No. 738,954. PATENTED SEPT. 15, 1903.

J. B. STRAUSS.

BRIDGE.

APPLICATION FILED DEC. 19, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

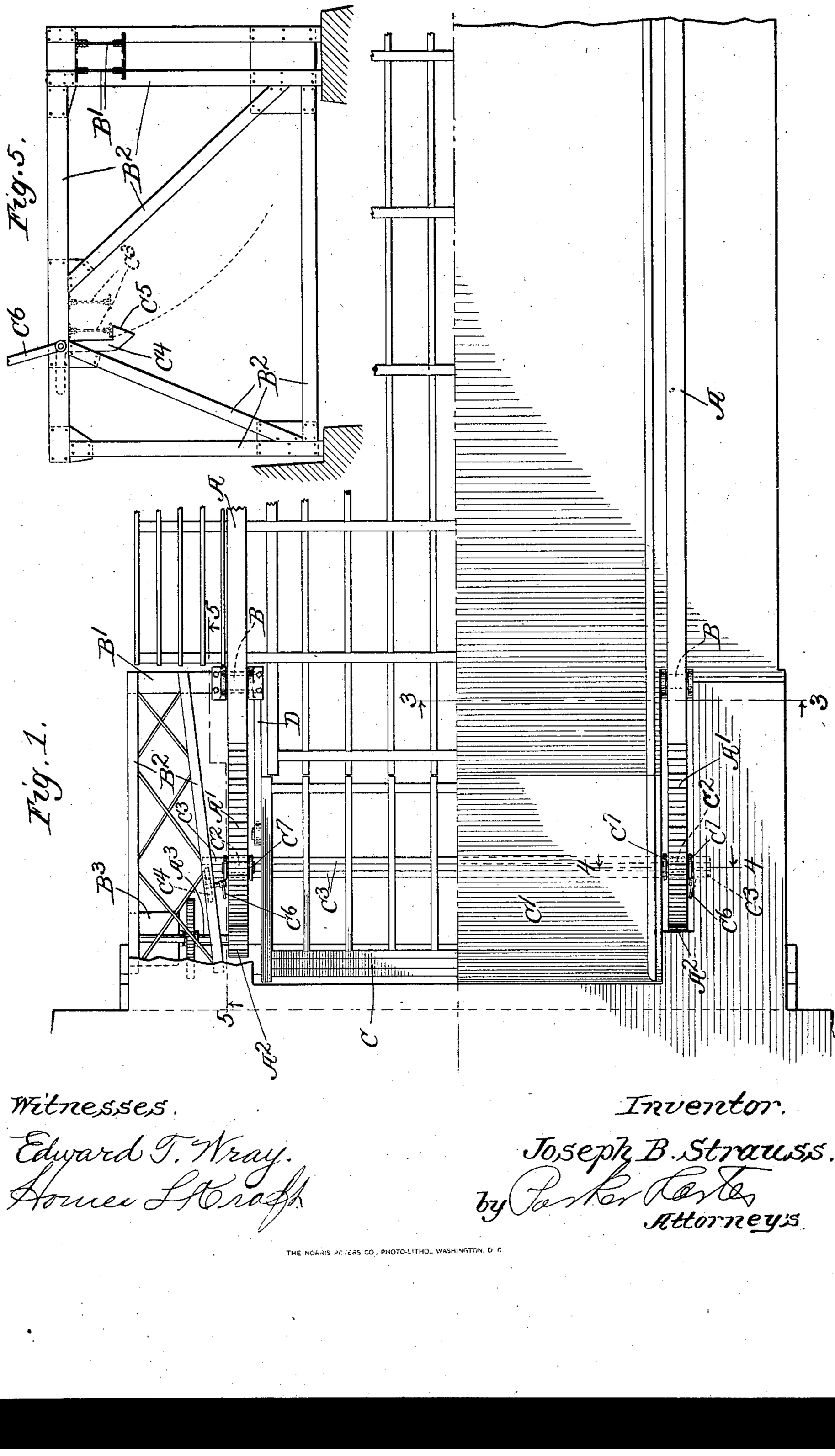

Fig. 1.

Witnesses.

Edward T. Wray.

Howes L. Kraft

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by Parker Carter & Attorneys.

