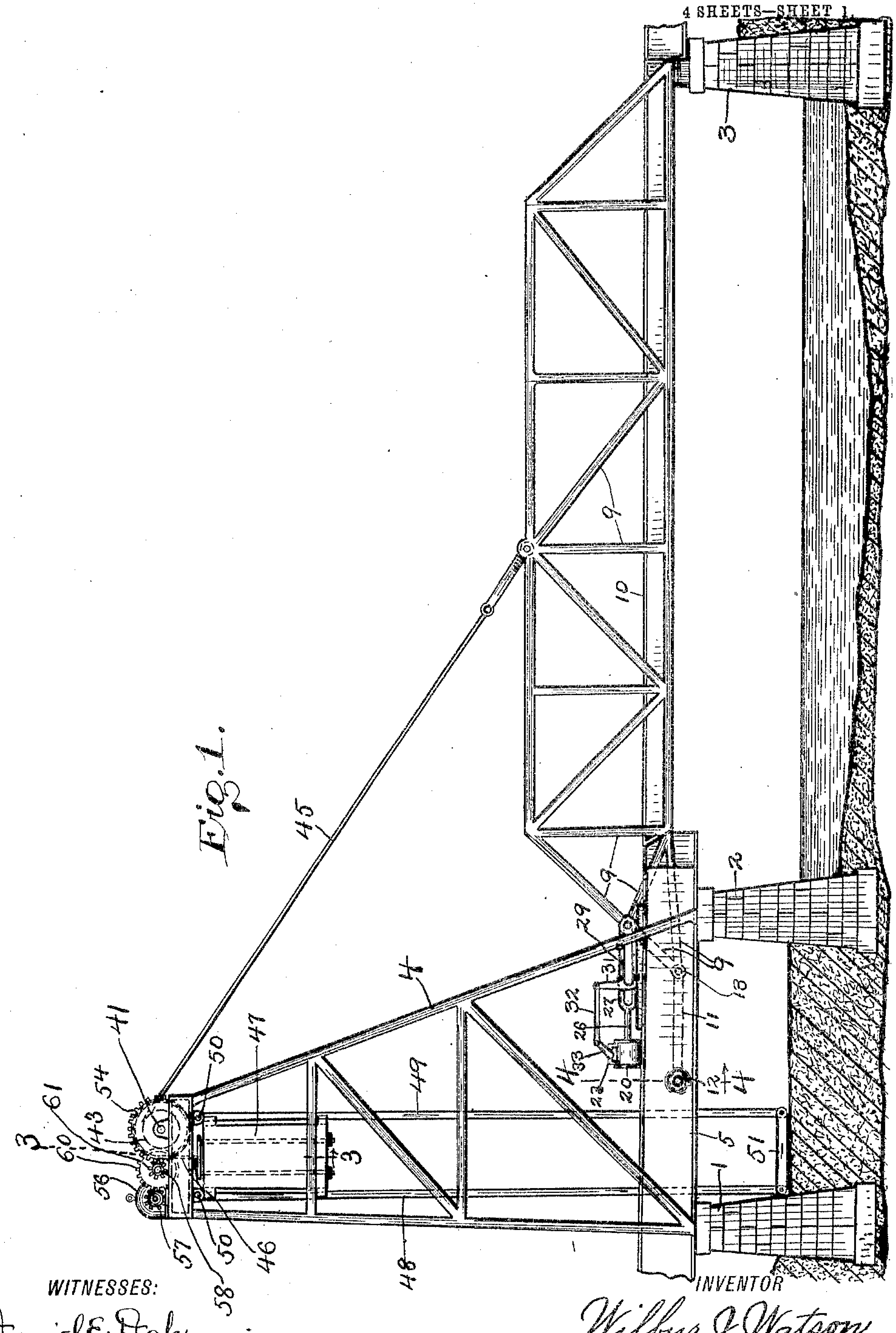
No. 789,398. PATENTED MAY 9, 1905.

W. J. WATSON.

BASCULE BRIDGE.

APPLICATION FILED NOV. 7, 1904.

4 SHEETS—SHEET 1.



WITNESSES:

