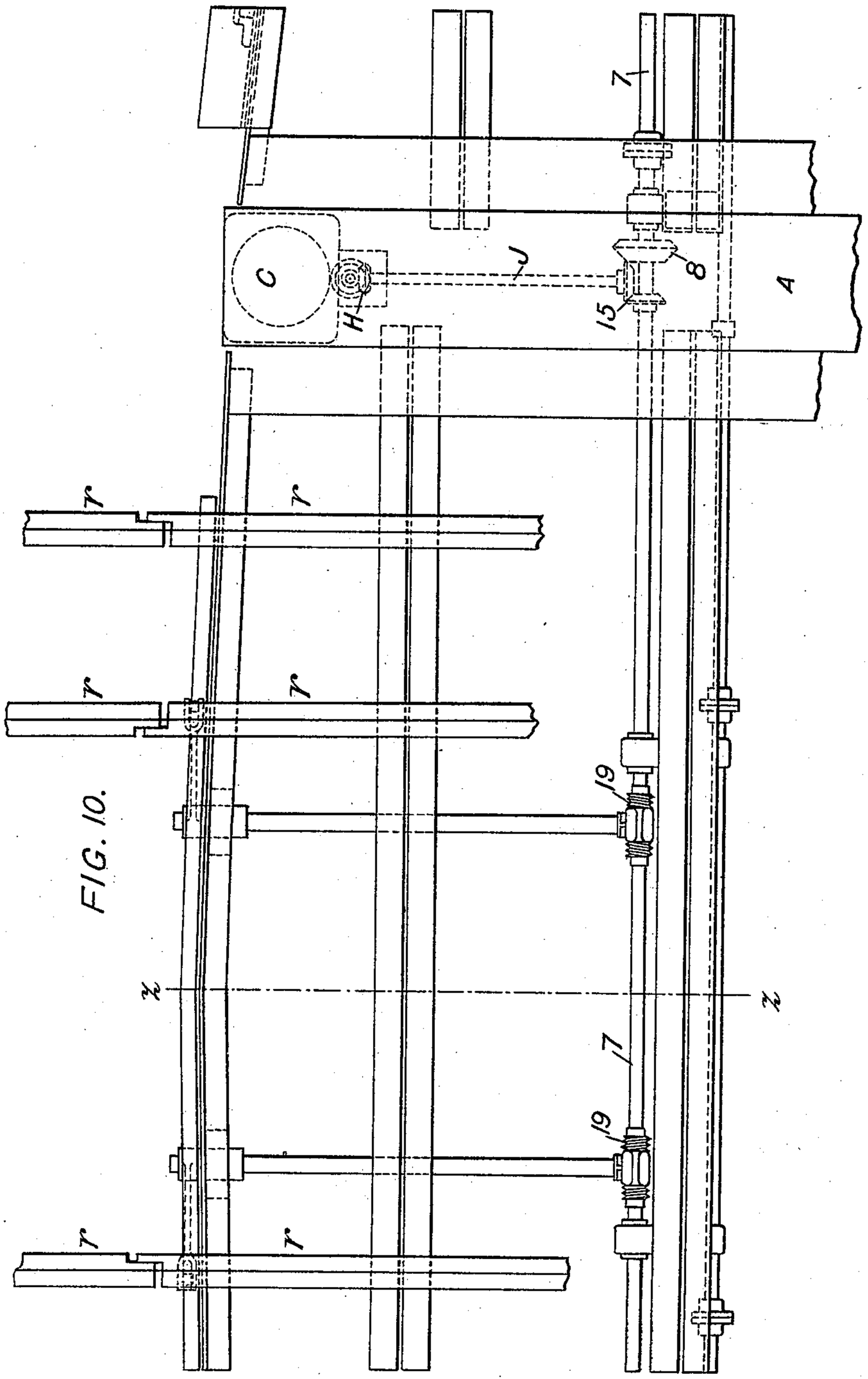

FIG. 10.

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(No Model.)

