No. 652,243. Patented June 26, 1900.

A. E. BROWN.

AUTOMATIC COUNTERBALANCING MECHANISM FOR FLOATING DERRICKS.

(Application filed Mar. 31, 1900.)

(No Model.) 4 Sheets—Sheet 1.

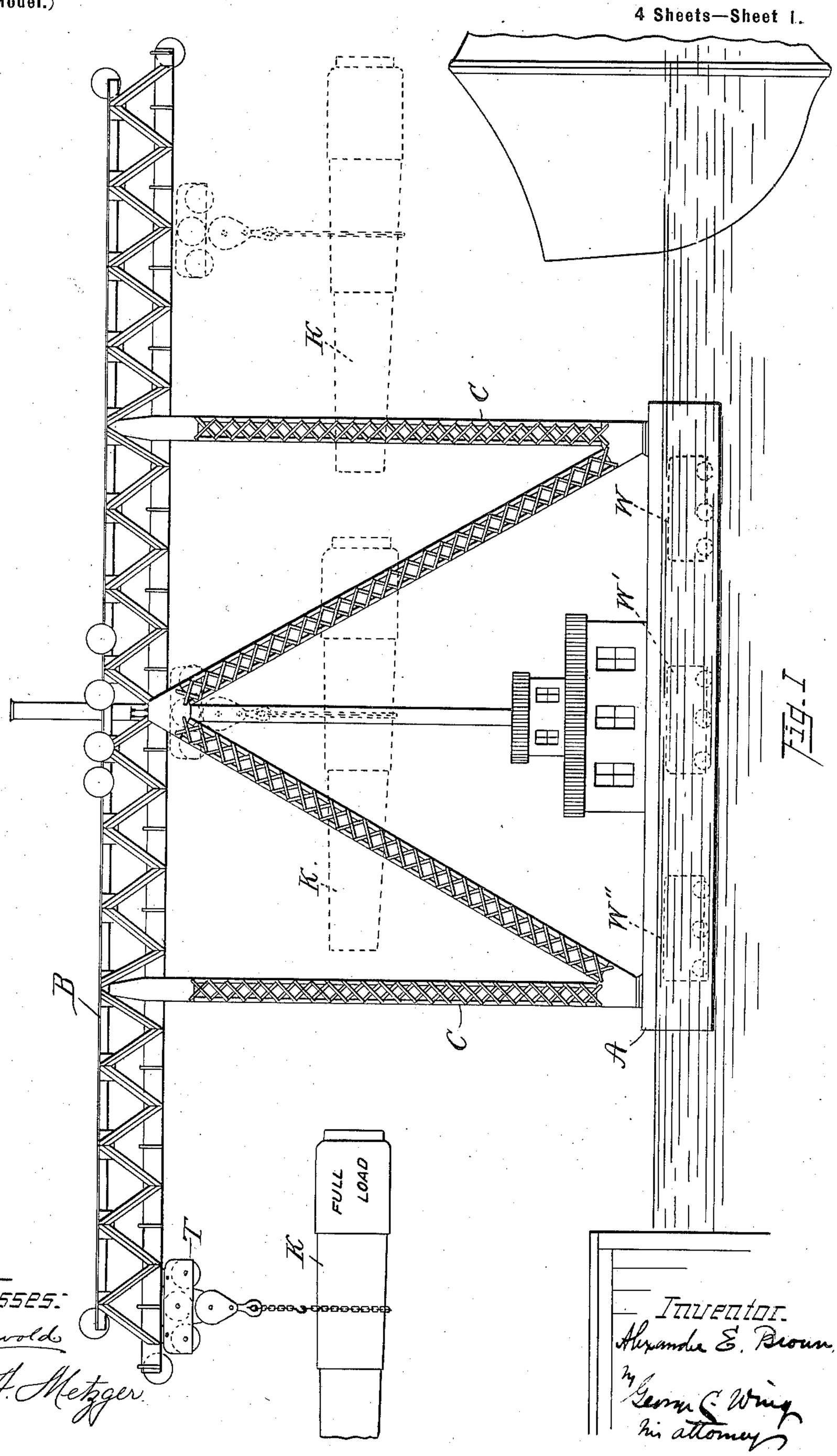

FIG. 1.

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By George C. Wing
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4 Sheets—Sheet 2.