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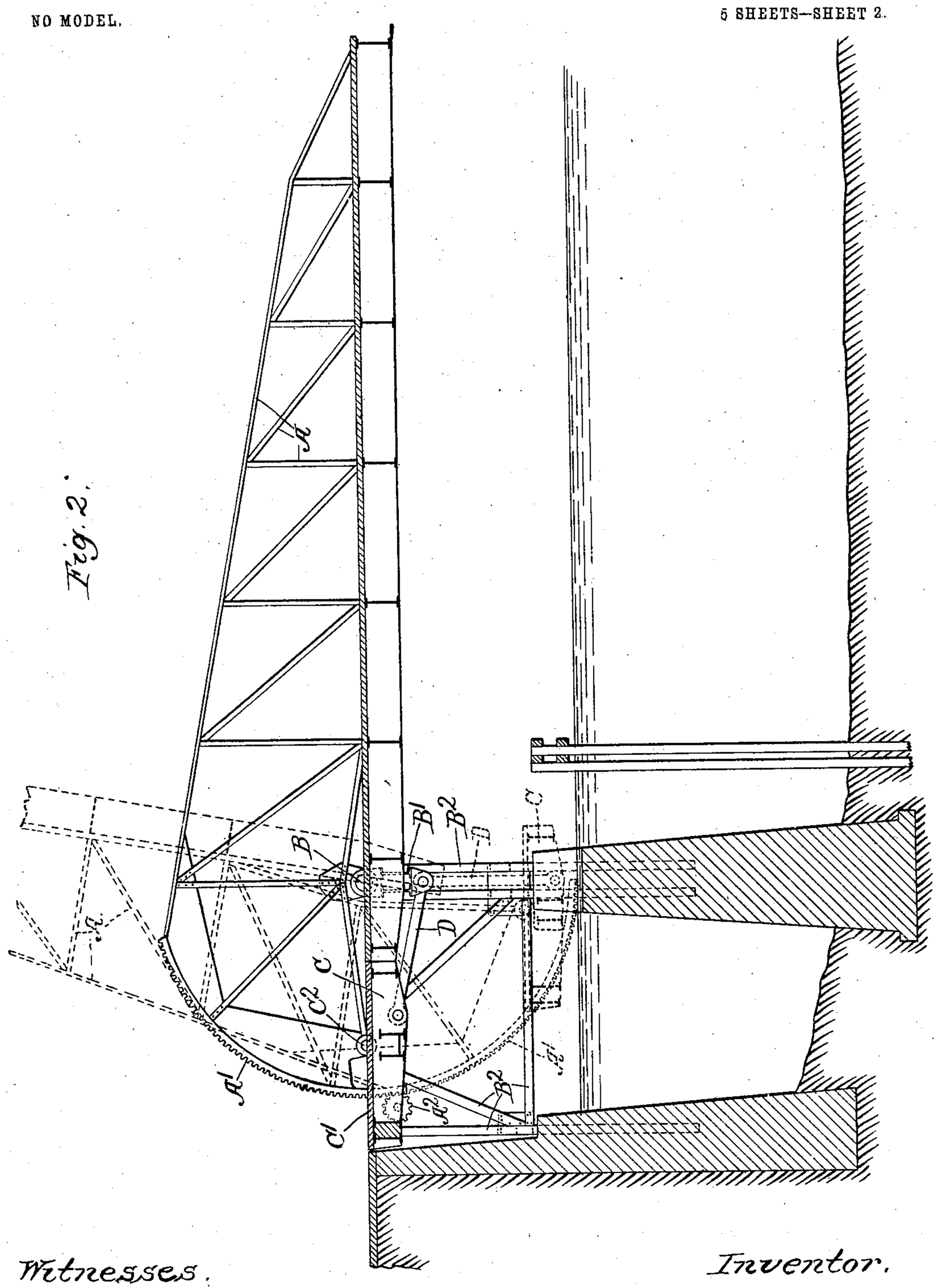
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.



Witnesses.

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NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.