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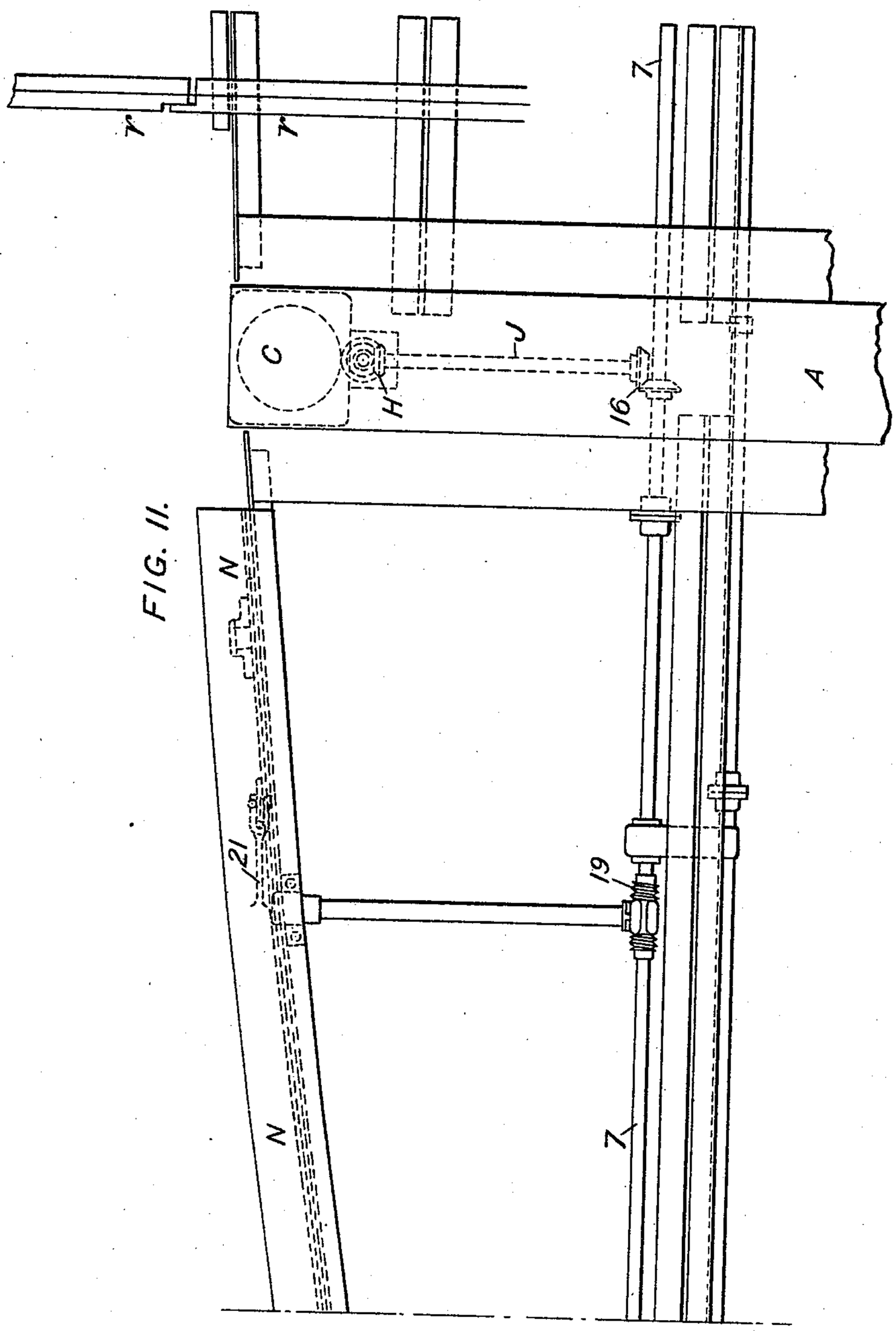
FIG. II.