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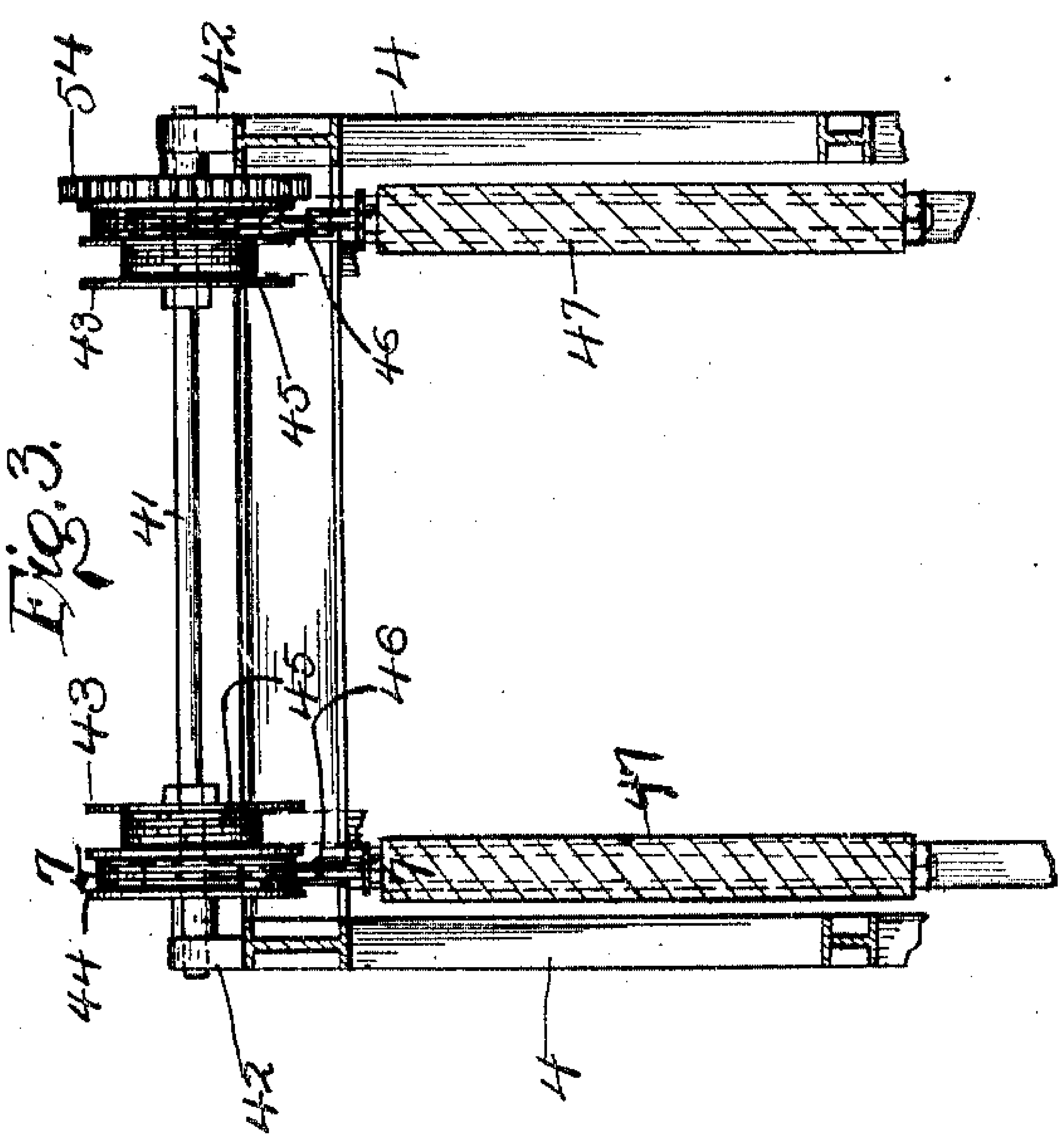
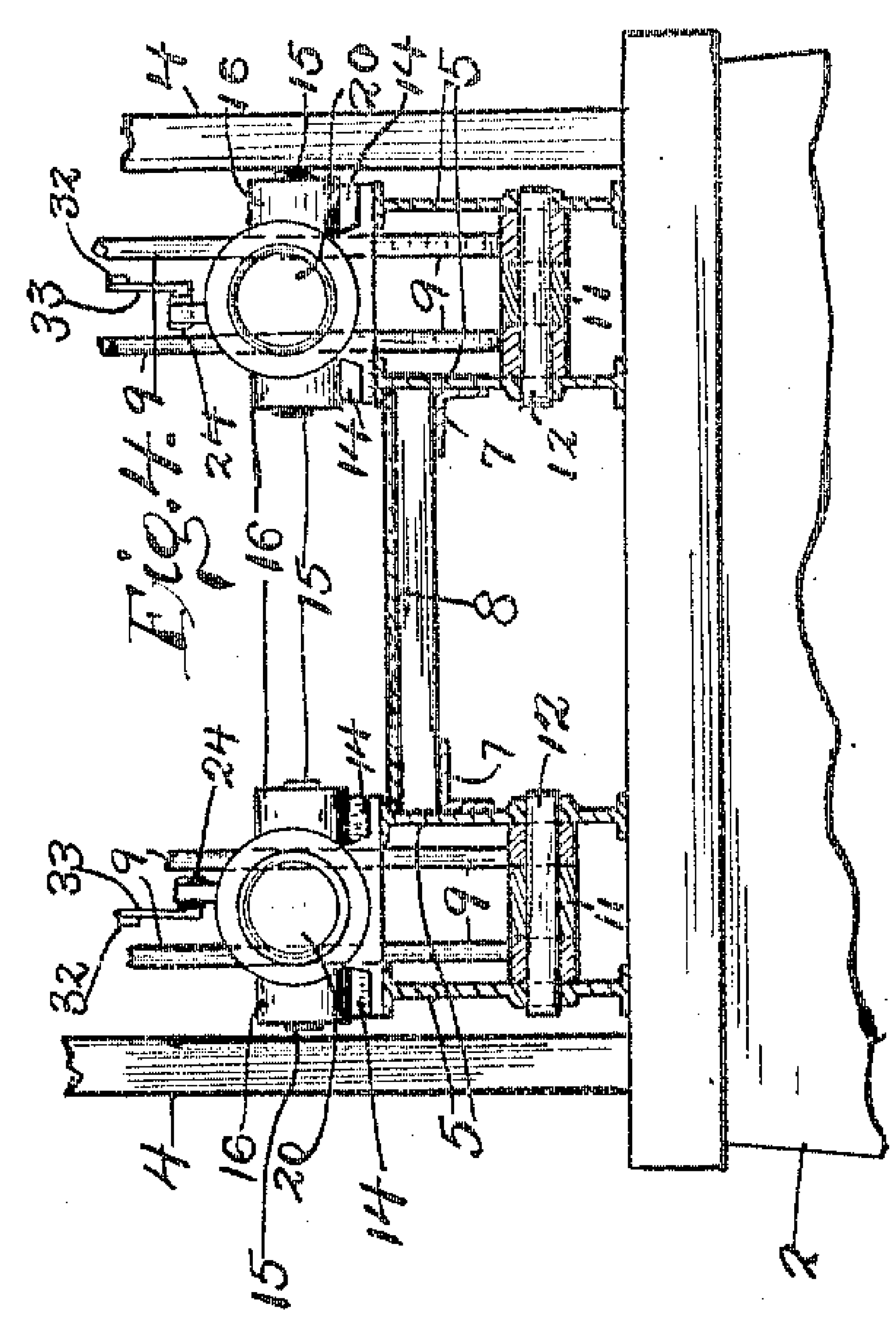


Fig. 3.