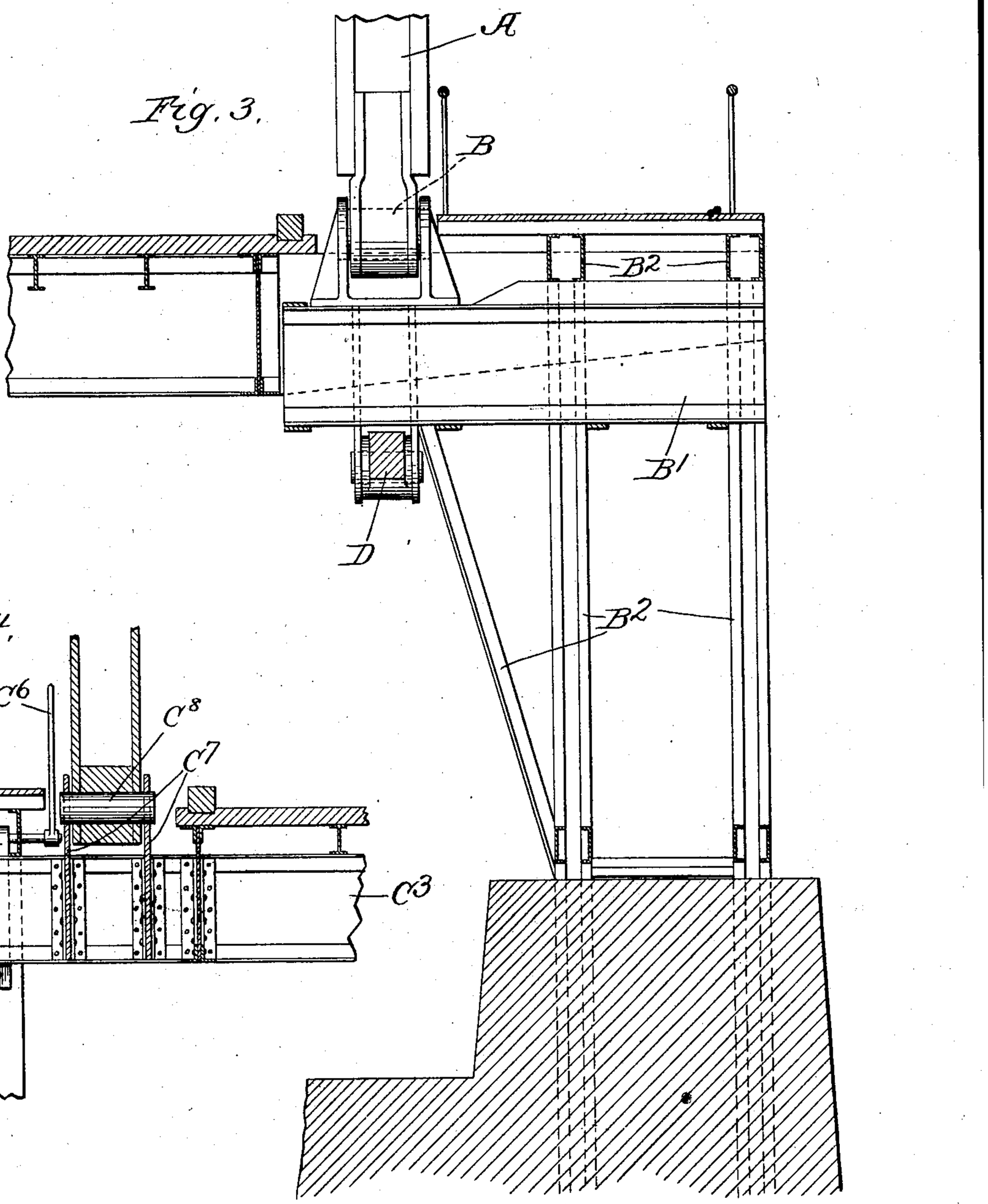

Fig. 4.

Witnesses.