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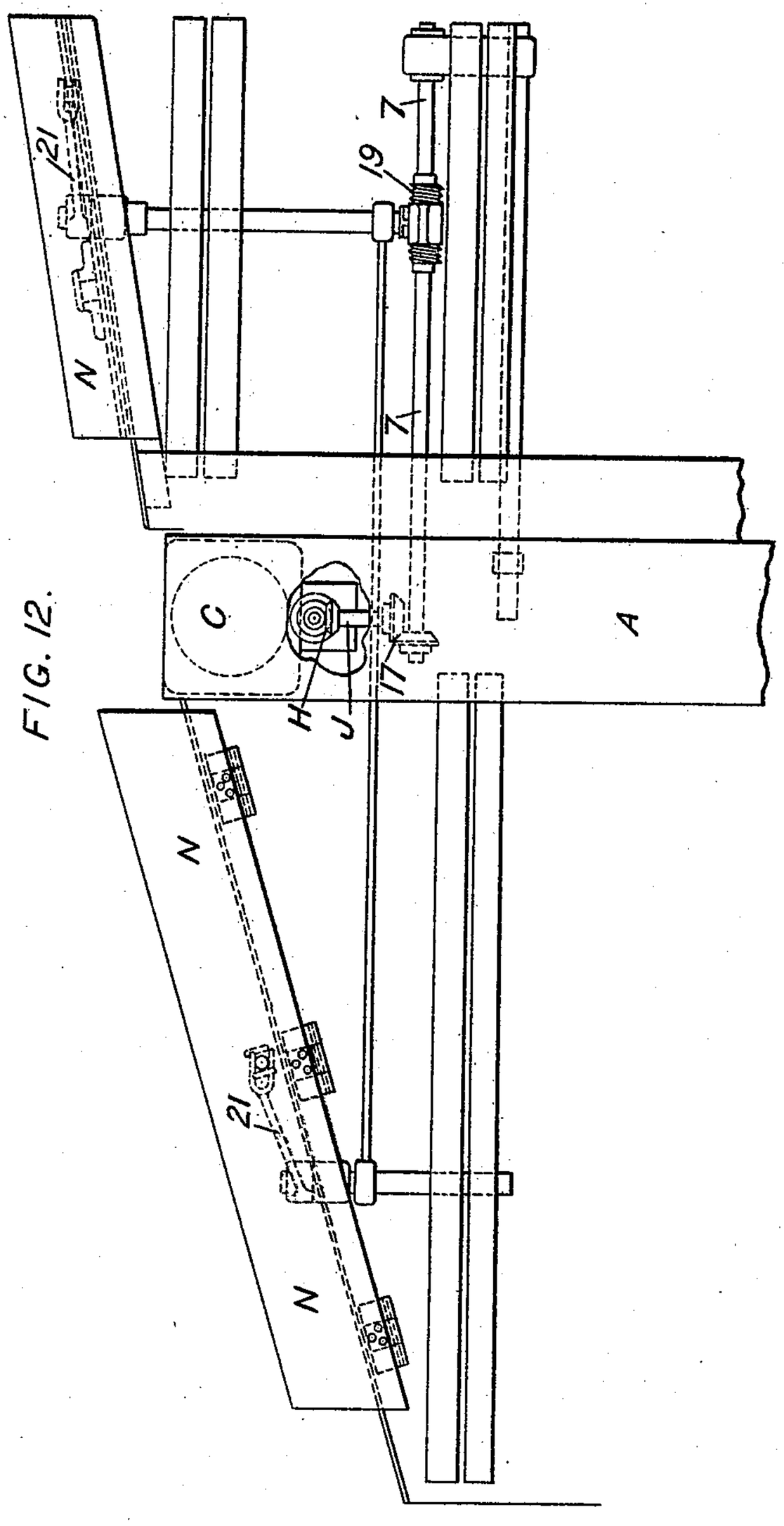
6 Sheets—Sheet 6.

FIG. 12.



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UNITED STATES PATENT OFFICE.

JOSEPH EDWARDS, OF NEW YORK, N. Y.

SWIVEL-DRAWBRIDGE.

SPECIFICATION forming part of Letters Patent No. 615,824, dated December 13, 1898.

Application filed June 22, 1898. Serial No. 684,191. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH EDWARDS, a citizen of the United States, residing at New York, in the borough of Brooklyn and State of New York, have invented new and useful Improvements in Swivel-Drawbridges, of which the following is a specification.

My invention relates to swivel-drawbridges, especially of the heavy class, the ends of which will unavoidably more or less sag and therefore when the bridge is closed requires to be supported, whereby there is of course much pressure between the bridge and the fixed spans, which needs to be removed whenever the bridge is to be drawn or opened; but when the bridge is to be closed the ends need again to be raised and supported to prevent the sagging thereof. This pressure between the ends of the bridge and the fixed spans must be removed before the bridge can be turned or drawn, and when it is closed the ends must be slightly elevated to place them firmly on the fixed spans.

