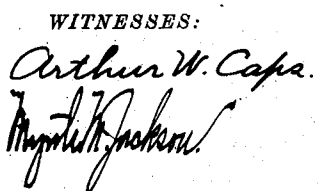


1,027,478.

3 SHEETS--SHEET 1.



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LIFT BRIDGE.
APPLICATION FILED NOV. 7, 1910.

1,027,478.

Patented May 28, 1912.

3 SHEETS—SHEET 2.

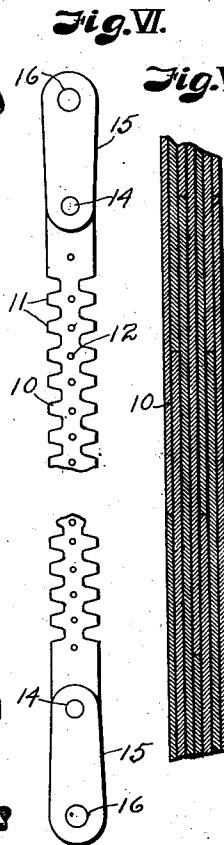
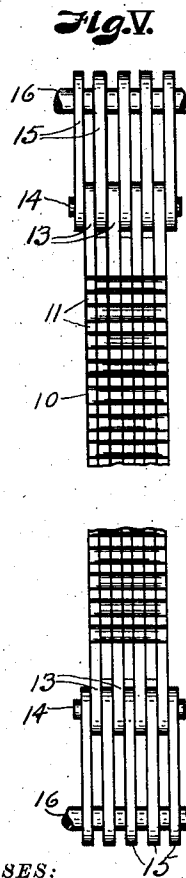
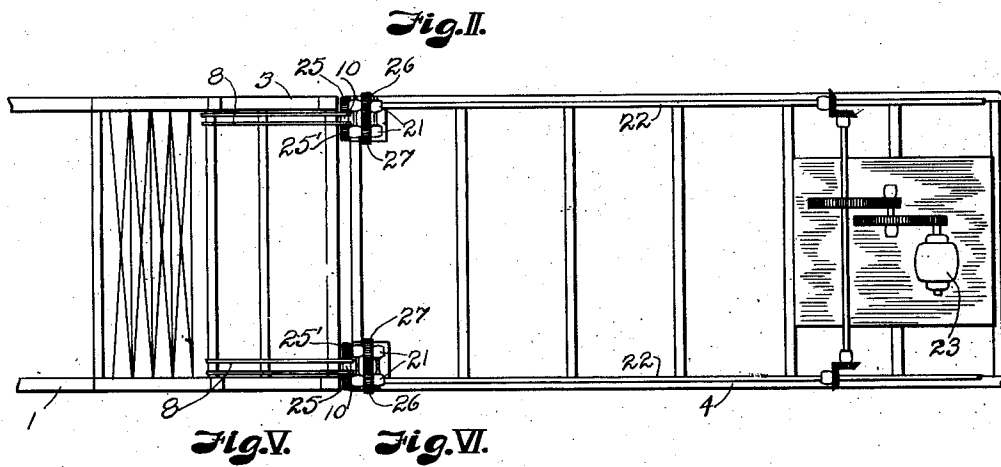
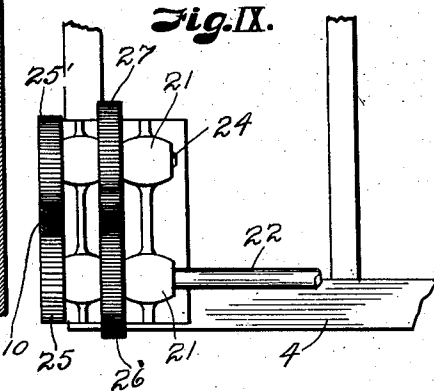
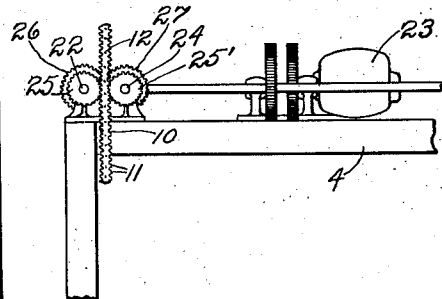


Fig. VII.