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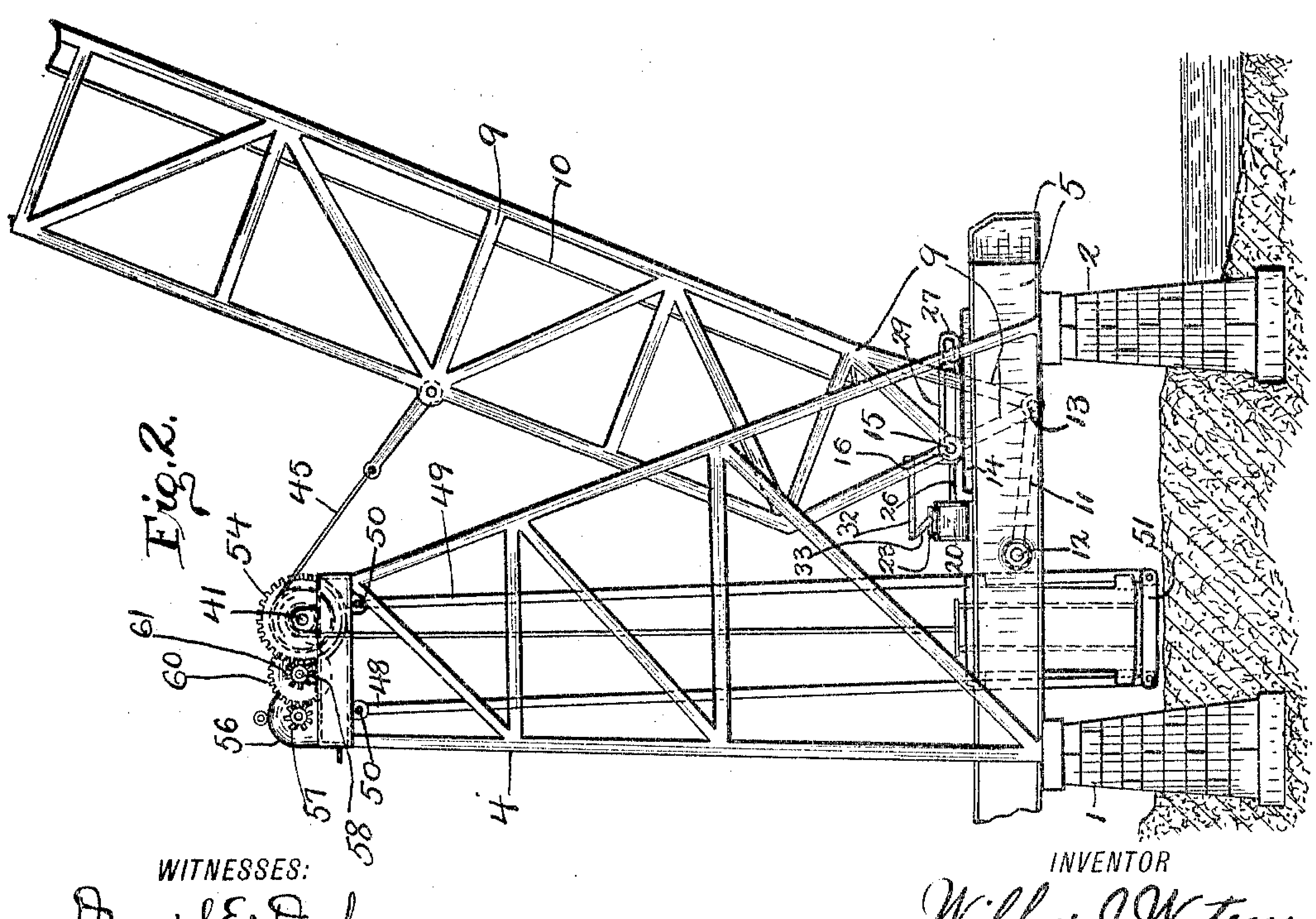

Fig. 2.

