No. 722,676. PATENTED MAR. 17, 1903.

P. B. CLARKE.

COMPENSATING VALVE FOR HYDRAULIC RAMS.

APPLICATION FILED JAN. 4, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

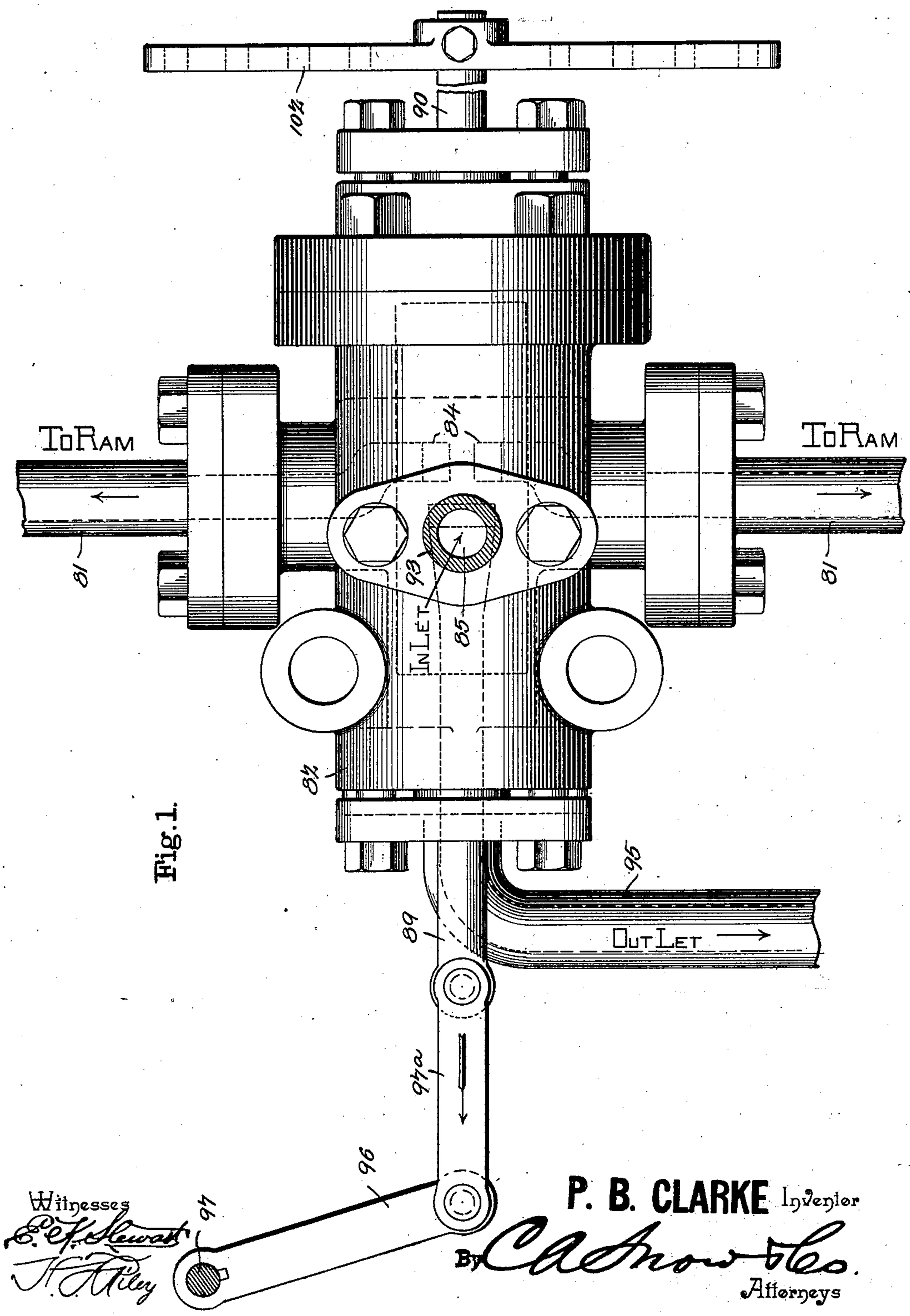

Fig. 1.

Witnesses
E. F. Stewart
H. C. Riley

P. B. CLARKE Inventor
By Cushman & Co.
Attorneys

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NO MODEL. 5 SHEETS—SHEET 2.