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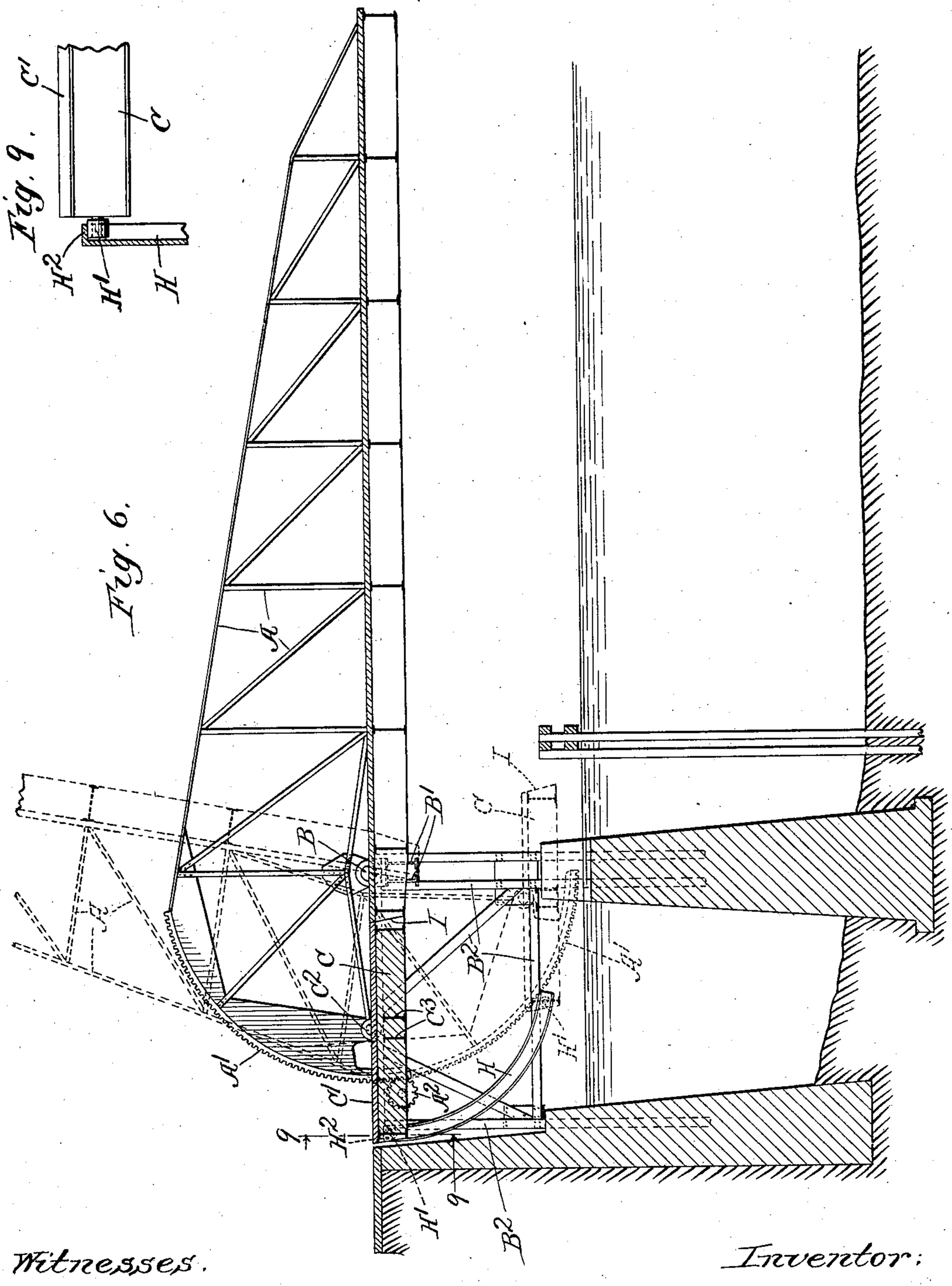
NO MODEL. 5 SHEETS—SHEET 4.

Fig. 6.



Witnesses.

Edward T. Wray.

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NO MODEL. 5 SHEETS—SHEET 5.

Fig. 7.