Fig. VIII.



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3 SHEETS—SHEET 3.

Fig. III.

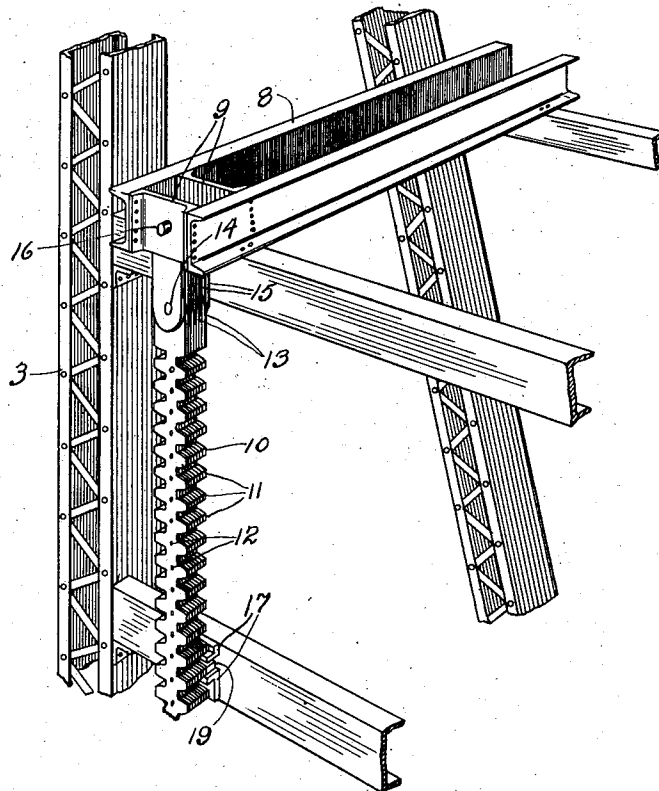
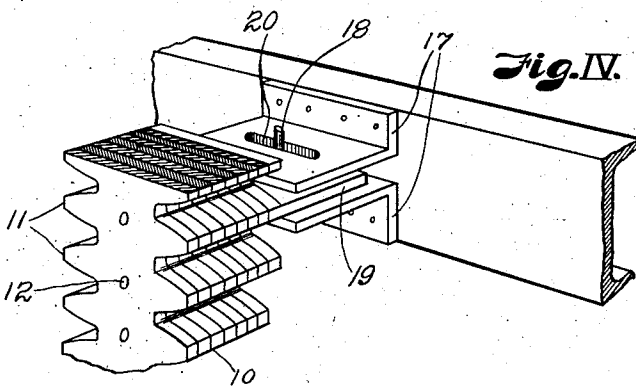


Fig. IV.



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UNITED STATES PATENT OFFICE.

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LIFT-BRIDGE.

1,027,478.

Specification of Letters Patent.

Patented May 28, 1912.

Application filed November 7, 1910. Serial No. 591,108.

To all whom it may concern:

Be it known that I, JOHN LYLE HARRINGTON, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Lift-Bridges; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to lift bridges and more particularly to a rack and pinion mechanism for raising and lowering the movable span in a bridge of this character.

It is the object of my invention to provide rack and pinion mechanism for bridges of this type wherein the racks are mounted on the bridge to have limited lateral movement, and are constructed to afford flexibility, so that when engaged by the pinions on the lifting span, they may move slightly with the lateral movement of the span.

In order to obviate lost motion between the racks and pinions, I provide my pinion mechanism with double wheels for engaging opposite sides of the racks, so that the parts are always held in operative relation.

