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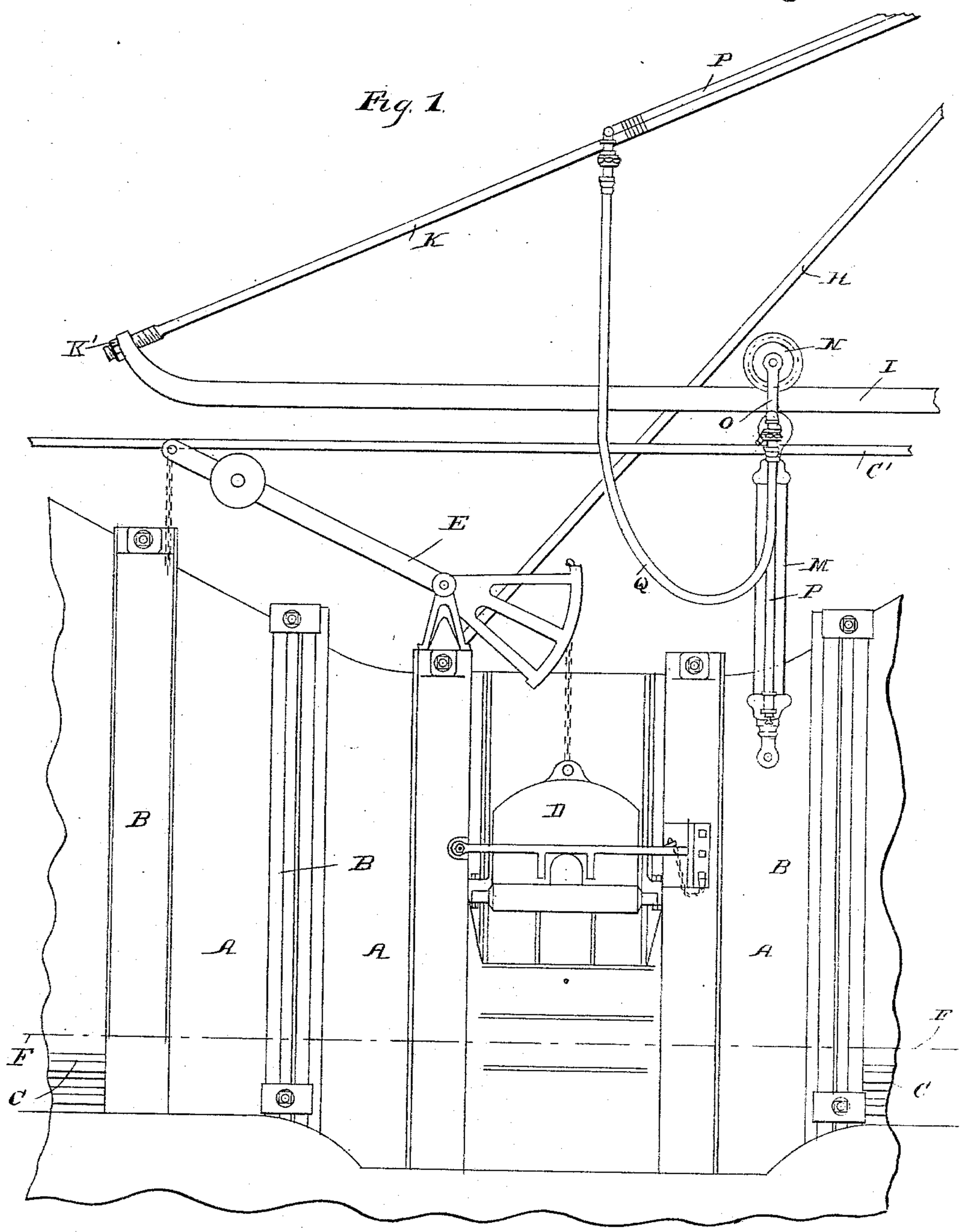
W. F. DURFEE.

HYDRAULIC JACK FOR CRANES.

No. 323,403. Patented Aug. 4, 1885.

Fig. 1.



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HYDRAULIC JACK FOR CRANES.