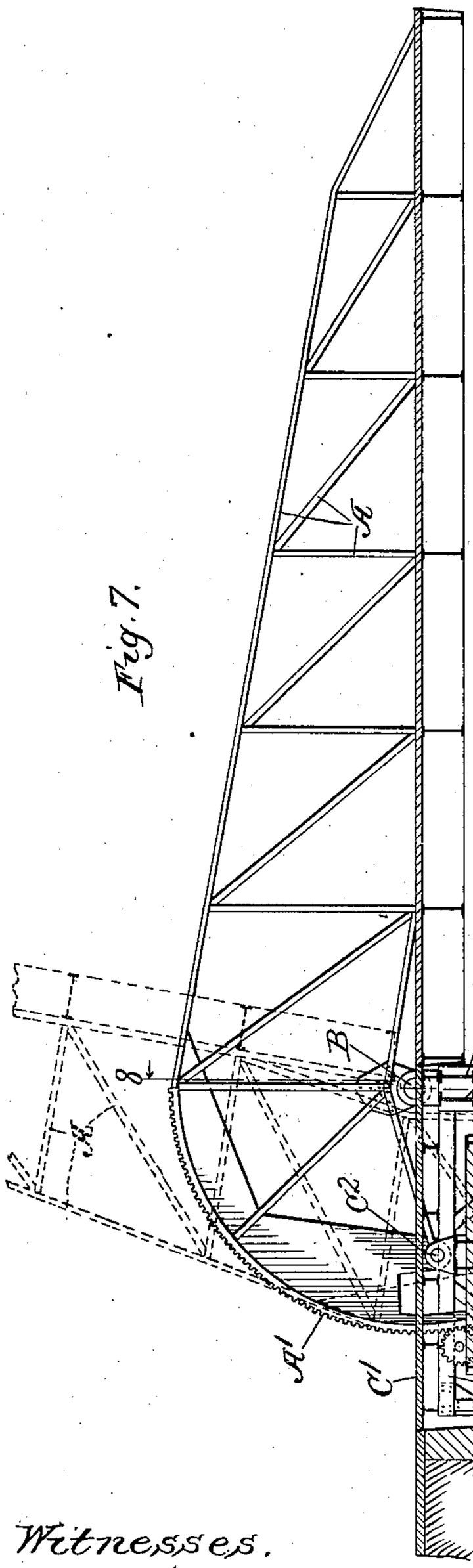
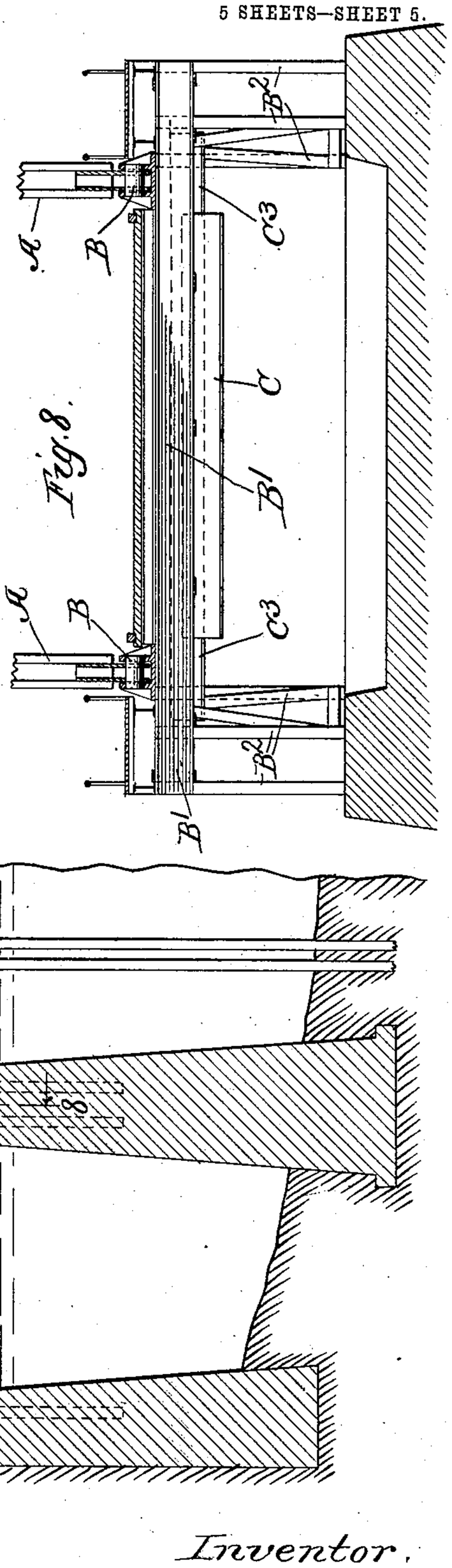


Fig. 8.



Witnesses.
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Howard L. Haugh.

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No. 738,954. Patented September 15, 1903.

UNITED STATES PATENT OFFICE.

JOSEPH B. STRAUSS, OF CHICAGO, ILLINOIS.