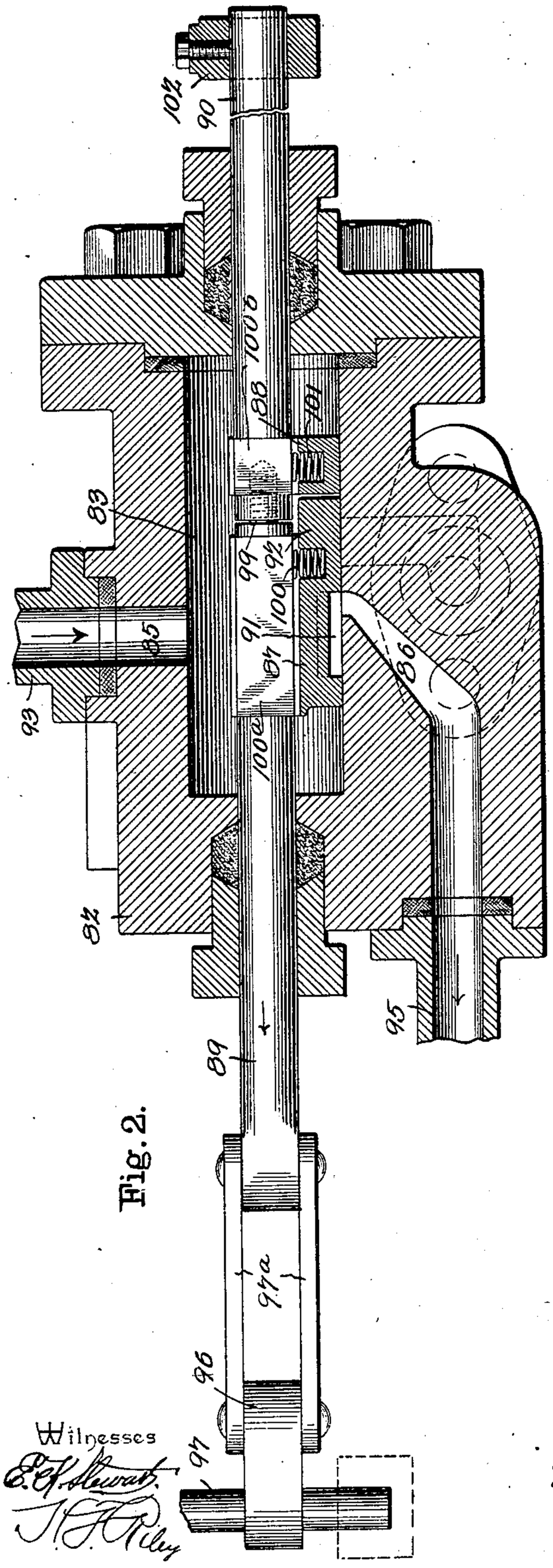

Fig. 2.

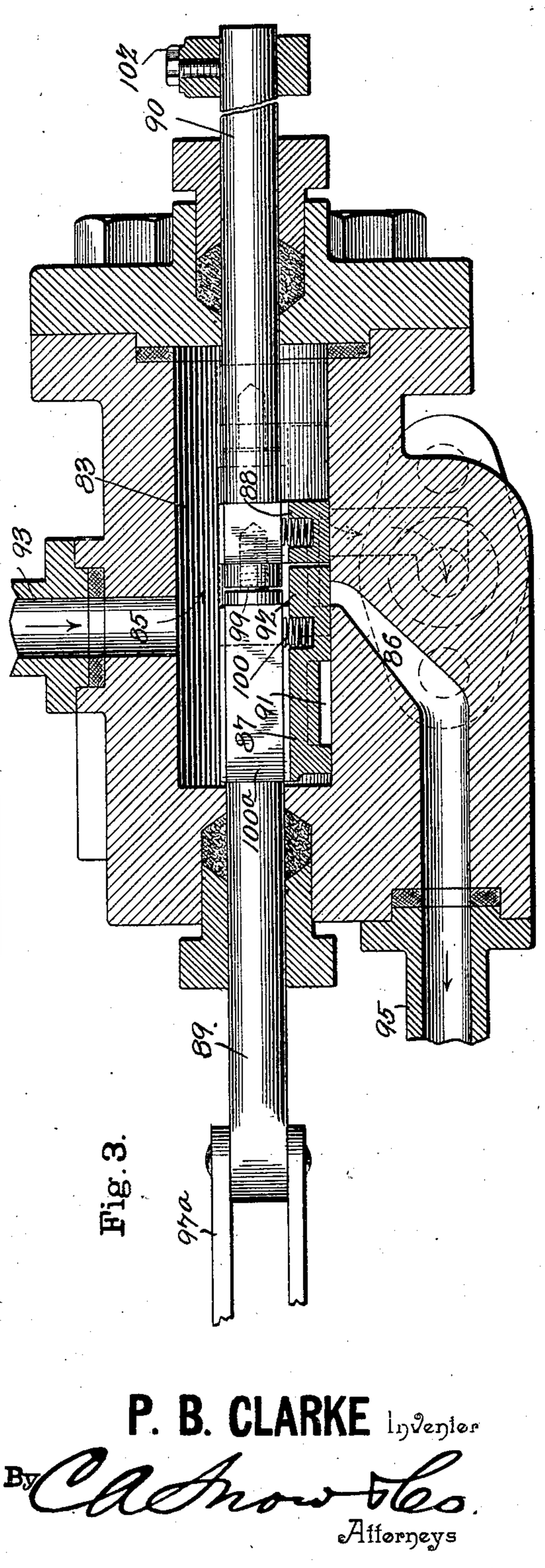

Fig. 3.