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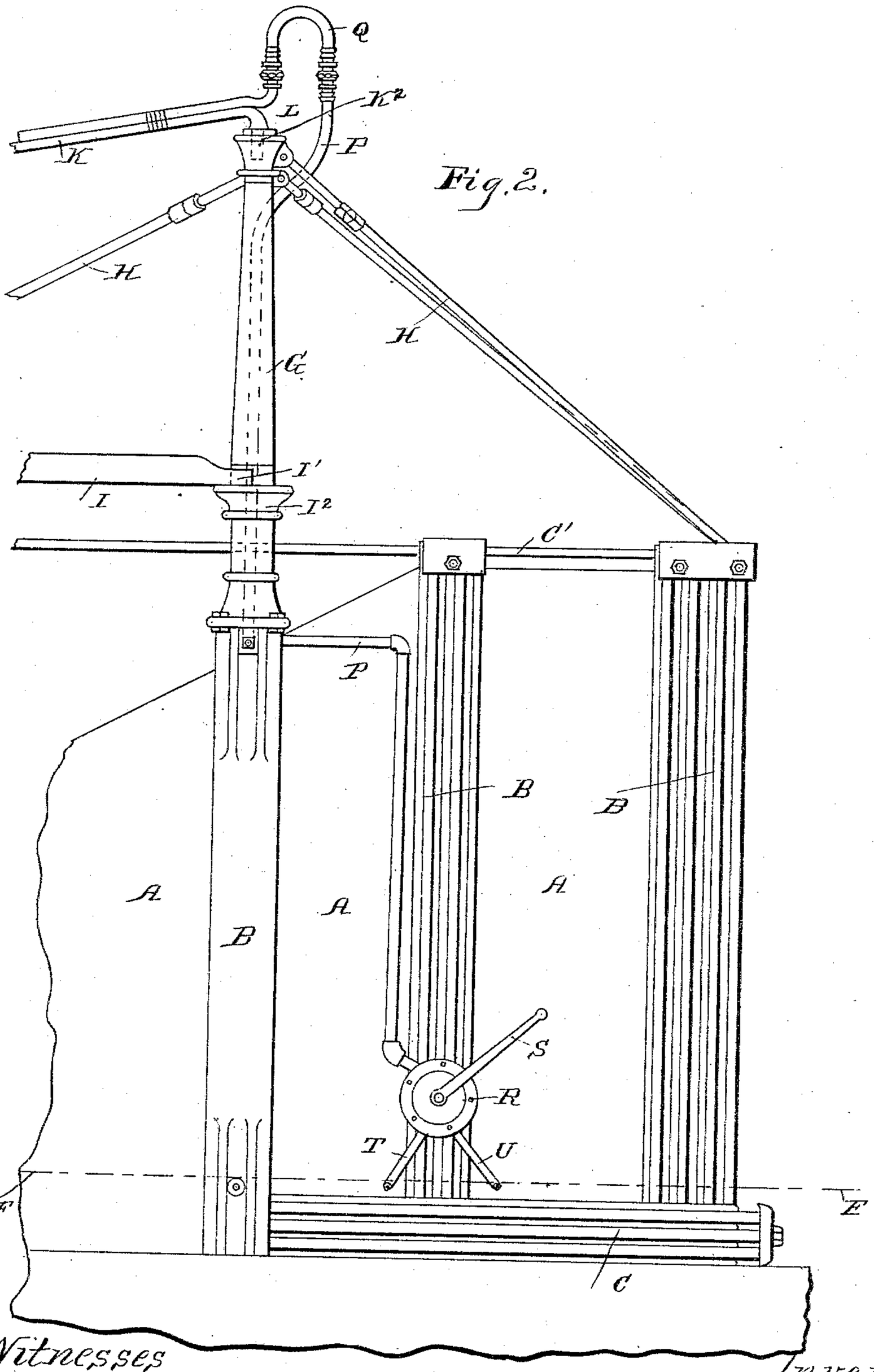
Fig. 2.



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HYDRAULIC JACK FOR CRANES.

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Fig. 3.