BRIDGE.

SPECIFICATION forming part of Letters Patent No. 738,954, dated September 15, 1903.

Application filed December 19, 1902. Serial No. 135,889. (No model.)

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.

My invention relates to bridges, and has for its object to provide a new and improved bridge, of which the following is a description, reference being had to the accompanying drawings, wherein—

Figure 1 is a plan view with parts omitted of one end of a bridge embodying my invention. Fig. 2 is a vertical section therethrough. 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 section on line 5 5, Fig. 1. Fig. 6 is a vertical sectional view showing a modified construction. Fig. 7 is a similar view showing a further modified construction. Fig. 8 is a section on line 8 8, Fig. 7. Fig. 9 is a detail section on line 9 9, Fig. 6.

Like letters refer to like parts throughout the several figures.

Referring now to Figs. 1 to 5, inclusive, I have shown a construction comprising a main span carried by trusses A A, which are mounted upon trunnions B, carried by a trunnion-supporting piece B′, supported by the frame B^2. There is one of these frames B^2 associated with each of the main trusses. It will be noted that these frames are at one side of the main trusses and that the trunnion-supporting piece projects out over the frame, so that the space beneath the trusses and the main span is free and unobstructed. This is shown clearly in Fig. 3. These frames B^2 may be made in any desired manner. As herein shown, they consist of two frame-pieces, as illustrated in Fig. 5, connected together by suitable cross-pieces and anchored to the masonry. These frames support the controlling mechanism for the main span—such as the electric motor B^3. There is preferably a motor for each truss. The trusses A are provided with the curved racks A′, adapted to be engaged by gears A^2 on the shafts A^3, operatively connected with the electric motors. The counterweight for the main span is pivotally connected thereto at a suitable point, so as to maintain a substantially horizontal position as the main span is raised and lowered, thus very materially shortening the structure and permitting a suitable movement of the counterweight without necessitating the use of a tail-pit, or at least greatly reducing the depth of such tail-pit. As shown in Fig. 2, the counterweight C is connected directly to the approach span C′, and the counterweight and approach span are pivoted to the main trusses at C^2. It is of course evident that any suitable construction may be used for this purpose. As herein shown, the counterweight extends entirely across the floor between the two main trusses, and there is provided a bumping-girder C^3, which extends entirely across between the trusses, the ends projecting beneath the said anchor-frames B^2, as shown in Fig. 4, so that when in their up position further movement is prevented by these frames and the parts are held in position. When the counterweight is attached to the approach span, so that the approach span itself acts either partially or wholly as a counterweight for the main span, I provide a suitable lock for the approach span, so as to hold it in proper position and prevent accidental movement. As herein shown, this locking device consists of a movable locking-arm C^4, attached to the frame B^2 and provided with a beveled face C^5. This locking device is adapted to be engaged by the bumping-girder as it moves up, so as to be moved to one side, and then falls back into position, so as to engage the bumping-girder, and thus holds the approach span in position. This locking device is controlled by means of a lever C^6. The counterweight or the approach span, or both, when they are combined may be pivoted to the trusses in any desired manner. As herein shown, the bumping-girder is provided with projecting parts C^7, which come into proximity to the trusses, and there is a pin C^8 passing through the truss and these projecting parts, as shown in Fig 4, thus securely pivoting them together. As shown in Fig. 2, I have indicated a means for providing an additional increment of efficiency in the counterweight during movement from the open to the closed position of the main span without increasing the short-end lever-arm of the main span, which consists in pivoting it at one side of its center and then connecting to it the

struts D, said struts being connected at their other end to a fixed part—as, for example, the trunnion-supporting piece B′—as shown in Fig. 3. It will be seen that by this construction the counterweight may be projected beyond the pivotal point to any degree desired and the parts balanced by the struts D, and thus the leverage of the counterweight increased so as to multiply its effect and at the same time keep it in a substantially horizontal position during the movement of the main span. It will be seen that in this construction when the main span is lifted by means of the operating mechanism the counterweight and the approach span when a part thereof will move down and will keep in a substantially horizontal position, so as to take the position shown in dotted lines in Fig. 2 when the main span is completely open. As ordinarily used the counterweight would be in a substantially vertical position when the main span is open, and the end would thus tip down below the water or into the ordinary tail-pit. By my construction the tail-pit is entirely done away with, or, if used at all, may be very small, and the great cost of the ordinary masonry is thus avoided.