Witnesses
E. F. Stewart.
T. J. Riley

P. B. CLARKE Inventor
By Cashow & Co.
Attorneys

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P. B. CLARKE.

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APPLICATION FILED JAN. 4, 1901

NO MODEL. 5 SHEETS—SHEET 3.

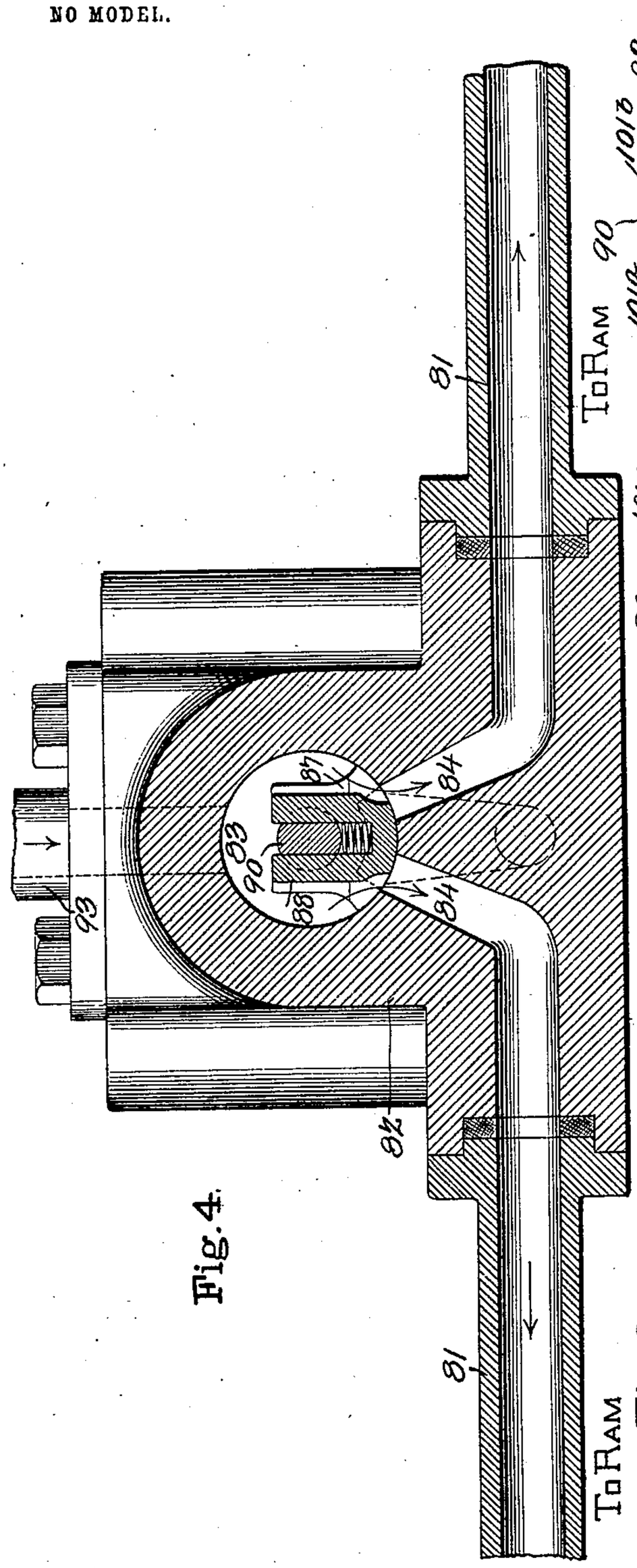

Fig. 4.

