J. B. STRAUSS.

BRIDGE.

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974,538. **Patented Nov. 1, 1910.**

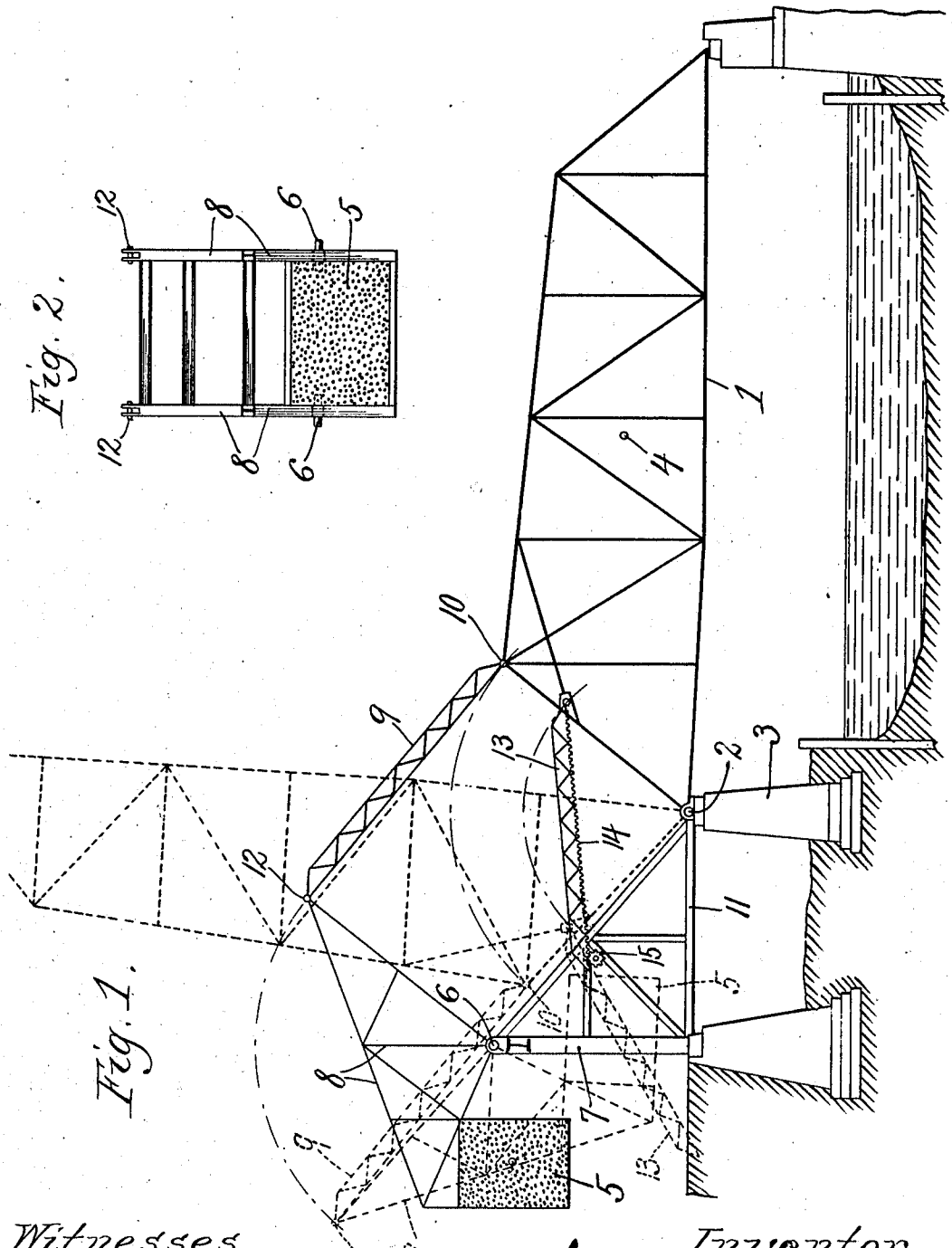

Fig. 1.

Fig. 2.

Witnesses.
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BRIDGE.

974,538. Specification of Letters Patent. Patented Nov. 1, 1910.

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To all whom it may concern:

Be it known that I, JOSEPH B. STRAUSS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Bridges, of which the following is a specification.

This invention relates to bascule bridges and has for its object to provide a new and improved bridge of this description.

Figure 1 illustrates one form of bridge embodying the invention; Fig. 2 is a plan view of the counterweight.