In Fig. 6 I have shown a construction where the approach span acts as a counterweight, and in this construction the approach span is pivotally supported at its center or at or near its center of gravity to the main span, thus giving the entire counterweight the arm equal to the distance between the pivots of the main span and the pivots of the counterweight. With this construction, if the parts are properly made, the counterweight and the approach span will retain a substantially horizontal position during the movement of the main truss and will take the position shown in dotted lines. It will be seen that in this construction the counterweight when the bridge is open projects beneath, or, perhaps, more properly speaking, past, the points of support of the main span, and this necessitates a clear way under the span, which is secured by the construction herein shown and which also may be secured by various other constructions. If desirable, suitable means may be provided for insuring the substantially horizontal position of the counterweight or approach span during all of its positions.

In Fig. 7 I have shown a construction where the counterweight and approach span are separate, the approach span being fixed. In this case the counterweight is pivoted to the main trusses substantially the same as in the other constructions, but is pivoted at its middle or at or near its center of gravity. The counterweight therefore maintains a substantially horizontal position as the main span moves, taking the position shown in dotted lines when the bridge is open. In this construction the trunnion-supporting piece B′ extends entirely across between the frames B^2. In this construction I secure the beneficial effects of the pivoted counterweight in connection with a bridge having a stationary or fixed approach span.

The construction embodying my present invention provides a bridge where all the moving parts are kept out of the water and where the tail-pit may be eliminated or reduced to very small proportions. The extreme length of the bridge is also very much reduced, and the elimination of the tail-pit in addition to reducing the cost of the structure gives a greater waterway, and thus the bridge does not obstruct the waterway in any material degree.

I have omitted the minor details of the iron construction in the figures in order to simplify the drawings and the drawings are therefore more or less diagrammatic.

I have described in detail particular constructions embodying my invention; but it is of course evident that the parts may be greatly varied in form, construction, and arrangement and that some of the parts may be omitted and others used with parts not herein shown without departing from the spirit of my invention. I do not, therefore, limit myself to the particular construction shown.

It will be seen that by this construction I am enabled to use a short tail end to the main span and that when the main span is closed the counterweight has a part which projects beyond the tail end, this projecting part being varied when the main span rises. In other words, this construction permits me to use a comparatively short tail end and yet to secure a comparatively long lever-arm for the counterweight, the projecting part of the counterweight being withdrawn toward the pivotal point of the main span or toward or within the boundary of the main span as it is lowered, thus permitting me to partially or wholly eliminate the tail-pit.

When the counterweight is provided with the retaining-strut D, it will of course be held in a substantially horizontal position at all times and will not be moved about its pivot due to its unbalanced condition, for with this form of my device the counterweight is always suspended at one side of its center. When the counterweight is suspended in the center, it will ordinarily move down in the proper position; but, if desired, it may be provided with a suitable guide, such as the guide H in Fig. 6. In this construction the counterweight is provided with one or more rollers H′, said rollers working in guideways in the guide H. It will be seen that neither these rollers nor the guide have any strain, for their only function is to keep the counterweight in its balanced position.

When the construction shown in Fig. 2 is used, the struts D hold the approach span in proper position and keep it from tipping when the load passes therealong. When the construction shown, for example, in Fig. 6 is used, it is necessary to provide some means to prevent the approach span from being tipped by the load. This may be accomplished in any desired manner. As shown in said

figure, the ends of the main approach spans at the break in the floor are beveled or inclined, as shown at I, so that the approach span cannot be moved up past the level of the floor of the main span. At the other end any suitable device may be used, such as the stop H^2 on the guide H, against which the roller H′ strikes when the approach span reaches the limit of its upward movement.

It will be noted that the upward movement of the tail end of the main girders is limited by the engagement of the bumping-girder C^3 with the frames B^2, and hence the uplift is carried by these frames. The greater part of the load is then transferred by the diagonal pieces B^2 (see Fig. 5) to the end pieces B^2, to which is connected the beam or girder B′, upon which is mounted the trunnions of the main span. It will thus be seen that this uplift is opposed by the load on the trunnions, and anchorage is therefore necessary. The smaller portion of the load is transferred to the abutment, and the only anchorage necessary is that required to take care of this part of the load. It will be seen that by this construction the tail end of the main span when in its normal position engages a part which is connected to the part carrying the load on the main trunnions, and it is this construction which avoids the necessity of providing anchorage for the greater part of the load due to the uplift.