The object of my invention is to provide an upward pressure or support to the extremities of the drawbridge when it is closed and to remove the said pressure and liberate the bridge therefrom, and so render it free to be rotated when desired, and also in connection therewith to simultaneously and automatically elevate the aprons of such bridges that cover the spaces between the ends of the bridge and the fixed spans. These objects I successfully attain by the mechanism illustrated in the accompanying drawings, consisting of six sheets, in which—

Figure 1 represents a vertical section of a hydraulic ram of peculiar construction, on the outside of the cylinder of which is provided a thread, which operates in a corresponding thread on the inner surface of a surrounding sleeve, the outer surface of the sleeve being provided with elongated gear-teeth; Fig. 2, an elevation of Fig. 1, somewhat modified; Fig. 3, also an elevation of Fig. 1 with a different modification; Fig. 4, a vertical section showing the position of the plunger of the ram when the end of the bridge is slightly raised thereby; Fig. 5, a vertical section showing the sleeve turned down and bearing upon the fixed span of the bridge; Fig. 6, a vertical section showing the plunger of the ram drawn up from the fixed span and the bottom of the sleeve resting thereon to support the end of the bridge when closed. Figs. 7, 8, and 9, taken together, so that Fig. 8 joins to the left of Fig. 7 and Fig. 9 to the left of Fig. 8, constitute a transverse elevation of something more than half of one end of the bridge, the transverse center of the bridge being shown by the dotted line *y y*, Fig. 7; and Figs. 10, 11, and 12 are plan views, respectively, of Figs. 7, 8, and 9, the broken line *z z*, Fig. 10, corresponding to the broken line *y y* in Fig. 7.

Similar letters and numerals of designation refer to similar parts throughout the several views.

A A are longitudinal girders extending the whole length of the bridge, of which there are four. Underneath and secured to the ends of each of these girders is one of the hydraulic rams shown by Figs. 1, 2, 3, 4, 5, and 6. The cylinders B of these said rams are fastened to the said girders by bolting the flanges *a a* thereof to the girders.

C, Figs. 1, 4, 5, and 6, is the plunger of the hydraulic ram; C′, the fixed span; D, a heavy threaded sleeve which surrounds the cylinder B B of the ram and in operation is screwed up and down on the said cylinder. This sleeve is provided on its outer surface with vertically-elongated cogs or teeth E E, (best shown in Figs. 2 and 3,) which correspond with the teeth of the pinion F, mounted on the vertical shaft G, which is rotated by means of the horizontal counter-shafts J through the miter-gear H and causes the rotation of the adjustable supporting-sleeve D.

In Figs. 1 and 6, K represents a small space between the plunger and cylinder of the ram to admit hydraulic pressure for lifting the plunger. *g* and *g′* (shown only in Fig. 1) are pipes for admitting water to operate the ram.

L is a suspending-stem fastened in the top of the plunger C and extending up through a stuffing-box *c*, located in the head of the cylinder B. This plunger-rod serves a twofold purpose—namely, to suspend the plunger and free it from the fixed span when not pressed down and to operate an indicator in the power-house to show at all times the vertical position of the plunger. M, Figs. 1, 2, and 3, is a bell-crank, one arm of which is attached to and operated by the said suspending-stem L and the counter-arm of which is connected with and operates the rod *d*, which

connects with and operates the indicator in the operator's room at the power-house of the bridge.

Referring now to Figs. 7, 8, and 9, (taken together, as previously stated,) the transverse central portion of the bridge, which is occupied by two sets of rail-tracks *r r r r*, extends from 1 to 2, (see Figs. 7 and 8,) and from 3 to 4 (see Figs. 8 and 9) is occupied by the carriage-ways and from 5 to 6 (see Fig. 9) is occupied by the footways or sidewalks. This I mention as each of these portions of the bridge at either end has a separate apron N for covering the gap between the ends of the bridge and the fixed spans, being five aprons N N N at either end of the bridge.