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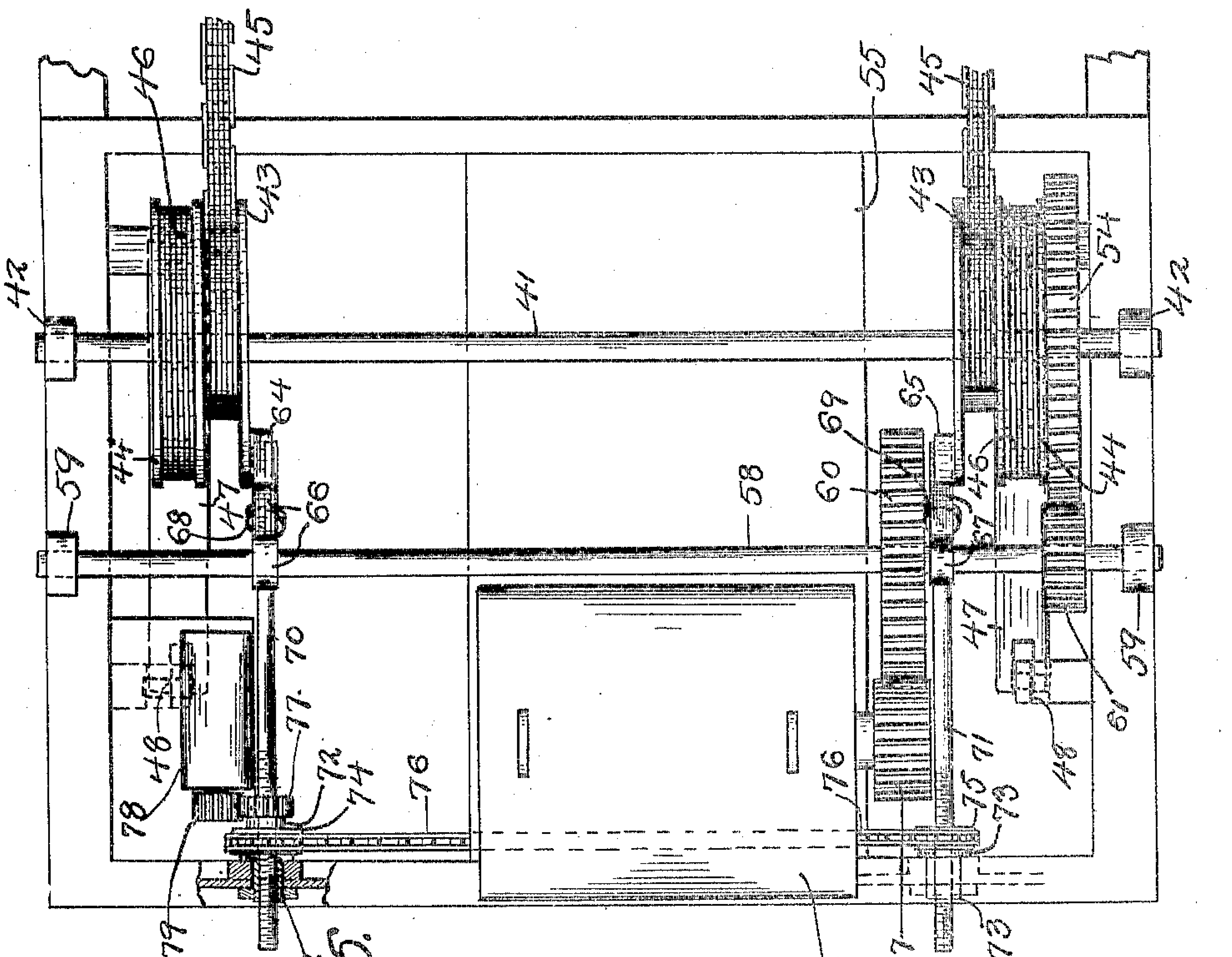

Fig. 5.

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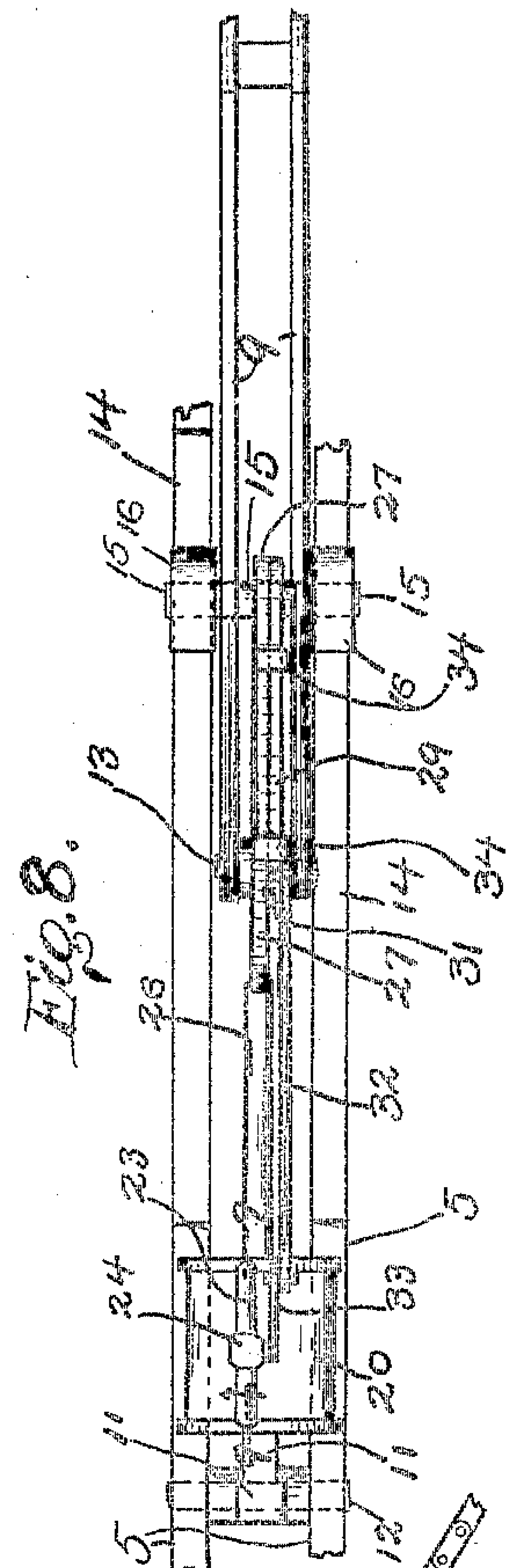

Fig. 8.