In this construction a moving leaf 1 is pivoted at its heel or extreme end so that it may be opened and closed. As herein shown the moving leaf is pivoted at 2 upon the fixed support 3 by means of horizontal trunnions or pivots, said trunnions or pivots being below the roadway. The center of gravity of the moving leaf is diagrammatically illustrated at 4. The lever arm of the moving leaf is the distance of its pivotal point to the center of gravity 4. A counterweight 5 is pivotally mounted by horizontal pivots or trunnions at 6 upon the support 7, the pivots of the counterweight being out of alinement with the pivots or trunnions of the moving leaf. As herein shown the counterweight 5 is not directly pivoted to the support 7 but is attached to a counterweight frame 8, the frame being pivotally connected to the support. The support for the counterweight may be formed in any desired manner, and it may be mounted upon a secondary span, the direct carrying part for the counterweight being preferably a bell crank as shown in Fig. 1. A counterweight link 9 is pivotally connected with the counterweight and with the moving leaf. The connection with the moving leaf is shown ahead of the trunnions of said leaf, that is, between the pivotal point of the leaf and its forward end and back of the center of gravity of the moving leaf, this pivotal connection being shown at 10. A fixed approach 11 is provided. The counterweight 5 extends across the space above the roadway. It will be noted that the counterweight frame has two arms one on each side of its pivotal connection with the support, the counterweight being attached to one arm and the counterweight link or connection being attached to the other arm. The counterweight may be of any suitable material, but it is preferably constructed of concrete or concrete steel.

The radial distance between the pivotal point 6 of the counterweight and the pivotal point 12 of the link 9 is the same as the radial distance between the pivotal point 2 of the moving leaf and the pivotal point 10 where the link 9 is connected thereto. The line joining the pivotal points of the counterweight and the moving leaf is equal and parallel to the line joining the pivotal points 10 and 12 of the link 9.

The moving leaf is operated in any desired manner, as, for example, by the operating strut 13 having the rack 14 which engages the gear 15 driven from any suitable motor. When it is desired to open the bridge the motor is operated, and the moving leaf moved to the position shown in dotted lines, the counterweight also moving to the position shown in dotted lines. It will be seen that in this construction the counterweight is separate from the moving leaf, but has a rigid connection therewith, and that the counterweight is connected to the moving leaf at the top line thereof.

The line joining the center of gravity 4 of the leaf and the pivots thereof is parallel to a line joining the center of gravity 14 of the counterweight and the pivot 6 upon which it is supported.

In the usual form of bascule bridge where the trunnions are located near one end instead of at the end, as in the present case, the more expensive counterbalance members are decreased by the use of a larger amount of the comparatively inexpensive counterweight. By means of the present construction this principle is applied to a bascule bridge pivoted at its heel or end, thus securing the same economy of construction. The counterweight in the present case is detached from the moving leaf and has a comparatively short lever arm and a one-piece link connection to the moving leaf. This link is rigid and is a compression member preferably a braced member, and is connected to the moving leaf back of the center of gravity thereof. This link is in an inclined or oblique position when the moving leaf is closed, and also when in all of its other positions. The point of attachment of the link is in a different horizontal plane from the trunnions and the attachments of the link to the leaf and the

counterweight frame are both back of the trunnions when the leaf is open. The angular motion of the center of gravity of the leaf and the center of gravity of the counterweight is the same.

It will be seen that in this construction it may be said that the tail end or part of the moving leaf is separated therefrom and mounted on trunnions, the counterweight being attached thereto.

It will be noted that the counterweight in this case is mounted upon a support separate from that of the leaf; that it projects back of said support when the leaf is closed; that this support has a diagonal member which connects the trunnions of the counterweight and leaf, and that there are two converging connections between this support and the main leaf, namely, the link 9 and the operating strut 13. The angular support upon which the counterweight and the girder to which it is attached are carried has the two sets of trunnions at the two acute angles thereof, and the relation of the parts is such that vertical reactions only are provided on the two supports, as the other reactions counteract each other.

The construction shown herein is particularly adapted to secure the maximum open span. It will be noted that when the bridge is open the counterweight passes between the supports upon which it is mounted, and that the center of gravity of the moving span moves back of its pivots. The link 9 acts as a tension member during a part of the movement, and then as a compression member, and hence this construction permits the complete opening of the span. If the span had to be stopped before the center of gravity passed the pivots, it would be only partially open.

This construction is particularly adapted for large and massive structures, and the parts are arranged so that the reactions upon the foundations are kept constant and vertical, that upon the pier supporting the moving leaf being equal to the weight of the counterweight and support. The reactions are such that all other forces, other than the vertical forces, counteract each other, and hence have no effect on the foundations. It will be noted that the vertical line drawn through the center of gravity of the counterweight, and the line passing through the axis of the link 9 intersect above the trunnions on which the counterweight is supported, and that the line joining this point of intersection and the trunnions of the counterweight passes between the supports or piers upon which the counterweight and moving leaf are supported. It will be noted that the lever arm of the counterweight and link 9 are both shorter than the lever arm of the moving leaf.