7 7, Figs. 7, 8, and 9, is a continuous shaft extending transversely to the bridge, which is operated by the right-angle gear 8, Fig. 7, and this gear is operated by the vertical shaft 9, which in turn is operated by the right-angle gear 10, located between the rail-tracks and the carriage-way of the bridge. This bevel-gear 10 is operated by the longitudinal shaft 11, Fig. 7, which extends to the power-house located at the longitudinally-central portion of the bridge, whereby the rotation of this longitudinal shaft 11 will rotate the transverse shaft 7 7. It is by means of this shaft 7 7 I obtain the power and motion for operating the said several aprons and adjustable supporting-sleeves and simultaneously and automatically raising and lowering the said aprons, as will be seen when I come to explain the general operation of my invention. It will now be seen that by rotating the extended shaft 7 7 the several countershafts J J will be rotated, which in turn will rotate the several adjustable supporting-sleeves D D surrounding the cylinders B B of hydraulic rams C C.

Referring now to Figs. 7, 8, and 9 and 10, 11, and 12, N N N are the aprons, consisting of heavy plate-steel, kept in their horizontal position by means of the vertical guiding-posts *n n*, as shown in Fig. 8. For each apron there is provided on the extended shaft 7 7 a pair of threaded sleeves 19 19, (see Fig. 7,) one of each pair of said sleeves having a right-hand thread and the other a left-hand thread. Operatively connected with either of each pair of these threaded sleeves is one arm of a bell-crank 20 20, which I will term the "shaft-arm." Connected with the counter-arm of these bell-cranks are vertical connecting-rods 21, the upper ends of which are pivoted to the lower side of the aprons, whereby a simultaneous horizontal movement from each other of the lower arms of the said bell-crank will give an upward movement to the connecting-rods 21 21 and so lift the aprons from the fixed spans, and the diverging and converging movements of the shaft-arms of these bell-cranks are produced by the rotation of the extended shaft 7 7 and the right-hand and left-hand threads on the respective two sleeves 19 19 thereon. The aprons of the footwalks being much lighter in weight are operated by attaching the connecting-rod 22 (see Fig. 9) to one of the shaft-arms of the bell-cranks 20, that operates on the apron of the carriage-way.

Having pointed out the various parts of my device and partially described their functions, I will now clearly explain the general operation of my invention.

Referring to Fig. 6, the vertically-adjustable supporting-sleeve D is shown as bearing on the fixed span and sustaining a heavy pressure, and thereby preventing the girder above it from sagging. Each girder at either end of the draw is provided with the same sustaining device. To draw or turn the bridge without first relieving the pressure on these adjustable supporting-sleeves would be impossible. To relieve this pressure, the operator at the power-house of the bridge turns on the hydraulic pressure and brings the hydraulic ram into action, forcing the plunger C down into the position shown in Fig. 5, thus transferring the pressure from the said sleeve to the plunger, which liberates the sleeve. The operator at the power-house now turns on the steam of the engine and rotates the shaft 7 7, which, as previously shown, will rotate the several counter-shafts J, which in turn will rotate the several supporting-sleeves D D and screw them up on the cylinders B of the rams until they stand in the position shown by Fig. 4. The pressure now that was sustained by the sleeves is sustained by the plungers of the rams. To now liberate the bridge from the fixed spans, the operator allows the water to escape from the rams and elevates the plungers thereof into the position shown by Figs. 1, 2, and 3, which completely frees the ends of the bridge from the fixed spans C. When the draw is to be closed, these operations are simply reversed—that is, the bridge being swung back into lineal position the plungers are forced down far enough to take up the sag of the bridge, whereupon the adjustable supporting-sleeves are screwed down into contact with the fixed spans (by reversing the motion of the operating-engine) and then releasing the plungers of the hydraulic rams by allowing the escape of the water therefrom. Here I will state that the plungers of the rams can be elevated and held suspended in an elevated position in order to clear them from the fixed span when the bridge is to be opened and closed by various contrivances connected with the suspension-stem L, extending from the top of the plunger up through the head of the cylinder. For example, the plungers may be raised and held up by hydraulic pressure in the chamber K (see Fig. 1) or by the spring S, as shown in Fig. 2, or by the weighted lever S′, as shown in Fig. 3, or by any other ordinary suitable contrivance. Therefore, aside from the said suspending-stem L projecting up from and connected with the plunger of the hydraulic ram, I do not limit myself to any special means for raising and holding

the plungers up from the fixed spans when they are not being forced down upon the same.

I will now explain how the aprons of the bridge are simultaneously and automatically lifted clear of the fixed span by the rotation of the same shaft 7 7 that operates the adjustable supporting-sleeves D D.