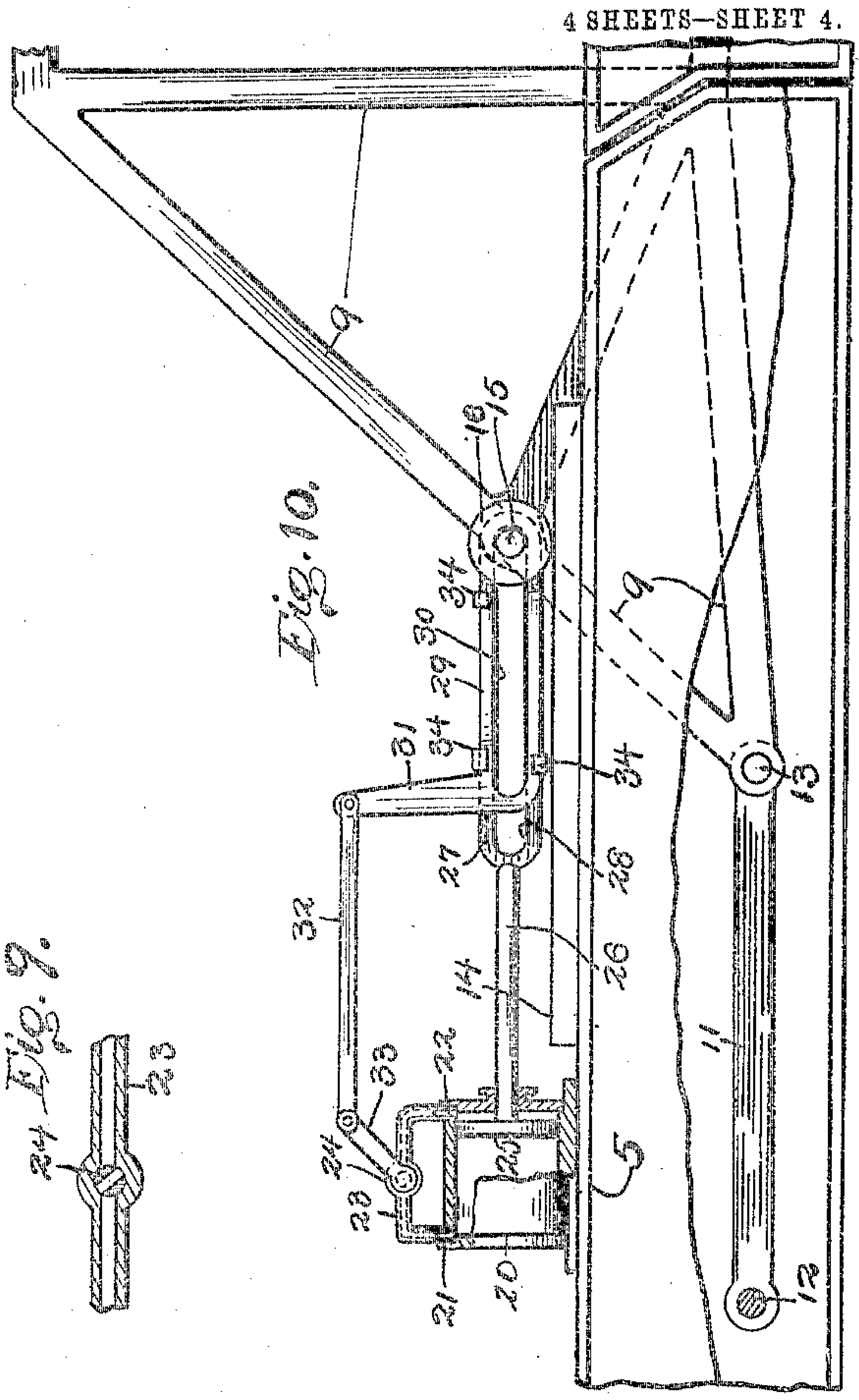

Fig. 10.

Fig. 9.