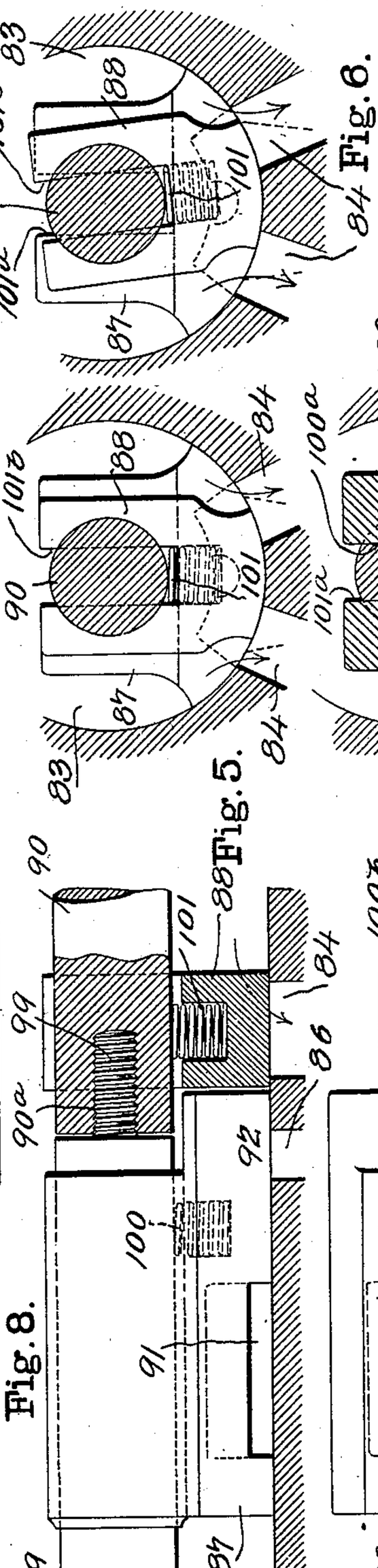

Fig. 5.

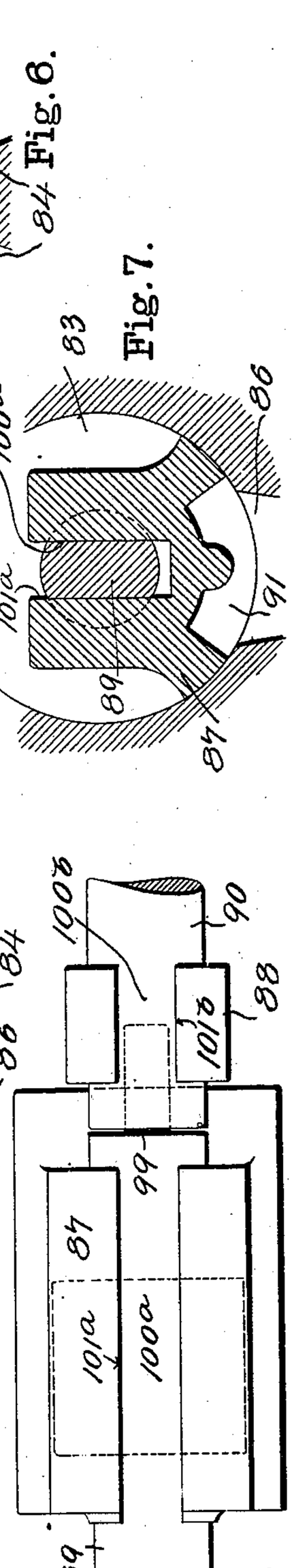

Fig. 7.

Fig. 8.

Fig. 9.

Witnesses
E. F. Stewart
T. A. Riley

P. B. CLARKE Inventor
By Cushman & Co.
Attorneys

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APPLICATION FILED JAN. 4, 1901.

NO MODEL. 5 SHEETS—SHEET 4.