I claim—

1. A bridge comprising a main span, a counterweight therefor pivotally connected to the main span, and means for limiting the movement of the counterweight about its pivot.

2. A bridge comprising a main span, a counterweight connected thereto, and means providing an additional increment of efficiency in the counterweight during movement from the open to the closed position of the main span without increasing the short-end lever-arm.

3. A bridge comprising a main span, pivotally supported between its ends, a horizontally-disposed counterweight movably connected with the short end of the main span, and an engaging device for holding said counterweight in a substantially horizontal position during the movement of the main span.

4. A bridge comprising a main span, mounted upon trunnions, supporting parts for said trunnions, an open way between said supporting parts, a horizontally-disposed counterweight connected with said main span, a portion of said counterweight passing by the trunnion-supports when the main span is open.

5. A bridge comprising a main span, provided with a series of main trusses, a beam or girder extending across the space between at least two of them, and a counterweight for said main span extending across between at least two of said main trusses and connected to said beam or girder.

6. A bridge comprising a main span, provided with a series of main trusses, and a counterweight for said main span extending across between at least two of said main trusses, said counterweight pivotally connected to said trusses.

7. A bridge comprising a main span, provided with a series of main trusses, a beam or girder at the tail end of said trusses extending across the space between them and pivotally connected thereto, and a counterweight attached to said beam or girder.

8. A bridge comprising a main span, provided with a series of main trusses, a beam or girder at the tail end of said trusses extending across the space between them and pivotally connected thereto, a counterweight attached to said beam or girder, and means for keeping said counterweight in substantially the same relative position during all the positions of the main span.

9. A bridge comprising a main span, a counterweight movably connected to said main span at one side of its center, and means for preventing movement of the counterweight due to its unbalanced condition.

10. A bridge comprising a pivotally-supported main span, a counterweight pivoted at one side of its center to said main span, so as to be in an unbalanced condition, and a retaining-strut connected to the short arm of the counterweight and to a fixed part so as to prevent displacement due to the unbalanced condition, whereby the effect of the counterweight is increased.

11. A bridge comprising a main span, supporting parts therefor, a counterweight attached to said main span, and an open way between the supports for the main span whereby the counterweight may pass between said supports.

12. A bridge comprising a main span, an approach span pivotally connected to said main span so as to move therewith, said approach span acting partially or wholly as the counterweight for the main span.

13. A bridge comprising a main span, an approach span pivotally connected to said main span so as to move therewith, said approach span acting partially or wholly as the counterweight for the main span, and a fixed engaging part adapted to engage said approach span so as to limit its upward movement.

14. A bridge comprising a main span, an approach span pivotally connected to said main span so as to move therewith, said approach span acting partially or wholly as the counterweight for the main span, and a locking device for locking the parts in their normal position.

15. A bridge comprising a main span, provided with main trusses, a cross-piece pivtally connected to the tail end of said main trusses, and an approach span carried by said cross-piece so as to move with the main span.

16. A bridge comprising a main span, sup-

ports for said main span located outside of the boundary of the main span so that the space between said supports is free.

17. A bridge comprising a main span, supports for said main span located outside of the boundary of the main span so that the space between said supports is free, and a horizontally-disposed counterweight pivotally connected to the tail end of said main span and adapted to pass between said supports when the main span is lifted.

18. A bridge comprising a pivoted main span having a tail end, a comparatively thin horizontally-extending counterweight attached thereto, and having a part which projects beyond said tail end, and means for varying the length of this projecting part as the main span rises.

19. A bridge comprising a comparatively thin horizontally-extending counterweight which projects beyond the tail end of the main span when the bridge is closed, and means for drawing the projecting end of said counterweight toward the pivotal point of the main span as the span is raised.

20. A bridge comprising a main span, a support therefor, a part for limiting the upward movement of the tail end of the main span and which receives the uplift, said part connected with the support for the main span whereby a portion of the uplift is counteracted by the main load.

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Witnesses:
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