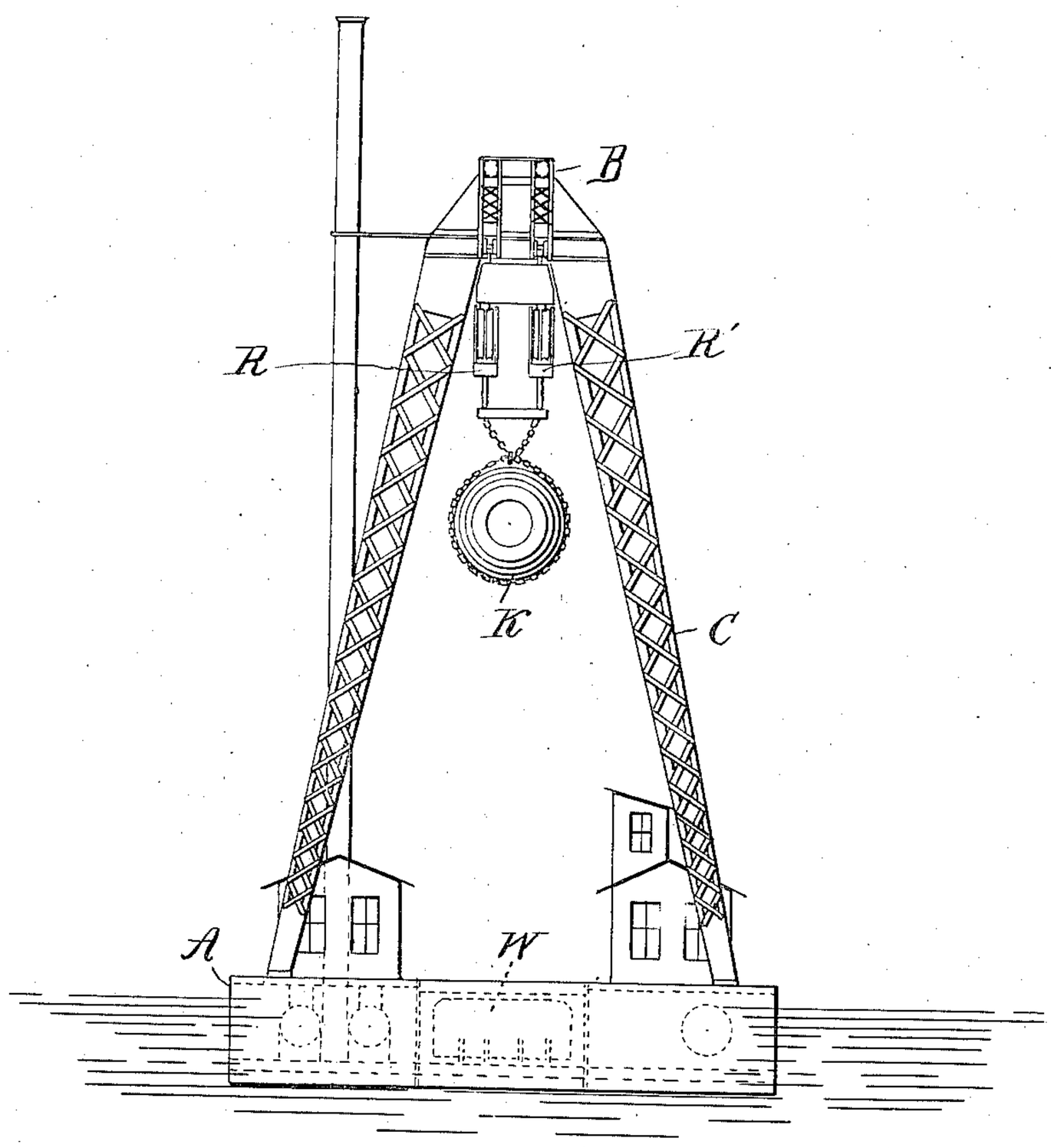

Fig. II

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(No Model.) 4 Sheets—Sheet 3.