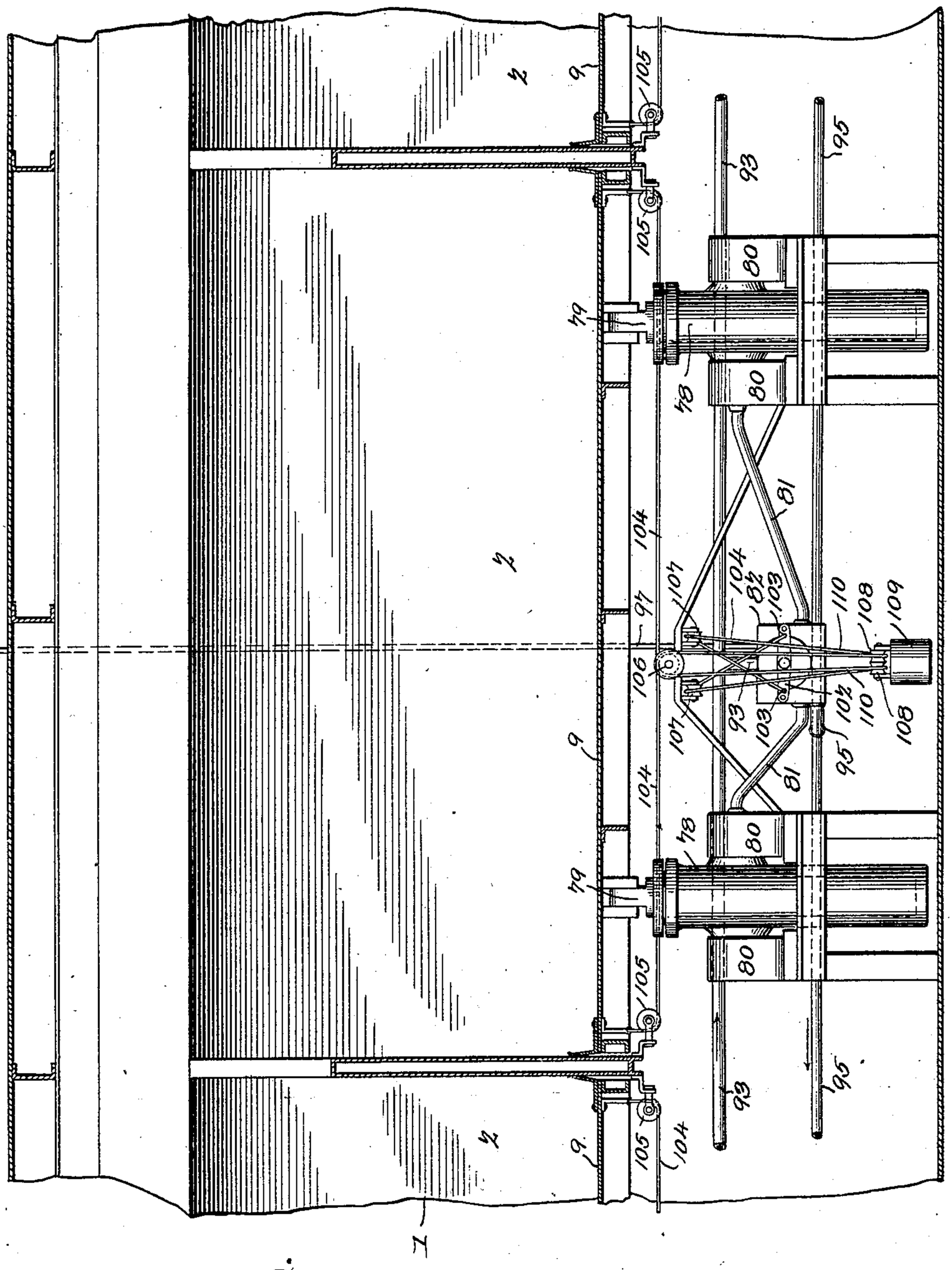

Fig. 10.

Witnesses
E. F. Edwards
T. F. Riley.

P. B. CLARKE Inventor
By Church & Co.
Attorneys

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P. B. CLARKE.

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APPLICATION FILED JAN. 4, 1901.

NO MODEL. 5 SHEETS—SHEET 5.