A further object of my invention is to provide other improved details of structure which will be hereinafter more fully described and illustrated in the accompanying drawings, wherein—

Figure I is a side view of a lift bridge having rack and pinion mechanism in accordance with my invention. Fig. II is a plan view of a part of the bridge. Fig. III is an enlarged perspective view of the upper mounting for the rack. Fig. IV is an enlarged perspective view of the rack bracing device. Fig. V is an enlarged edge view of a rack and its mountings. Fig. VI is a side view of same. Fig. VII is a longitudinal section of same, showing the overlapped construction. Fig. VIII is a detail view of the operative connection between the rack and pinions. Fig. IX is a plan view of same.

Referring more in detail to the parts:—1 designates the approaches, 2 the piers, 3 the towers, and 4 the vertically movable span of a lift bridge of ordinary construction, the span being connected at its ends with

counterpoise weights 5, through cables 6, which run over sheaves 7 on the towers in the ordinary manner. Near the top of each tower, I mount a supporting frame 8 which is preferably formed of channel bars, spaced apart and projected beyond the inner vertical plane of the tower, there being one of these frames near each side of the tower and as the construction of the supporting frames, the racks and the pinion mechanisms is the same in each instance, but one will be described in detail with the understanding that such description relates equally to the rest.

Fixed to the inner faces of the channel bars of the frame 8, at the outwardly projecting end of the frame, are diaphragms 9 which space the bars apart and are also spaced from each other, as clearly illustrated in Fig. III. Supported on the approach, directly beneath the upper frame 8, is a lower frame of the same construction for supporting the lower end of the rack.

10 designates the rack which is preferably formed of layers of flexible metal plates having edge teeth 11 formed therein, the plates being laid one upon the other with the joints in successive layers broken as shown in Fig. VII. Through the central part of each plate are apertures which are adapted to register when the layers are brought together, and projected through these apertures are bolts 12 for forming a unit of the plurality of plates.

At each end of the rack alternate plates have the projecting link heads 13 which are apertured to receive the pin 14 of the supporting links 15 which lap on each side of the rack heads and project into the spaces between alternate plates. The free ends of the links 15 are also apertured and are projected into the space between the diaphragms 9 and the channel members of the supporting frames 8, where they are pivotally mounted on a pin 16 which projects through and is carried by the diaphragms 9.

By providing the link mounting at both the top and bottom, the rack is allowed free pivotal movement within a limit controlled by the movement of the links, which is more than sufficient to allow the rack to follow the lateral movement of the lifting span.

In order to hold the rack against movement toward the open span, I provide the rack with a keeper bracket comprising a T-plate 19, the wings of which are rigidly

fixed to the outside of the rack by bolts 12 and are slotted to correspond with the rack teeth slots, the body of the plate being projected from the side of one of the teeth so as not to interfere with the pinion when the bridge is in operation. Fixed to the body of the T-plate at about its center and extending vertically, both above and below the plate, is a pin 18. Fixed to cross braces on the towers, are plates 17 which are arranged in pairs and adapted to lie above and below the bodies of the T-plates 19, each of the rack plates having a slot 20, through which a pin 18 is projected, so that the T-plates 19 may have free lateral movement to the extent of the length of the slots, while the pins 18 will hold the plates and the racks against movement into the span opening, so that when the span is in operation the racks can not buckle or move inwardly so as to interfere with the pinions.

I prefer to provide a rack on the towers at each corner of the movable span, as in this manner the bridge may be balanced to better advantage, while the span is being raised or lowered, it being necessary in any event to place a rack on each tower, so that both ends of the span may be lifted or lowered together.

Referring now to the pinion mechanism, 21 designates bearings on the span 4, such bearings being arranged in pairs and in parallel planes. Journaled in one set of bearings is a drive shaft 22 which is connected by suitable transmission with a motor 23 of any ordinary type. The end of shaft 22 extends past and adjacent to the rack 10 and has rigidly fixed to its free end a pinion 25 which engages the rack teeth. Journaled in the other set of bearings 21 is an axle 24 which extends past and adjacent to the edge of rack 10 opposite the main drive shaft and has rigidly fixed to its free end a pinion 25', which engages the teeth on the edge of rack 10 opposite the pinion 25. Fixed to the drive shaft 22 and axle 24 are driving gears 26 and 27 which transmit power from the main shaft to the axle 24, so that when the shaft is in motion the pinions may be revolved in unison and work against opposite edges of the rack to lift the span.