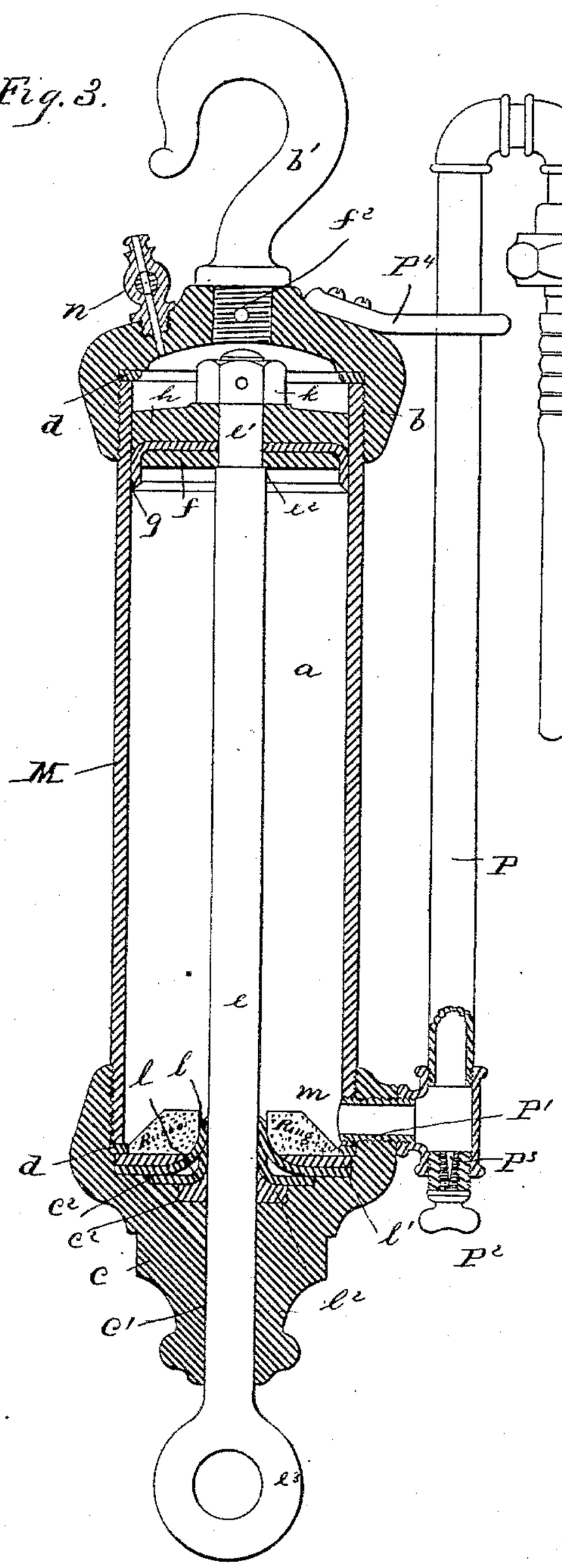
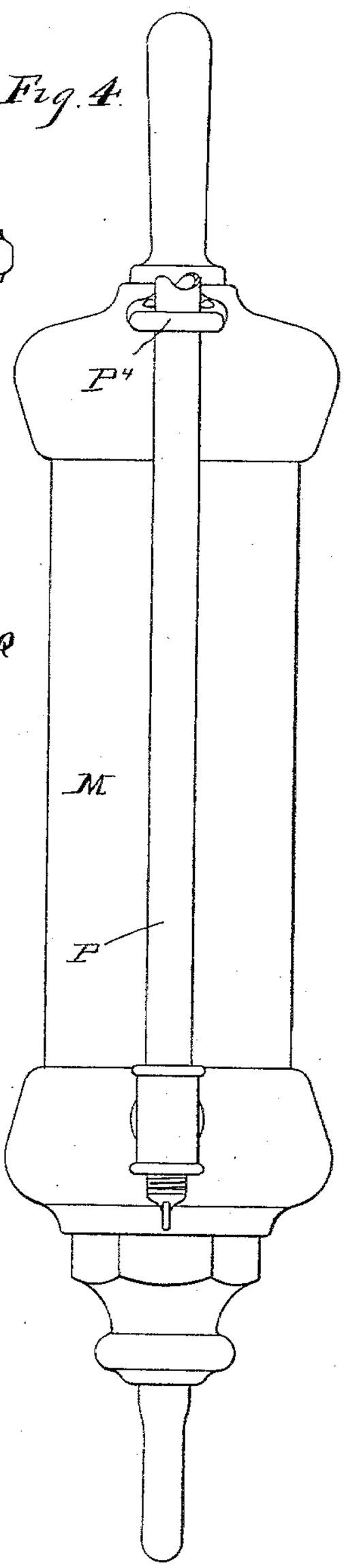


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

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HYDRAULIC JACK FOR CRANES.