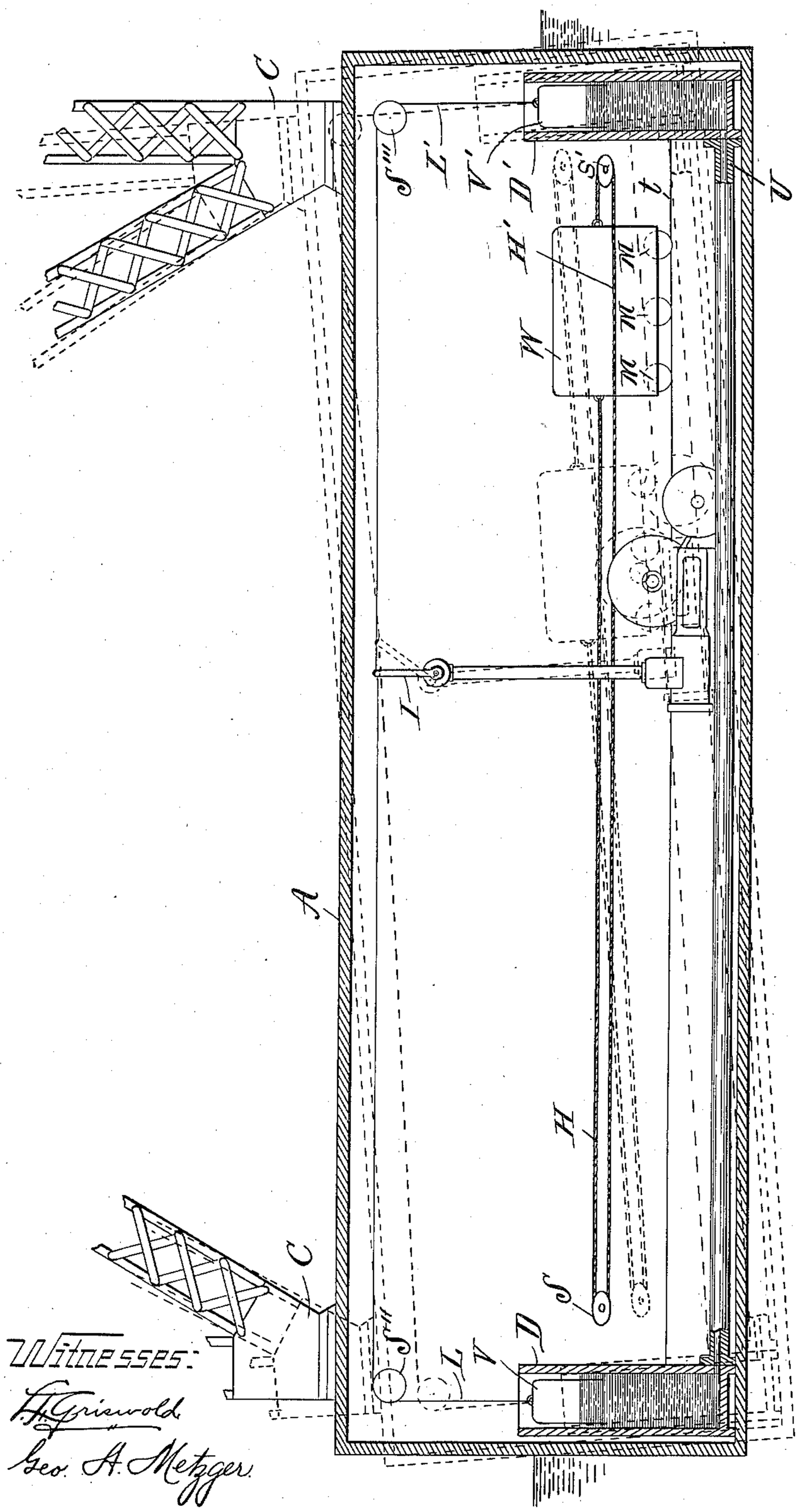

Fig. III.

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(Application filed Mar. 31, 1900.)

(No Model.) 4 Sheets—Sheet 4.