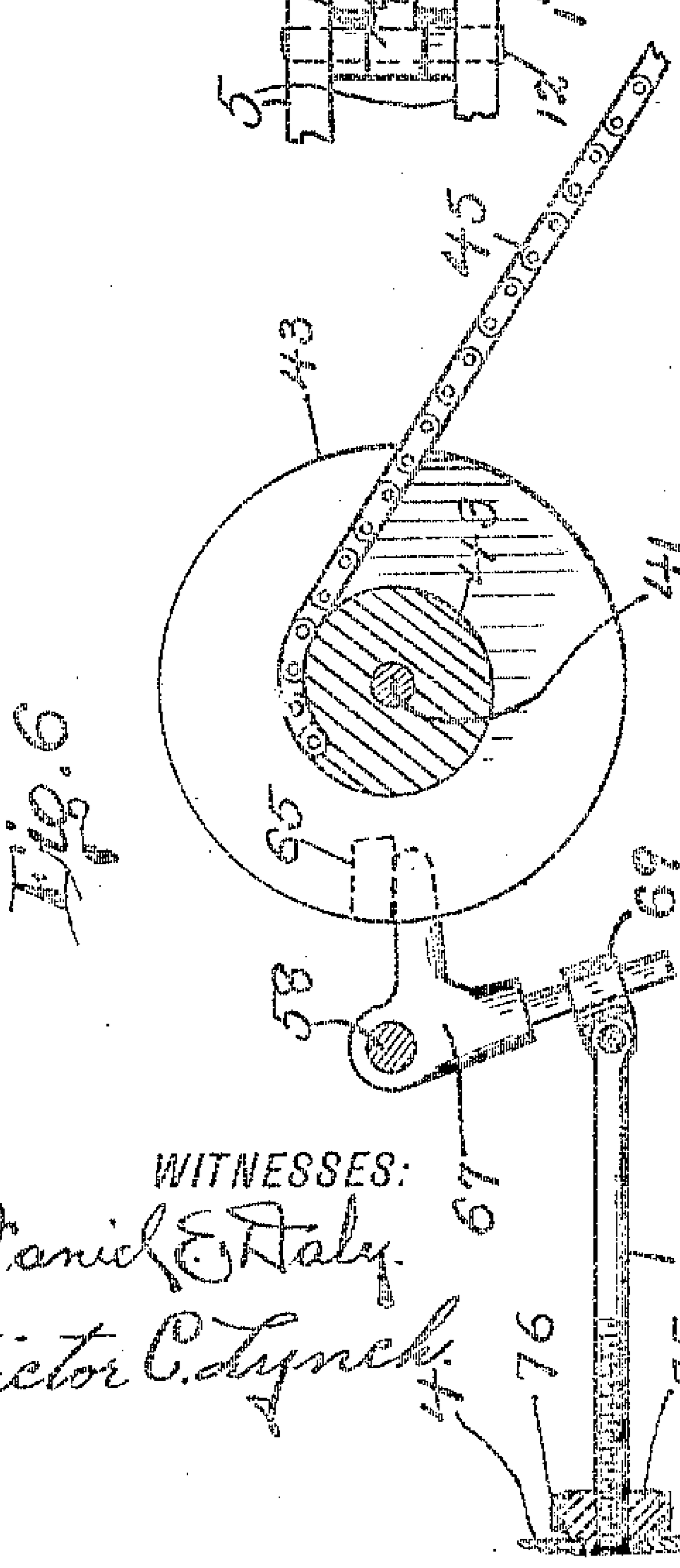

Fig. 6

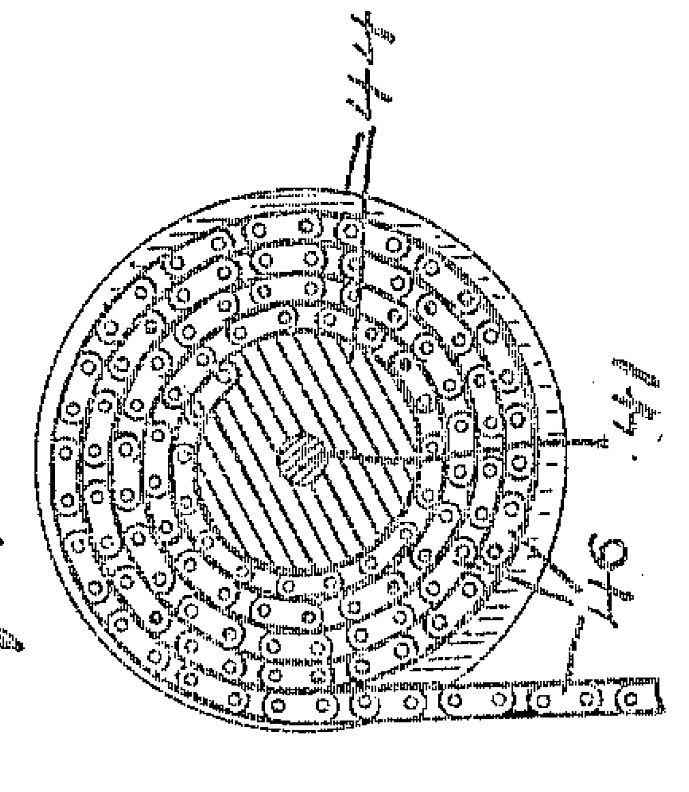

Fig. 7.

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No. 789,398. Patented May 9, 1905.

UNITED STATES PATENT OFFICE.

WILBUR J. WATSON, OF CLEVELAND, OHIO.

BASCULE-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 789,398, dated May 9, 1905.

Application filed November 7, 1904. Serial No. 231,776.

To all whom it may concern:

Be it known that I, WILBUR J. WATSON, a citizen of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Bascule-Bridges; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to improvements in bascule-bridges, and especially to the particular type of bridges where counterbalancing-weights are operatively connected with the movable span of the bridge, so as to be raised or lowered when the bridge is closed or opened.

The object of this invention is to reduce the cost of construction of bridges of this class, to secure economy in the operation thereof, to obtain the widest possible opening in proportion to the length of the span, and to guard against undue strain on the structure or machinery of the bridge, thereby increasing the durability and efficiency of the bridge.

My invention therefore consists in providing new and improved means for forming an operative connection between the counterweight and the movable span, so that the connecting means will of itself form a compensating medium in order that the force exerted by the weights will always be in proportion to the force necessary to balance the span in any position.

My invention further consists in the means for supporting and connecting the movable span to the stationary part of the bridge, so that the said movable span is free to move in both a vertical and horizontal plane.

My invention further consists in providing means for supporting the counterweights when the bridge is closed, so as to take all of the weight of the counterweights from the span.

My invention also consists in certain features of construction and combinations of parts, as described in the specification, pointed out in the claims, and illustrated in the drawings.

In the accompanying drawings, Figure 1 is a side elevation of a bridge embodying my invention. Fig. 2 is a similar view of the same with the span raised. Fig. 3 is a section on line 3 3, Fig. 1. Fig. 4 is a section on line 4 4, Fig. 1. Fig. 5 is a plan of the top of the tower. Fig. 6 is a detail view of one of the devices for relieving the strain of the counterweights. Fig. 7 is a section on line 7 7, Fig. 3. Fig. 8 is a detail view showing regulating mechanism in top plan. Fig. 9 is a section on line 9 9, Fig. 8. Fig. 10 is a detail view showing regulating mechanism in side elevation.