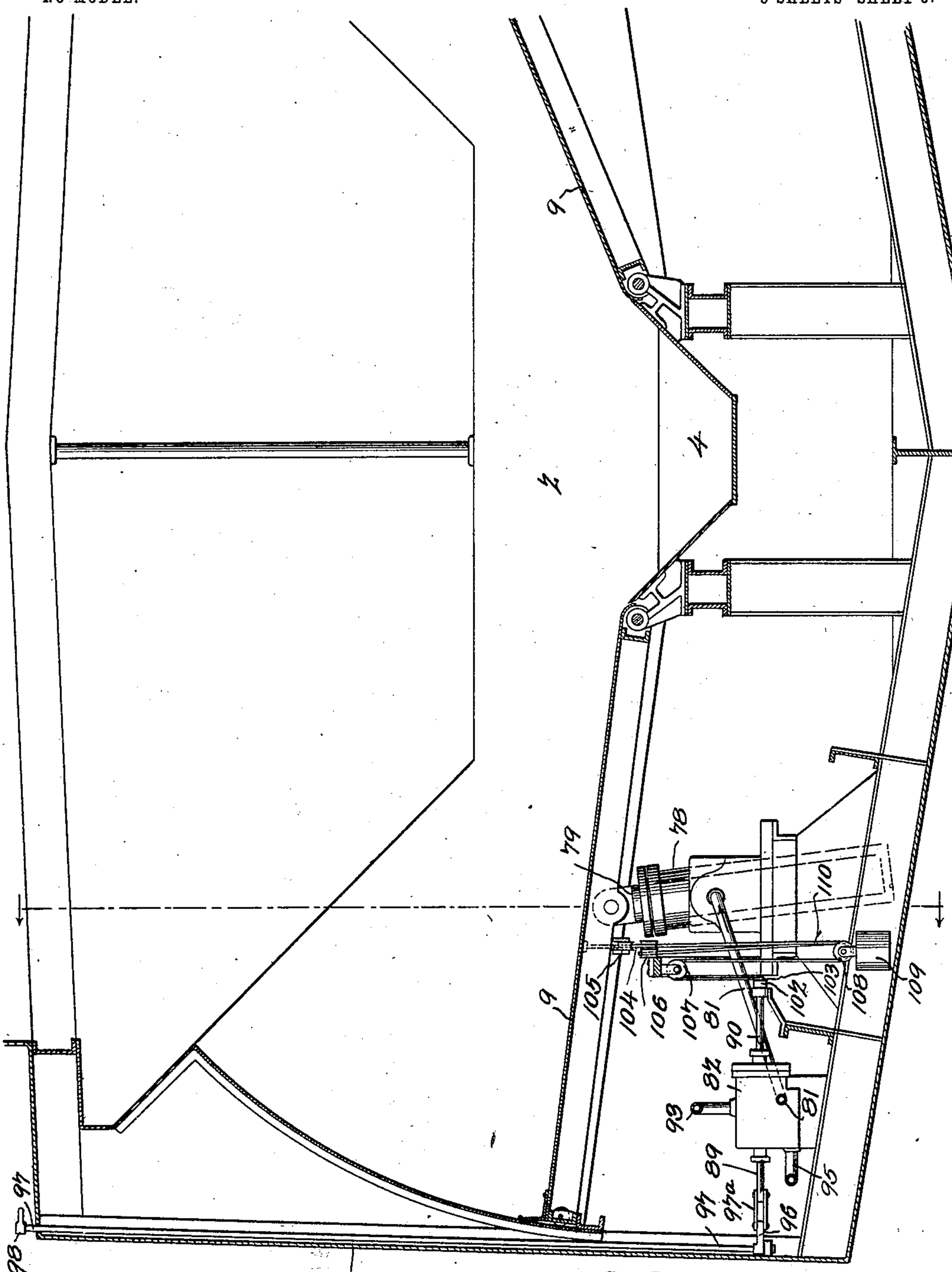

Fig. 11.

Witnesses
C. F. Stewart
H. F. Riley

P. B. CLARKE Inventor
By Cushman & Co.
Attorneys

UNITED STATES PATENT OFFICE.

PEETE B. CLARKE, OF NEW YORK, N. Y.

COMPENSATING VALVE FOR HYDRAULIC RAMS.

SPECIFICATION forming part of Letters Patent No. 722,676, dated March 17, 1903.

Application filed January 4, 1901. Serial No. 42,118. (No model.)

To all whom it may concern:

Be it known that I, PEETE B. CLARKE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Compensating Valve for Hydraulic Rams, of which the following is a specification.

The invention relates to a compensating valve for controlling the power of hydraulic rams.

The object of the present invention is to provide a compensating valve designed for automatically regulating the flow of fluid under pressure to a pair of rams to proportion the power of the rams to the load to be lifted by them, so that a load will be evenly lifted by the rams irrespective of its uneven distribution to the rams.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a plan view of an equalizing-valve constructed in accordance with this invention. Figs. 2 and 3 are longitudinal sectional views of the same. Fig. 4 is a transverse sectional view. Figs. 5, 6, and 7 are detail transverse sectional views showing the valve in different positions. Figs. 8 and 9 are detail views illustrating the construction of the valve-stem and the reciprocating and oscillating valves. Fig. 10 is a longitudinal sectional view of a portion of a barge provided with rams and having an equalizing or compensating valve constructed in accordance with this invention. Fig. 11 is a transverse sectional view of the same.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates a barge provided with bins or compartments 2, having depending hoppers 4, and each bin or compartment is also provided with dumping-gates 9, hinged at opposite sides of the hoppers 4 and adapted to be swung upward by the means hereinafter described to discharge the entire contents of the bin into the hoppers. The upward movement of the oppositely-disposed dumping-gates is effected by hydraulic rams 78, arranged in pairs and located at opposite sides of the dumping-gates. These hydraulic rams, which may be of any desired construction, are provided at opposite sides with trunnions and are adapted to rock or oscillate as their plungers 79 move upward and downward in raising and lowering the dumping-gates. The trunnions of the rams are arranged in suitable bearings 80, and the inner trunnions are hollow and are connected with pipes 81 for supplying the water or other liquid under pressure to the rams. When the liquid is admitted to the hydraulic rams, the plungers thereof move upward and carry with them the dumping-gate with which they are connected, and the admission of water to these rams is controlled to equalize the power and to proportion the same to the load to be raised by the respective rams to cause the dumping-gate to be uniformly raised even when the coal or other material is distributed unevenly over the said gate, whereby the latter will be prevented from sagging at either side or being twisted or strained by the hydraulic rams.