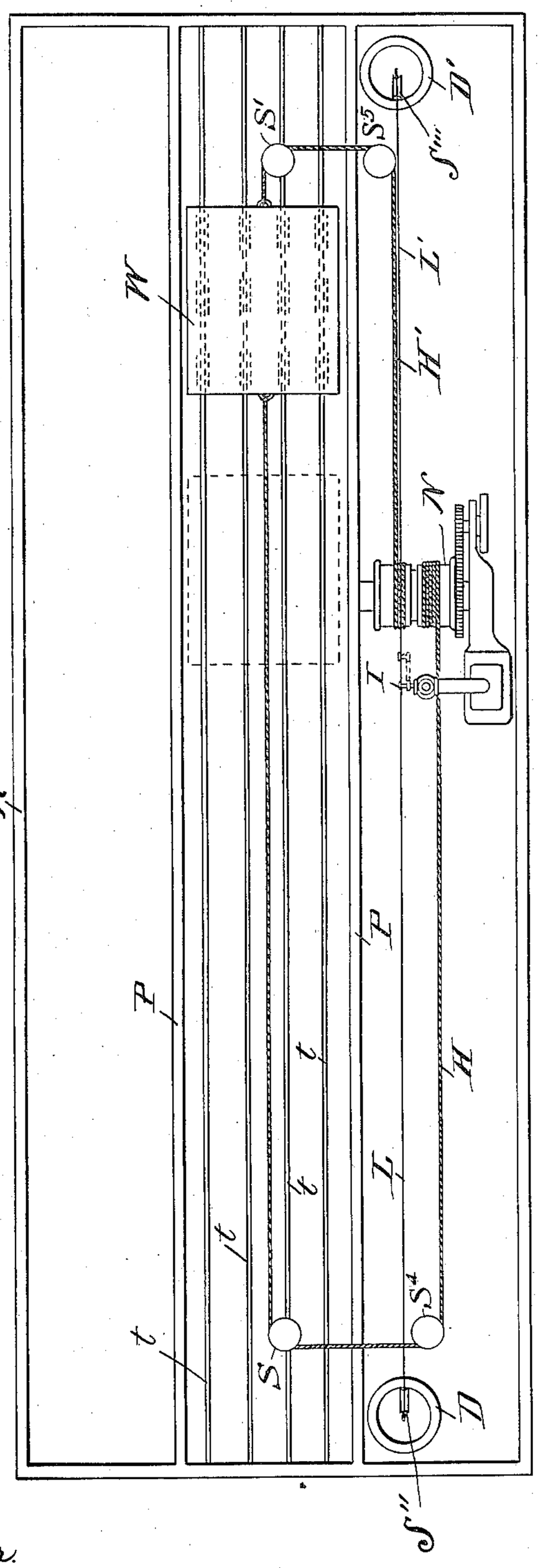

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

ALEXANDER EPHRAIM BROWN, OF CLEVELAND, OHIO.

AUTOMATIC COUNTERBALANCING MECHANISM FOR FLOATING DERRICKS.

SPECIFICATION forming part of Letters Patent No. 652,243, dated June 26, 1900.

Application filed March 31, 1900. Serial No. 10,989. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER EPHRAIM BROWN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful device or mechanism for counterbalancing the weight of the load handled by a crane, derrick, or like structure and thereby reducing and substantially avoiding the tendency of such structures to tip unduly or to overturn during their operation, of which the following is a specification.

Although my said invention is adapted for use with crane or boom derricks designed for use on both land and water, its operative efficiency is more marked in connection with the class of these tools or implements that are intended for use upon water, and as better illustrative of its operative qualities I have, through this specification, accordingly shown and described my said invention as applied to a form of pontoon-crane for the heavy handling in which these structures are usually employed. As is well understood, in this general type of floating cranes the boom or lifting-arm must necessarily project and overhang beyond the barge that carries the structure and to a degree that often occasions a tipping of the supporting-barge directly proportioned to the load encountered and the distance of the same from the base or body of the structure itself. Under these conditions the serviceableness and safety of cranes as heretofore made, and particularly of the pontoon class referred to, are by no means sufficiently insured, and to provide means of meeting and automatically overcoming the tipping effects above described and to enable the crane to instantly and exactly steady itself, according to the requirements of each lift, may accordingly be said to be the chief end and aim of my present invention.

As accomplishing this end and aim my invention may be broadly described as the introduction into the base-support of a floating barge, crane, or other form of derrick of an adequate counterbalancing-weight adapted to move in an opposite direction from the load and load-carrier and to an extent and until it shall counterpoise the load or weight that tends to tip the barge and bring the same to a substantial equilibrium.

My said invention further involves a self control and regulation of the movements involved in the operation above designated which depends upon and is always precisely apportioned to the tipping proclivities for the time being of the boom or crane-arm, and all by the means and mechanisms as applied to pontoon-cranes, which I will now proceed to more fully describe and point out.

In the drawings, Figure I is a side view of a pontoon-crane of a type adapted to utilize my said invention. Fig. II is an end view of the same, showing by dotted lines the relative location in the pontoon and bridge proper of the counterbalancing apparatus. Fig. III is a sectional side view of a pontoon or barge equipped with said apparatus, which is therein indicated diagrammatically. The full lines of the figure show the several parts in their relative positions under the operative conditions indicated in Fig. I. Fig. IV is a downward diagrammatic view of the device as shown in Fig. III, with the addition of a second sheave at each end of the barge or pontoon around which the cable is represented as passing after having passed around the sheaves shown in Fig. III.