No. 323,403. Patented Aug. 4, 1885.

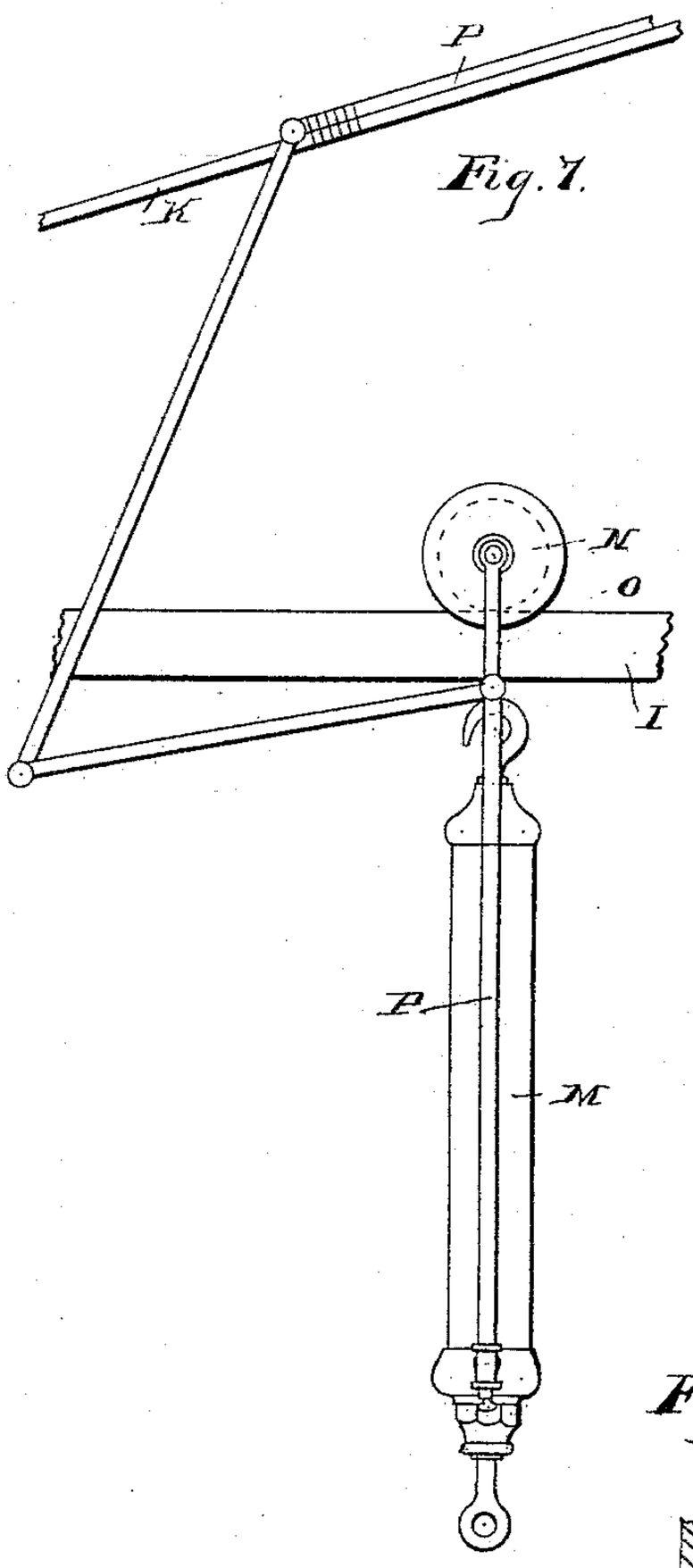


Fig. 7.

Fig. 6.