The adjacent ends of the pipes 81 are connected with the opposite sides of the valve-casing 82, having a longitudinal chamber 83 and provided with ports 84, extending therefrom to the pipes 81, which lead to the hydraulic rams. The valve-casing, which is disposed transversely of the barge, is provided at its top with an inlet-port 85, and it has an outlet or exhaust port 86 at its bottom. Within the valve-casing are arranged valves 87 and 88. The valve 87 is a reciprocating valve, and the other valve 88, which is an oscillating valve, is adapted to reciprocate with the valve 87 to be carried to and from the ports 84, and when it is in position at the said ports it is capable of oscillating over the same to vary the flow of water or other liquid to the rams to cause one of the latter to operate with greater power than the other when the load to be lifted is unevenly distributed over the surface of the dumping-gate. The valves 87 and 88 are connected with sections 89 and 90 of a valve-stem which is adapted to reciprocate to move the valves longitudinally of the chamber of the valve-casing. The reciprocating valve 87 is provided at its bottom with a recess 91, and it has a solid portion 92. The recess 91 is

adapted to establish a communication between the outlet or exhaust port 86 and the ports 84 to permit the water or other liquid to exhaust from the hydraulic rams after the latter have been operated to raise the dumping-gate and it is desired to lower the same. The solid portion 92 of the reciprocating slide-valve 87 is adapted to cover the outlet or exhaust port, as illustrated in Fig. 3 of the accompanying drawings, when the ports 84 are open, as shown in Fig. 4, and it is also adapted to cover the ports 84 to cut off the water from the rams and also to lock the rams for holding the dumping-gate in an elevated position. The upper inlet-port 85 is connected by a suitable feed-pipe 93 with the means for supplying the liquid under pressure, and the exhaust port or outlet 86 is connected with an exhaust-pipe 95.

The section 89 of the valve-stem is connected by links 97^a with an arm 96 of a rock-shaft 97, disposed approximately vertically and extending to the deck of the barge and provided at its upper end with an arm or handle 98, by means of which the rock-shaft 97 is partially rotated to reciprocate the valve-stem in either direction.

The valve-stem section 90 is provided with a threaded socket 90^a for the reception of a threaded shank 99 of the section 89 of the valve-stem, and the said section 90 is movably connected with the section 89 and is adapted to be reversely rotated or oscillated, by the means hereinafter described, to oscillate the valve 88 over the ports 84 to vary the size of the openings thereof. The inner adjacent ends of the sections 89 and 90 of the valve-stem are provided at opposite sides with recesses, forming reduced portions 100^a and 100^b to fit in recesses 101^a and 101^b of the valves 87 and 88. The recesses 101^a and 101^b extend downward from the upper faces of the valves 87 and 88, and coiled springs 100 and 101 are interposed between the sections of the valve-stem and the bottoms of the said recesses to hold the valves tightly against the bottom of the valve-casing.

The valve-casing may be constructed in any suitable manner, and it is provided at its ends with suitable stuffing-boxes. The outer end of the section 90 of the valve-stem is provided with a laterally-extending head secured to the section 90 by a set-screw or other suitable device and forming a pair of oppositely-disposed arms, which are connected to the inner ends 103 of cables 104, that have their outer ends attached to the dumping-gate at opposite sides thereof. The outer ends of the cables or other flexible connections pass around guide-pulleys 105, which are mounted in suitable fixed brackets located below the dumping-gate adjacent to the side edges thereof. The cables extend from the outer guide-pulleys 105 to central guide-pulleys 106 and are looped by means of the central pulleys 106 and a pair of pulleys 107, located at opposite sides of and arranged slightly below the central pulley 106. The loops which depend from the guide-pulleys 106 and 107 receive pulleys 108 of a weight 109, and the cables after forming the loops 110 extend downward from the pulleys 107 to the arms formed by the head 102 of the valve-stem. The inner portions of the cables cross each other and extend to the opposite sides of the valve in order to connect the cable at the right-hand side of Fig. 10 with the right-hand arm of the valve-stem, and the cable at the left-hand side is connected with the other arm. Should the right-hand side prove lighter than the left-hand side of the dumping-gate, the right-hand arm will be lifted and the oscillatory valve will be swung toward the right from the position illustrated in Fig. 5 of the drawings to that shown in Fig. 6 to partially close the right-hand feed-port 84 and lessen the power of the right-hand ram. This movement correspondingly increases the size of the port 84 at the left-hand side, and the left-hand hydraulic ram will have its power proportionately increased. The power will be proportioned between the rams to the load to be lifted by them, and they will operate with equal facility on an unevenly-distributed load. The weight keeps the cables taut; but only a comparatively slight movement of the oscillatory valve is necessary to effect the operation of the compensating valve and only a slight upward movement of the lighter side of the dumping-gate will occur before the compensating action results.