In the several figures the same part is designated by the same letter of reference.

A is a pontoon-barge or floating support for an overhead tramway or crane made up of the bridge-truss B and track or tracks R R′, which said truss is supported by a suitable frame structure or legs C C, resting on the barge A. The said truss and tracks are represented in the drawings as mounted longitudinally with respect to the barge and overhanging the latter at both its ends.

T is a trolley adapted to traverse the track or tracks R and carry the load K that is to be lifted and handled.

At each end of the barge A is located a well or tank D D′, connected for the free passage of any fluid contents of said wells by means of a duct or pipe U. Floats V V′ are located in said wells, to which lines L L′ are attached and pass upwardly over sheaves S″ S‴, mounted on suitable bearings in the barge or pontoon A to and in connection with the arm I or other suitable actuating mechanism of the valve of the steam-chest of an engine carried by the said pontoon. For convenience the arm I is shown as located midway between

the wells D D'. In practice it will be found desirable to have the connecting-lines L L' or other suitable mechanism from the floats to the motive-power-controlling device of construction for sensitive action, so that they will respond to their expected function upon very slight actuating movements.

As shown in Fig. IV, the pontoon or bridge A is by preference divided longitudinally into three compartments by the partitions P P, in one of which compartments the engine above referred to is situated and a winding-drum N, which is actuated thereby. In the same compartment are also located the wells D D' already described. In the central one of these compartments from one end to the other are located suitable tracks *t t t t*, upon which a weight W is mounted on wheels M M to facilitate its travel on said tracks. Said weight constitutes a counterbalance proper and in every case should accordingly be duly proportioned to overcome when at the extreme or intermediary points of its travel on said tracks the corresponding moment on the overhanging arms or ends of the truss-tramway B of the load at such time in engagement with and sustained by the trolley T. Attached to the opposite ends of the weight W are cables H H', of which H passes to and around sheaves or similar devices S S^4, located at one end of the pontoon or bridge A, and the other, H', passes to and around sheaves or similar devices S S^5, located at the other end of the same, and thence in each case backwardly to and in connection with the winding-drum N.

With a view of simplifying an understanding of the device where in Fig. III, I show a sectional side view of the same I have dispensed in that figure with the secondary sheaves S^4 and S^5, which are represented in Fig. IV as located at each end of the pontoon outside of the central compartment, with the cables II and II' passing around them as well as around the sheaves S and S'.

Of course a single cable passing around the drum N in one or more turns would answer the purposes of the separate cables H H', above referred to, without a departure from my invention, and other modifications in the various details of construction, hereinbefore described, may likewise be made. The peculiar character of the several effectuating parts of my mechanism are for the most part interchangeable without essential character with respect to the invention generally involved.

Fig. I represents the crane when it has engaged a full load at one extremity of the trolley's travel, and W (in dotted lines) indicates the position of the counterbalancing-weight (under the above conditions) in correspondence with the operative principles of my invention, as hereinafter more fully pointed out. In the same figure is shown in dotted lines a central location of the load K in suspension from the trolley T and a like location of the same at the opposite extremity of the trolley's travel from that shown in full lines in the same figure. In the central location referred to W' (in dotted lines) indicates the location of said counterbalancing-weight under the conditions named, and W'' the position such weight will assume when the load K is carried to said opposite extremity of the trolley's travel. The dotted lines in Fig. III denote a possible tipping position of the barge or pontoon and the relative positions of the interior mechanism under such circumstances. It is by the operation of this very interior mechanism, as will be further shown herein, that the said tipping condition is avoided, offset, or reduced.