The counterweight link, it will be noted, is connected not at the center of gravity of the leaf but back of said center of gravity, and this brings in certain non-vertical forces which tend to overthrow or injure the foundations when the moving leaf and counterweight are pulled toward each other during the opening of the bridge. This construction provides means for annulling these non-vertical forces.

I claim:

1. A bascule bridge comprising a moving leaf mounted upon horizontal pivots at its heel and terminating at said pivots, a counterweight carrying part mounted on fixed horizontal pivots behind the leaf pivots, the two sets of pivots separately supported, a rigid link connecting the moving leaf and counterweight, the vertical line through the center of gravity of the counterweight and the line passing through the axis of the link intersecting above the trunnions on which the counterweight is supported.

2. A bascule bridge comprising a moving leaf mounted on horizontal pivots at its heel, a counterweight carrying part mounted on fixed horizontal pivots behind the leaf pivots, two separate supports, one for the leaf and the other for the counterweight support, a rigid link connecting the moving leaf with the counterweight, the vertical line through the center of gravity of the counterweight and the line passing through the axis of the link intersecting above the trunnions on which the counterweight is supported when the bridge is closed, the line joining said point of intersection and the trunnions of the counterweight passing between said supports.

3. A bascule bridge comprising a moving leaf pivotally connected to a support, a separate counterweight carrying part pivotally mounted behind said leaf, a counterweight carried thereby, a rigid link connecting the leaf with the counterweight carrying part, the lever arm of the counterweight and the lever arm of the link being both shorter than the lever arm of the moving leaf, the lever arm of the link greater than the lever arm of the counter-weight and less than the lever arm of the leaf.

4. A bascule bridge comprising a moving leaf mounted on horizontal pivots at its heel and terminating at said pivots, a counterweight carrying part mounted on fixed horizontal pivots behind the leaf pivots, the two sets of pivots separately supported on fixed supports, a counterweight on said counterweight carrying part, a rigid link connecting the moving leaf and counterweight, whereby the two balance each other in all positions, the center of gravity of the counterweight being in front of the counterweight carrying part when the bridge is in its open position.

5. A bascule bridge comprising a moving

leaf, a separated counterweight, a rigid link connecting the counterweight to the leaf, pivots at both ends of said link separate supports for the leaf and counterweight, and a mounting frame in combination therewith adapted to produce only vertical reactions on the two supports, the reaction on the front support being substantially equal in all positions of the leaf between its open and closed positions to the weight of the leaf, and the reaction on the rear support being substantially equal in all positions of the leaf between its open and closed positions to the weight of the counterweight and its support.

6. A bascule bridge comprising a moving leaf mounted upon trunnions and terminating at said trunnions, a counterweight carrying part mounted on fixed trunnions behind the leaf pivots, the two sets of trunnions separately supported, a rigid link connecting the moving leaf and counterweight, the link connected with the leaf ahead of the leaf pivots, the line connecting the center of gravity of the leaf and the leaf trunnions being parallel to the line connecting the center of gravity of the counterweight and the counterweight trunnions in all the various positions of the moving leaf between its open and closed positions and the line connecting the leaf trunnions and the point where the link is attached to the leaf being parallel to the line connecting the counterweight trunnions and the point where the link is connected to the counterweight carrying part.

7. A bascule bridge comprising a leaf, two frames each provided with members which converge to a point, one frame fixed and the other movable, the two frames movably connected together at their converging points, a counterweight attached to the movable frame, and a rigid link transmitting the counterweight stress to the leaf.

8. A bascule bridge comprising a moving leaf mounted upon pivots, a counterweight carrying part mounted on pivots behind the leaf pivots, the two sets of pivots separately supported, a counterweight carried by the counterweight carrying part, a rigid link connected with the leaf at a point intermediate its pivots and its center of gravity, said link connected with said counterweight, an operating device connected with the leaf ahead of its pivots and with the support for the counterweight pivots above said leaf pivots, and means for eliminating the horizontal forces produced in the supports.

9. A bascule bridge comprising a moving leaf mounted upon pivots at its heel, a counterweight carrying part mounted on pivots behind the leaf pivots, a separate support for the counterweight carrying part having an inclined member which connects the two sets of pivots, a rigid link connecting the counterweight carrying part and the leaf and connected with said leaf ahead of the leaf pivots, said link parallel to said inclined member.

10. A bascule bridge comprising a bridge truss and a counterweight truss, separately supported, one member of the bridge truss parallel to a member of the counterweight truss, and connecting members between the ends of said parallel members one of said members connected with said leaf ahead of the leaf pivots.

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