Again referring to the drawings, 1, 2, and 3 represent the masonry abutments of the bridge. On the abutments 1 and 2 is mounted a tower 4 of the usual construction. A pair of I-beams 5 are arranged to span the abutments 1 and 2 at each side of the tower. To the inner beams of each pair are secured brackets 7, which support the floor 8. The movable span is of the usual construction, comprising the trussed side pieces 9, between which is hung the floor 10.

The movable span is secured to the bridge as follows: Between each pair of I-beams 5 is pivotally secured a link 11 by means of a pin 12, and the free end of each link is pivotally secured to the lower end of the adjacent side piece of the movable span by a pin 13. On the I-beams 5 are mounted tracks 14. A pin 15 is rigidly secured in each of the side pieces 9 at a point slightly above the tracks 14, and on the ends of each pin 15 are mounted rollers 16, arranged to travel on the tracks 14. When the movable span is raised by the means hereinafter described, the rollers 16 will travel back on the track 14, and the lower end of the span where it is secured to the links will swing down in a slight curve. The rollers 16 therefore constitute means for supporting the span against vertical reactions, while leaving it free to move horizontally, and the links 11 constitute means for supporting the span against horizontal reactions, while leaving the span free to move vertically. When the span is raised, the center of rotation, which is at the intersection of vertical and horizontal lines drawn through the points of vertical and horizontal support, respectively, will be caused to move back, and it is therefore possible to build a bridge embodying my invention so that the full clear opening can be procured by revolving the span about seventy-five degrees. The point of horizontal support is preferably placed such a distance below the point of vertical support that as the span is raised the point of vertical support moves backward a sufficient distance to provide a lever-arm of the center of gravity of the span about the center of rotation, which shall always be greater than necessary to overcome the moment of the wind-pressure on the bridge about the center of rotation, and therefore there will always be tension on chains or cables. The point of horizontal support may be a fixed point, while still allowing the span to have both a vertical and horizontal movement; but this would complicate the construction, as the point of vertical support would then move in a curve instead of in a horizontal plane, as shown.

In order to provide against a too rapid opening or closing of the bridge due to careless operation or excess of wind-pressure, I provide regulating devices which serve to retard the movement of the span and cushion it as it comes to rest. My cushioning and retarding device is arranged as follows: At each side of the tower 3 on the respective pairs of I-beams 5 is mounted a cylinder 20, in the ends of which are formed ports 21 and 22. The ports 21 and 22 are connected by a pipe 23, which is provided with an ordinary valve 24. In the cylinder 20 is arranged a piston 25, which is provided with a piston-rod 26. The piston-rod 26 is enlarged and preferably flattened, as at 27, and therein is formed a longitudinal slot 28. The said slot 28 is adapted to receive the aforementioned pin 15, which carries the rollers 16. To the piston-rod 26 is secured a plate 29 by means of turned-over flanges 34, so as to allow said plate 29 to slide on the piston-rod. In the plate 29 is formed a slot 30, which is not as long as the slot 28 and which is also arranged to receive the pin 15. To the plate 29 is secured a vertical arm 31, to which is pinned one end of a link 32, and the other end of the said link 32 is pinned to a crank-arm 33, secured to the stem of the valve 24.

The operation of my cushioning and retarding mechanism is as follows: The cylinder is filled with oil or other cushioning agent, and when the bridge is down the pin 15 will be against the end walls of both of the slots 28 and 30 farthest from the cylinder and the valve 24 will be closed. Now as the span moves up the pin 15 will travel along the slots in the direction of the cylinder, and when the span is about two-thirds raised the pin 15 will come in contact with the opposite wall of the slot 30 in the plate 29. As the span continues to move up the pin 15 will shove back said plate 29, thereby opening the valve, and by the time the plate has been moved back sufficiently to entirely open the valve the pin 15 on the moving span will also come in contact with the opposite wall of the slot 28 in the piston-rod. Then as the bridge continues to move up the piston will be moved back in the cylinder, driving the oil from in front of it up through the pipe 22 and down into the cylinder at the rear of the piston, but as the piston is moving back the plate 29, which is moving back with the piston-rods, begins to gradually close the valve, thereby offering increasing resistance to the passage of the oil through the pipe, which results in cushioning and gradually retarding the movement of the span. By the time the span has been raised to its full opening the valve will be completely closed and the span will gradually come to rest. The reverse operation takes place when the bridge is lowered.