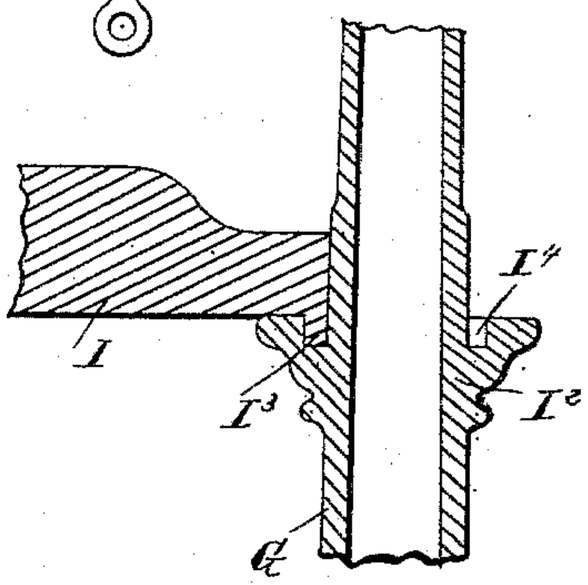
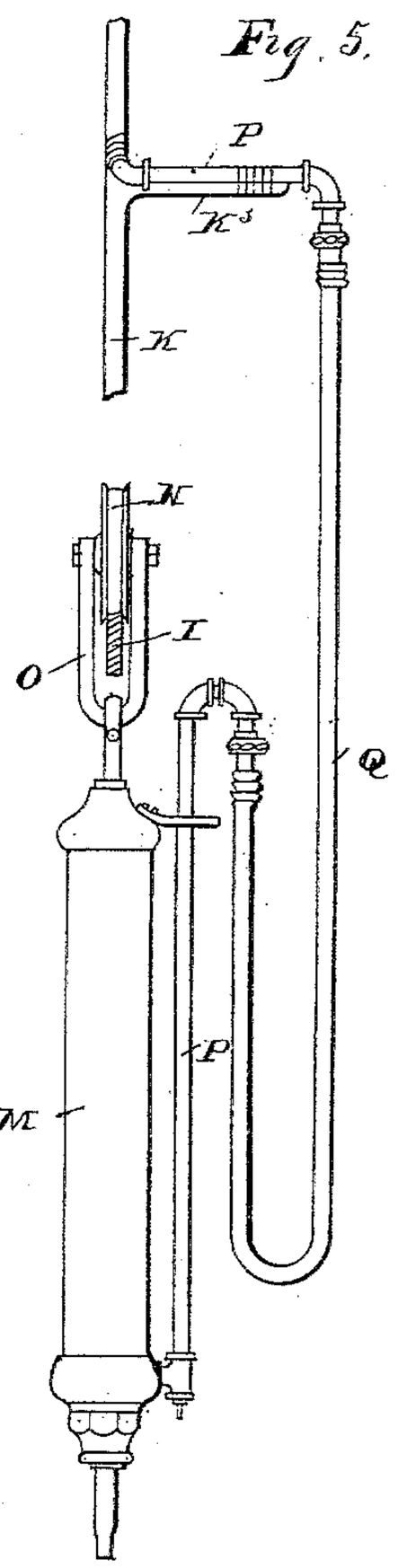


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM F. DURFEE, OF BRIDGEPORT, CONNECTICUT.

HYDRAULIC JACK FOR CRANES.

SPECIFICATION forming part of Letters Patent No. 323,403, dated August 4, 1885.

Application filed March 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. DURFEE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Hydraulic Jacks for Cranes; and I do hereby 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.

My invention has for its object to provide means for lifting heavy bodies or masses, which shall be simple in construction, easy to manage, economical in cost, and which may be readily applied to cranes of ordinary construction already in use. With these ends in view I have devised the novel construction and combination which I will now proceed to describe, and then specifically point out in the claims.

I have illustrated my invention as applied to a crane having an arm composed of a single bar and in connection with a metallurgical furnace. It should be understood, however, that my invention is equally applicable to a crane having an arm composed of parallel bars bolted together at their extremities, with their inner ends bolted to a jaw or collar at the mast.

In the drawings, Figures 1 and 2 together show the front of a metallurgical furnace in elevation, and illustrate the application and use of my invention. Figs. 3 and 4 are respectively an enlarged section and elevation of the lifting-jack detached. Fig. 5 is an elevation of the jack, showing the connections; Fig. 6, a detail section of the mast and swinging arm; and Fig. 7, a modified form of connection, a jointed pipe being substituted for a flexible pipe.

Similar letters indicate like parts in all the figures.