By providing the double pinions, constant engagement with the rack is insured and it is impossible for the rack to spread from the pinions irrespective of the lateral motion of the span or rack.

It is apparent that a set of pinions is provided at each corner of the span to cooperate with the racks on the towers and that these pinions may be operated from a common motor.

Inasmuch as the operation of the span is apparent from the drawings and description of the mechanical construction of the parts, it is unnecessary to describe same in detail.

Having thus described my invention, what I claim as new therein and desire to secure by Letters-Patent is:—

1. A lift bridge comprising towers and a vertically movable span, racks having linked pivotal mounting on the towers, to afford limited lateral movement thereof relative to the span, pinions on the span engaging said racks, and means for actuating said pinions.

2. A lift bridge comprising towers and a vertically movable span, racks arranged vertically on the towers and having linked connection therewith to afford limited lateral movement thereof, relative to the span, pinions carried by the span and engaging said racks, and means for actuating said pinions.

3. In a lift bridge, towers and a vertically movable span, frames carried by the towers and projecting into the span opening, links pivotally mounted on said frames, racks pivotally connected with said links, pinions on the span engaging said racks, and means for actuating said pinions.

4. In a lift bridge, towers and a vertically movable span, frames carried by said towers and comprising spaced members, diaphragms supported by said spaced members and separated to form a chamber, a pin carried by said diaphragms and extending through said chamber, links pivotally mounted on said pin, racks pivotally connected with said links, pinions carried by said span and engaging said racks, and means for actuating said pinions.

5. In a lift bridge, towers and a vertically movable span, flexible racks carried by the towers, pinions on the span engaging said racks, plates on the towers and on the racks, and pin and slot connection between said plates for permitting lateral movement of the racks, and means for actuating said pinions.

6. In a lift bridge, towers and a vertically movable span, racks pivoted on said towers to have limited lateral movement relative to the span, plates on said towers having lateral slots therein, plates fixed on the racks and having pins projecting into the slots in the tower plates, pinions on said span engaging said racks, and means for actuating said pinions.

7. In a lift bridge, towers and a vertically movable span, racks pivoted at their upper and lower ends to towers to have limited lateral movement relative to the span, plates fixed to said towers and arranged in pairs, the members of said pairs having registering lateral slots, plates fixed on the racks and projecting between the tower plates, pins on the rack plates extending into the slots in the tower plates, pinions on said span engaging said racks, and means for actuating said pinions.

8. In a lift bridge, towers and a vertically
movable span, racks pivoted at their upper
and lower ends to towers to have limited
lateral movement relative to the span, plates
5 fixed to said towers, plates having wings
fixed to the racks and having body portions
overlapping the tower plates, pin and slot
connection between the tower and rack
plates to permit lateral movement of the
10 racks, the parts of the rack plates being cut
to follow the contour of the rack teeth and
the bodies of the rack plates being extended
from the faces of the rack teeth, pinions on
said span engaging said racks, and means
15 for actuating said pinions.

9. In a lift bridge, towers and a vertically
movable span, upper and lower frames on
the towers, each of said frames comprising
spaced members having diaphragms sepa-

rated to form chambers, the upper and lower 20
frames being arranged in pairs, pins ex-
tending through said diaphragm, links piv-
otally mounted on said pins, racks having
their upper and lower ends pivotally con- 25
nected with said links, means on the towers
for holding said racks against movement in
the direction of the span, although permit-
ting limited lateral movement thereof, pin-
ions on the span arranged in pairs, the
members of each pair engaging opposite 30
sides of one of the tower racks, and means
for actuating said pinions.

In testimony whereof I affix my signature
in presence of two witnesses.

JOHN LYLE HARRINGTON.

Witnesses:

MYRTLE M. JACKSON,
ARTHUR W. CAPS.