It will be seen that the compensating valve is exceedingly simple and inexpensive in construction, that it is readily operated to control the hydraulic rams, and that it is capable of automatically varying the power of the same to proportion the power properly to the load to be lifted should the material be unevenly distributed over the dumping-gates.

What I claim is—

1. In a device of the class described, the combination of a valve-casing provided with ports designed to be connected with rams, a movable valve located within the casing and arranged to relatively vary the size of the openings of the said ports and increase the exposed area of one port and decrease the exposed area of the other port to increase the power of one of the rams and reduce that of the other without reducing the combined power of the rams, and means for connecting the movable valve with the load to be lifted by the rams, whereby the power of the rams will be proportioned to the load to be lifted by them, substantially as described.

2. In a device of the class described, the combination of a valve-casing provided with ports designed to be connected with rams, an oscillatory valve arranged within the valve-casing and arranged to relatively vary the size of the ports and increase the exposed area of one in proportion to the decrease of the area of the exposed portion of the other

port to transfer a portion of the power of one ram to the other to proportion the power to the distribution of the load to be lifted without lessening the combined power of the rams, and means for connecting the oscillatory valve with the load to be lifted, substantially as described.

3. In a device of the class described, the combination of a casing having inlet and exhaust ports and provided with ports or openings designed to communicate with a pair of rams, a reciprocating valve adapted to close the exhaust-port and the ports or openings communicating with the rams, a movable valve connected with and carried by the reciprocating valve and adapted to relatively vary the size of the ports or openings to relatively vary the power of the rams, and means for connecting the said movable valve with the load to be lifted, substantially as described.

4. In a device of the class described, the combination of a casing having inlet and exhaust ports and provided with ports or openings designed to be connected with a pair of rams, a reciprocating valve arranged to cover and uncover the exhaust-port and the ports or openings leading to the rams, an oscillatory valve connected with and carried by the reciprocating valve and arranged to relatively vary the size of the entrances to the ports or openings leading to the rams to relatively vary the power of the rams to proportion the same to the load to be lifted, and means for connecting the oscillatory valve with the load, substantially as and for the purpose described.

5. In a device of the class described, the combination of a casing having inlet and exhaust ports and provided with ports designed to communicate with a pair of rams and located adjacent to the exhaust-port, a reciprocating valve arranged to cover the exhaust-port and the ports leading to the rams and provided with a recess adapted to establish a communication between such ports, a movable valve carried by the reciprocating valve and arranged to relatively vary the size of the ports leading to the rams to relatively vary the power of the same, and means for connecting the said movable valve with the load to be lifted, substantially as described.

6. In a device of the class described, the combination of a casing provided with an inlet-port and having an exhaust-port and ports 84 arranged adjacent to one another, a reciprocating valve arranged to cover the ports 84 and the exhaust-port and provided with means for establishing a communication between such ports, an oscillatory valve carried by the reciprocating valve and arranged to relatively vary the size of the ports 84 to relatively vary the power of the rams, and means for connecting the oscillatory valve with the load to be lifted, substantially as described.

7. In a device of the class described, the combination of a casing having an inlet-opening and provided with an exhaust-port and having ports 84 designed to communicate with a pair of rams and located adjacent to the exhaust-port, a valve-stem composed of two sections, one of the sections being capable of rotary movement, a reciprocating valve connected with the other section, an oscillatory valve connected with the section having the rotary movement and arranged to relatively vary the size of the ports 84 to relatively vary the power of the rams, and means for connecting the oscillatory valve with the load to be lifted, substantially as described.

8. In a device of the class described, the combination of a casing provided with an inlet-opening and having exhaust and feed ports 86 and 84, a valve-stem composed of sections 89 and 90 having reduced portions, the reciprocating valve provided with a recess receiving the reduced portion of the section 89 of the valve-stem, the oscillatory valve having a recess receiving the reduced portion of the section 90 of the valve-stem, and springs interposed between the valves and the sections of the valve-stems, substantially as described.

9. In a device of the class described, the combination with a plurality of rams, of a valve-chamber having ports in communication with said rams, and a compensating valve for regulating the flow of liquid through said ports and to vary relatively the power exerted by the rams, said valve being so mounted and constructed with respect to the ports as to increase the area of one port in proportion to the decrease in the area of the other port without decreasing the effective combined area of both ports, substantially as described.

10. In a device of the class described, the combination with a plurality of rams, of a valve-chamber having ports independently connected to the respective rams, a compensating valve normally covering a portion of both ports, and means for automatically adjusting the position of said valve in proportion to the relative power to be exerted by the rams without decrease in the effective combined area of both ports.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

PEETE B. CLARKE.

Witnesses:
JOHN FRENCH,
CHARLES ENGEL.