Referring to Fig. 7, the two threaded sleeves 19 19 on the said shaft, one having a right-hand thread and the other a left-hand thread, will by rotating the said shaft 7 7 in one direction widen the space between the lower or shaft arms of the bell-cranks 20 20 and by rotating the said shaft in the opposite direction draw the said lower arms toward each other, whereby the connecting-rods 21 21 between the counter-arms of the bell-cranks and the aprons will be correspondingly elevated and lowered and the aprons thereby lifted and lowered. The said threaded sleeves are placed in position on the said shaft to correspond with the adjustable supporting-sleeves D D—that is, when the latter are resting on the fixed span so do the former—whereby when the rotation of the operating-shaft 7 7 begins to elevate the sleeves D D it simultaneously and automatically begins to lift the aprons, and the intervening parts and pitch of threads on the sleeves that operate the aprons and on the cylinders of the rams are so proportioned that when the adjustable supporting-sleeves D D are sufficiently elevated to clear the fixed spans the aprons will have the same clearage.

The draw is opened and closed by an operator in the power-house located on the central part of the bridge by having control of the hydraulic pressure that operates the rams and the engine that furnishes the motive power that rotates the several shafts.

The practicability and usefulness of my invention are thoroughly proven by its successful and highly satisfactory operation on what is known as the "New Harlem bridge" in the Manhattan borough of the city of New York.

What I claim as new and useful, and desire to secure by Letters Patent, is—

1. In a swivel-drawbridge, a series of hydraulic rams underneath and attached to the ends of the bridge-girders the plungers of the said rams having suspending-stems passing up through the head of the cylinders of the said rams and having attached thereto any ordinary suitable plunger-suspending and indicator-operating device, in combination with vertically-adjustable supporting-sleeves surrounding the said cylinders and having a threaded connection therewith and the said sleeves having on their outer surface elongated spur-gear teeth connected with pinions and any ordinary suitable means for rotating the said pinions, whereby the rotation of the said sleeves on the said cylinders will give a vertical movement to the said sleeves, as and for the purpose specified.

2. In a swivel-drawbridge, a transverse shaft having fixed thereon underneath each apron of the bridge a pair of externally and reversely threaded sleeves having an operative connection with one of the arms of a pair of bell-cranks and the counter-arms of the said bell-cranks having a pivoted connection with a pair of connecting-rods between said counter-arms of the bell-cranks and each of the said aprons; whereby the rotation of the said shaft will diverge and converge the shaft-arms of the several pairs of said bell-cranks and thereby automatically raise and lower the said aprons, substantially as and for the purpose set forth.

3. In a swivel-drawbridge, a series of hydraulic rams underneath and attached to the ends of the bridge-girders, the plungers of the said rams having suspending and indicator-operating stems passing up through the head of the cylinders of the said rams and having attached thereto any ordinary suitable plunger-suspending and indicator-operating device, and the said cylinders having surrounding and vertically-adjustable supporting-sleeves threaded therewith and having on their exterior surface elongated spur-gear teeth connected with corresponding pinions operated by counter-shafts, in combination with a transverse operating-shaft having fixed thereon at suitable intervals pairs of externally and reversely threaded sleeves having operative connection with the shaft-arms of corresponding pairs of bell-cranks and the counter-arms of the bell-cranks having connection with aprons of the bridge by intermediate vertical connecting-rod; whereby the vertical movement of the adjustable supporting-sleeves surrounding the cylinders of the said rams and the raising and lowering of the said aprons will be simultaneously and automatically performed by the rotation of the said transverse operating-shaft as and for the purpose described.

4. In a swivel-drawbridge a series of hydraulic rams underneath and attached to the ends of the bridge-girders, the plungers of the said rams having suspending-stems passing up through the head of the cylinders of the said rams and having attached thereto weighted levers to counterbalance the weight of and suspend the said plungers and having one arm of a bell-crank attached thereto, and the counter-arms of the said bell-cranks having attachment to one end of a rod having its other end connected with an indicator, in combination with adjustable supporting-sleeves surrounding the said cylinders having a threaded connection therewith and having on the exterior thereof elongated spur-gear teeth fitting into and operated by corresponding pinions operated by a suitable shaft, as and for the purposes described.

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