Explaining now the operation of the foregoing counterbalance contrivance or mechanism the wells or tanks D D' and the connecting-duct U are to be filled with water or other convenient medium to insure the flotation of the parts V V', as shown, at whatever tipping angle the pontoon is likely to be exposed. It will be obvious that in order to secure the exact operative effects of the wells and their respective floats these wells should be located on the supporting-body of the crane or derrick in line with the direction that the tip is to occur, and that a location that is at direct right angles to such tipping line would be without utility in the connection, and that if so located or at an angle other than a right angle to such tipping line by reason of a roll or tip of the supporting structure in a line different from that which said mechanism was chiefly intended to control an additional and undesired operation of the mechanism might occur. Assuming the pontoon for the time being to be free of load and having the weight W central of the same, said pontoon and crane supported thereby will be in approximate equilibrum and the connecting-lines L L', if of the same length, will meet the lever-arm I with equal and opposite tension upon the same. Under such conditions the said mechanism will of course be at rest and without operative significance. If now the trolley T is run out upon its track and engaged with a load, as shown, for instance, in the full lines of Fig. I, the pull of the hoisting-ropes in raising said load must at once throw the pontoon out of equilibrium, with an increasing tendency to upturn the same at one end and depress it at the other and according as the pull described itself increases. As soon, however, as in the foregoing movements the structure departs from an equilibrium it is manifest that to an extent the pontoon A and the several parts carried and supported thereby will assume positions at angles with the horizontal, as indicated by the dotted lines in Fig. III, and that by reason of the free connection between the wells or tanks D D' through the duct U the well D, for instance, will sink below and the well D' will rise above their normal levels. This relative change of levels of the wells or tanks D D' will evidently not be accompanied by any change of level of their fluid contents with

respect to each other, although with respect to the containing wells themselves the contents of D′, in the case supposed and depicted in Fig. III, will descend and the contents of D will rise to an equal distance. It is plain, therefore, that during this operation the float V′ must descend and the float V must rise to a corresponding extent relatively to the well or tank itself and that the lever-arm I and the steam-valve or other motor-regulator controlled by the same will thereby be actuated. By this means the drum N, carrying the weight-pulling cables H H′, is revolved, and the arrangement is such that when thus revolved the weight W is caused to travel on its track in an opposite direction from the load and against the tip of the pontoon until this tip, which occasioned the lever-arm I to be actuated, as just explained, is overcome by the weight W itself, and the original level of the structure is thereby regained. Thereupon the floats V V′ and the lever-arm I resume their normal positions and the winding-drum of course stops. If now the load is carried along the track R by the trolley T toward the pontoon or bridge A or is disengaged from the trolley, the counterbalancing position assumed by the weight W under the operation last described will at once unbalance the structure, and a tip thereof on the side and toward the said weight W will ensue. Thereupon this new tipping movement will actuate the lever-arm I, as before, but in an opposite direction, and admit steam at the opposite side of the steam-piston, which will cause a reverse revolution of the drum N, and a consequent traverse back of the weight W, until an equilibrium is gained and the lever-arm I is again in normal place.

Of course various modifications in the details of arrangement and construction of the device I have selected to illustrate my invention in this specification may be made without departing from its main characteristics. Thus it is quite within said invention and intended to be covered by my claims that other motive power than steam may be employed, together with all the corresponding mechanical changes in the apparatus disclosed by the drawings that are necessary or convenient to insure a complete coöperation of all working parts. So, for instance, my device may dispense with one of the floats shown or may increase the number thereof by suitable mechanical rearrangements for the purpose, and also instead of the lines designated by L L′ a rigid shaft or other form of connection between the float and power controlling device may be substituted and be within the scope of the invention. Broadly speaking, the precise character or form of the mechanism employed is not material so long as under the conditions indicated the means employed utilize the relative change of position of a float or floats with respect to its containing well or wells to control the action of the power mechanism that traverses the said counterbalance forward and back, as described.

Having thus described my said invention, what I claim, and desire to secure by Letters Patent, is—

1. An automatic counterbalancing device for pontoon derricks, cranes or like structures, consisting of a movable weight suitably mounted on the base or supporting portion of said structures to travel forward and back thereon when impelled by suitable power mechanism provided for the purpose; wells or tanks containing water or other fluid medium, located along said structure's line of tipping, which said wells are united to each other by a duct or other intercommunicating fluid-vehicle, and are provided with a float or floats connected with said power mechanism, as specified, in such manner and by such means that the latter will be actuated to impel said weight forward or back against the tip of said structure whenever, by reason of said tipping, the float, or floats, change their relative positions with respect to their containing well or tank, substantially as shown and described.

2. In a pontoon, or other structure, bearing a crane or derrick, the combination of a movable counterbalancing-weight, suitable power mechanism for moving said weight forward or back against the tip of said pontoon or structure, and intercommunicating wells, or similar fluid-receptacles, provided with one or more floats as described, together with suitable connections between said float, or floats, and said power mechanism to actuate said mechanism whenever, by reason of the tipping of the said pontoon or structure, a change in the relative position of said float or floats and its containing well or tank occurs, substantially as shown and described.

ALEXANDER EPHRAIM BROWN.

In presence of—
RICHARD DEVENS,
F. G. TALLMAN.