A A represent the panels of the furnace; B B, vertical binders; C C, horizontal binders; C′, one of the longitudinal tie-rods; D, the furnace-door, and E mechanism for lifting the same, all being of ordinary construction.

F F represent the floor-line; G, the crane-mast, and H rods which support the mast.

I is a swinging arm, forked, as at I′, to enable it to embrace the mast, upon which it turns freely, being supported by collar I^2.

The fork I′ upon the swinging arm is provided with a downwardly-projecting lip, I^3, fitting in a groove, I^4, in the collar, which acts as an oil-cup, and also to hold the arm firmly against the mast.

K is a supporting-rod secured to the outer end of the swinging arm, and having a screw-thread and nut, K′, by means of which the arm is adjusted. The upper end of this rod is formed into a swivel-pin, L, which turns freely in an oil-cup, K^2, in the top of the mast.

M is the hydraulic lifting-jack, which is detachably suspended from a loop, O, carried by a flanged roller, N, which moves on the swinging arm, as will be more fully explained.

P P represent sections of metal pipe, and Q Q sections of flexible rubber pipe, which connect the jack with a valve, R.

T represents the induction and U the eduction pipe. The valve, which may be an ordinary two-way valve, is operated by a lever, S. In the position shown the induction-pipe is open, and the piston-rod *e* is at its highest point.

Turning now to Fig. 3, *a* is a metallic cylinder, closed at the top by a cap, *b*, into which hook *b′* is screwed and held from turning by a pin through hole f^2. The lower cap, *c*, is provided with an aperture, *c′*, through which the piston-rod passes.

d d are leather gaskets at both ends of the cylinder to secure absolutely water-tight joints.

e is the piston-rod, having a reduced portion, *e′*, and shoulder e^2, and screw-threaded at its end.

The piston I construct as follows: *f* is a plate resting against shoulder e^2, which is forced into a cup-leather, *g*. The cup-leather fits the cylinder closely. Above the cup-leather is a slightly-cupped disk, *h*, also fitting the cylinder closely. These parts are held together by a nut, *k*, which engages a screw-thread at the extreme end of the piston-rod. A pin passing through both nut and rod prevents the former from becoming loosened, thus forming an absolutely water-tight piston. At the bottom of the cylinder I provide two or more cup-leathers, *l*, which rest in steps c^2 in the

lower cap, and are held in place by disks l' and l^2. The lower disk, l^2, is thickest on its inner side, being curved upward to a feather edge, which rests against the piston-rod. Above this disk is a cup-leather, which rests in the curve of the disk, its outer edge lying in a step in the cap, and its inner edge against the piston-rod. Above this is another cup-leather, and above that another disk curved on its inner edge. The arrangement is such that pressure within the cylinder forces the upper cup-leather against the piston-rod and against the outer side of the lower cup-leather, which it also forces against the piston-rod, thus preventing the possibility of leakage at this point.

m is a heavy rubber ring, which I place at the bottom of the cylinder, and which, resting upon the upper disk and cup-leather, acts to receive the blow of the piston in the event of its sudden descent from any cause.

n is a petcock in the upper cylinder-cap, which permits the escape of air when the piston is forced upward, but so slowly that the air within the cylinder acts as a cushion to prevent the piston from being forced violently against the cap.

In use the water is caused to enter the cylinder at the bottom thereof from pipe P, the parts being joined by an ordinary T-connection, as at P'. At the lowest point in the pipe I provide a screw-plug, P^2, having a notch, P^3, upon one side, by means of which I am enabled to drain the cylinder and the pipe by giving the screw-plug a slight turn backward. This necessity for drainage only occurs in the event of the jack being for some time out of use and there being danger of a freeze-up.

It will be observed that pipe P is carried above the top of the cylinder, to which it is secured by a support, P^4. At the upper end of this section of pipe a section of rubber pipe, Q is attached. This section of rubber pipe joins a section of metal pipe, which is carried by and securely bound to the supporting-rod K, the rubber pipe being amply long to permit the jack to be moved from one end of the swinging arm to the other. K^3 is a horn projecting outward from rod K. The section of metal pipe which is supported by the rod is curved outward and secured to this horn, the object being to carry the point of attachment of the section of rubber pipe out beyond the jack (see Fig. 5) far enough so that the latter in passing from one end of the arm to the other cannot possibly come in contact with the hose. A pipe from the valve runs to the mast, and up the back side thereof. (See dotted lines in Fig. 2.) Near the upper end of the mast this pipe is bent away therefrom, so that its upper end is parallel with but at some distance from the upper end of the section carried by the supporting-rod K. These two sections are connected by a section of rubber pipe which is curved upward, then downward, and is of sufficient length to permit arm I to swing freely without checking the flow of water.