The mechanism for lifting the span is arranged as follows: A shaft 41 is mounted in suitable bearings 42 at the top of the tower, and at each end of the said shaft are secured two drums 43 and 44 of equal diameters. The drums 43 carry the chains 45, which are secured to the movable span, and the drums 44 carry the chains 46, to which are secured the counterweights 47. The chains 45 and 46 consist of a series of flat plates pivotally secured together in the usual manner. Each drum is provided with a single groove just the width of the chain, so that as the chain is wound about the drum it will be coiled upon itself, thereby increasing the working diameter of the drum. When the span is down, the chains secured thereto will of course be unwound from their drums, while the counterweight-chains will be wound on their drums and will therefore have an advantage in increased leverage over the drums which carry the span-chains; but as the counterweights descend their chains unwind from their drums, reducing the working diameter of said drums, while the span-chains wind on their drums, increasing the working diameter thereof. Therefore as the span is raised the force exerted by the counterweights will be gradually lessened, and as the bridge is lowered the force exerted by the counterweights will be gradually increased as the span comes to rest. The chains themselves therefore constitute a compensating medium, so that the force exerted by the counterweights will always be in proportion to the force necessary to balance the span in any position. At the sides of the towers are arranged guides for the counterweights 47, each of which consists of two vertical side pieces 48 and 49, which are pivotally secured at their upper ends to the tower by pins 50 and are connected together at their lower ends by means of a link 51. The guides therefore are free to swing horizontally, so that they can accommodate themselves to the change in the position of the counterweight, for as the counterweights travel up and down they constantly move from one vertical plane to another, because the working diameters of the drums are always changing when the weights are traveling. A gear-wheel 54 is secured on the shaft 41. At the top of the tower is arranged a platform 55, on which is arranged a motor 56. On the end of the motor-shaft is secured a pinion 57. A shaft 58 is mounted in suitable bearings 59, and thereon is rigidly mounted a gear-wheel 60, arranged to mesh with the pinion 57 on the motor-shaft, and a pinion 61, arranged to mesh with the gear-wheel on the shaft 41. The motor is therefore directly connected with the shaft 41, which carries the drums, thereby reducing the cost of construction and securing a considerable saving in the cost of operation. On the drums 43 are secured lugs or projections 64 and 65. On the shaft 58 are fulcrumed two bell-crank levers 66 and 67, which are arranged so that the horizontal arms thereof will extend under the lugs 64 and 65 when the span is down. On the vertical arms of the respective bell-crank levers are secured collars 68 and 69, respectively. Rods 70 and 71 are pivotally secured to the respective collars 68 and 69, and their opposite ends are screw-threaded and pass through screw-threaded sleeves 72 and 73, rotatably mounted in the sides of the tower. Sprocket-wheels 74 and 75 are secured on said sleeves 72 and 73, respectively, and are operatively connected by a sprocket-chain 76. On the sleeve 72 is also secured a pinion 77. A motor 78 is mounted on the tower in proximity to the rod 70, and on the shaft thereof is secured a pinion 79, arranged to mesh with the pinion 77. When the span has been lowered and come to rest, the motor 78 is started, rotating the rods 70 and 71, and thereby causing them to move longitudinally toward the shaft 58, which in turn causes the vertical arms of the bell-crank levers 67 and 68 to swing up and come in contact with and raise the lugs on the drums 43, producing a slight rotation of the said drums, and thereby lifting the counterweights. The tension is therefore taken off of the chains connected with the span, allowing the span to rest firmly on its supporting-piers, thus eliminating the pounding action at the toe end of the span, which is an objectionable feature in bascule-bridges as usually built.

What I claim is—

1. In a bridge structure, the combination with a stationary portion of a movable span pivotally secured at one end to said stationary portion and points of support mounted on said span and arranged to rest on said stationary portion when the span is stationary and to travel on said stationary portion when the span is raised or lowered.

2. In a bridge structure, the combination with a stationary portion of a movable span, a link pivotally secured to said stationary portion and to the end of the said movable span and points of support mounted on said span and arranged to rest on said stationary portion when the span is stationary and to travel on said stationary portion when the bridge is raised or lowered.

3. In a bridge structure, the combination with a stationary portion of a movable span hinged at one end to said stationary portion, a drum, and a chain secured to said span and to said drum and arranged so that when the drum is rotated to wind in the chain, each succeeding coil of the chain will wind upon the preceding coil, thereby increasing the working diameter of said drum, for the purpose set forth.

4. The combination with a bridge structure of a movable span, means for raising and lowering said span, a weight for counterbalancing said span while being raised and lowered and means for supporting said counterbalancing-weight when the bridge is at rest, so as to take the load off of the movable span.

5. In a bridge structure, the combination of supporting-piers, a span hinged to said piers, a tower arranged on said piers, a drum mounted in said tower and a chain secured to said span and said drum, and arranged to wind upon itself when the drum is rotated so as to lift the span.

6. In a bridge structure, the combination of a tower, a drum for carrying the counterweight-chain having a constantly-varying working diameter when the bridge is being raised and lowered, a counterweight supported from said drum, and a movable guide for said counterweight.

7. In a bridge structure, the combination of piers, a platform arranged on said piers, a span pivotally secured at one end of said platform, and points of support mounted on said span and arranged to rest on said platform when the span is stationary and travel on said platform when the span is raised or lowered.

8. In a bridge structure, the combination of piers, a platform, tracks arranged on said platform, a movable span, a link pivotally secured to the said platform and to the end of said span, rollers arranged on said span and arranged to rest on said tracks when the span is stationary and to travel on said tracks when the bridge is raised or lowered.

9. In a bridge structure, the combination of a stationary portion, a span hinged at one end to said stationary portion, a cylinder, a passage-way forming a connection between the ends of said cylinder, a valve arranged in said passage-way, a piston arranged in said cylinder, means for operatively connecting the piston with the span so that as the span is raised or lowered the said piston will be caused to travel from end to end of said cylinder, and means for connecting said valve

and said span so that each time the span is raised or lowered the said valve will be opened and closed, for the purpose set forth.

10. In a bridge structure, the combination of piers, a platform, a span rotatably supported at one end on said platform, a cylinder having a passage-way connecting the ends of said cylinder, a valve arranged in said passage-way, a piston arranged in said cylinder, a piston-rod provided with a longitudinal slot, a plate having a slot of less length than the slot in the piston-rod an arm secured to said plate, a crank-arm secured to the valve-stem of said valve, a link connecting the said crank-arm with the said arm on the said plate and a pin secured to the said span and arranged to travel in the said slots substantially as described and for the purpose set forth.

11. In a bridge structure, the combination of piers, a tower, a movable span, drums mounted in said tower, cables secured to said drums and said movable span, a platform arranged at the top of said tower, a motor mounted on said platform and means for directly connecting said motor and said drums for the purpose set forth.

In testimony whereof I sign the foregoing specification in the presence of two witnesses.

WILBUR J. WATSON.

Witnesses:

VICTOR C. LYNCH,

G. M. HAYES.