The operation is as follows: Suppose that it is desired to charge the furnace. The masses of metal are lifted by tongs, (of ordinary construction, not shown,) which are attached to the ring e^3 at the lower end of the piston-rod. It should be understood that the normal position of the piston, when not in use, is at the bottom of the cylinder. For convenience in description, however, I have shown it in its raised position in the drawings. The mass of metal having been grasped by the tongs, water is admitted to the jack, below the piston, by moving valve-lever S to about the position shown in Fig. 2. It will of course be understood that in the manipulation of the valve-lever the operator will have to be guided to a certain extent by the weight to be raised, the distance it is to be raised, and the pressure of the water. The valve may be a two-way valve, of any ordinary construction, so that by moving the lever to a vertical position I am enabled to check the ingress of water, and thus to hold the piston and the weight which is being lifted thereby at any desired position. Having raised the mass of metal to the desired height, the flow of water is stopped, and the arm swung round toward the furnace. The tongs may then be brought to the exact position desired by sliding the jack along the arm by means of roller N. To lower the tongs it is merely necessary to reverse lever S, which will cause the water to flow in the opposite direction, thus lowering the piston. I do not desire to limit myself to the exact details of construction shown, as it is manifest that they may be varied within reasonable limits without departing from the spirit of my invention.

I have shown my invention in connection with a metallurgical furnace, as a convenient means of illustrating one of its many uses. It is equally applicable, however, to any of the uses to which hydraulic cranes have heretofore been applied, and may be constructed and applied at a tithe of the expense attending the construction of a hydraulic crane.

In the modified form shown in Fig. 7, I have substituted a jointed pipe for a flexible rubber hose. The flexible hose, however, is deemed preferable for ordinary uses.

Having thus described my invention, I claim—

1. The combination, with a swinging crane-arm and its stay-rod, of a roller adapted to traverse the arm, a hydraulic jack supported by the roller, a water-pipe extending along and supported by the stay-rod, devices for supplying water to the pipe, and flexible connections, whereby the pipe may communicate with the jack to supply water thereto, substantially as set forth.

2. The combination, with a crane-arm and its stay-rod, of a roller adapted to traverse the arm, a hydraulic jack supported by the roller, a water-pipe extending along the stay from the axis of the crane to about the mid-

dle of the crane-arm and supported by the stay, devices for supplying water to the pipe, and flexible water-connections between the jack and the nearest end of the pipe, substantially as set forth.

3. The combination, with the crane-arm, of the roller adapted to traverse the same, the hydraulic jack supported by the roller, the projection K^3, overhanging the path of the jack, a water-pipe supported by said projection, water-supply connections leading to said pipe, and a flexible pipe connected with the latter at the extremity of said projection and with the jack, substantially as set forth.

4. The combination of the stationary mast, an upright water-pipe carried thereby, a crane-arm adapted to swing on said mast, a hydraulic jack supported by said arm, a water-pipe carried by the crane-arm, and a flexible pipe, Q, connecting said first-mentioned pipes, and a second flexible pipe connecting the water-pipe upon the arm with the jack, substantially as set forth.

5. A hydraulic lifting-jack consisting of the combination of a cylinder, an upper cap having a petcock and means for attachment to a supporting device, a piston and piston-rod, a lower cap having openings for the passage of said piston-rod and an inlet-pipe, disks l' and l^2, cup-leathers l, and rubber ring m, substantially as set forth.

6. In a hydraulic lifting-jack, the combination, with the piston and a piston-rod passing through the lower cap, of cup-leathers held against the rod to prevent leakage, and a solid rubber ring, against which the piston strikes in the event of its sudden descent.

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

WILLIAM F. DURFEE.

Witnesses:
A. M. WOOSTER,
A. B. FAIRCHILD.