(No Model.)

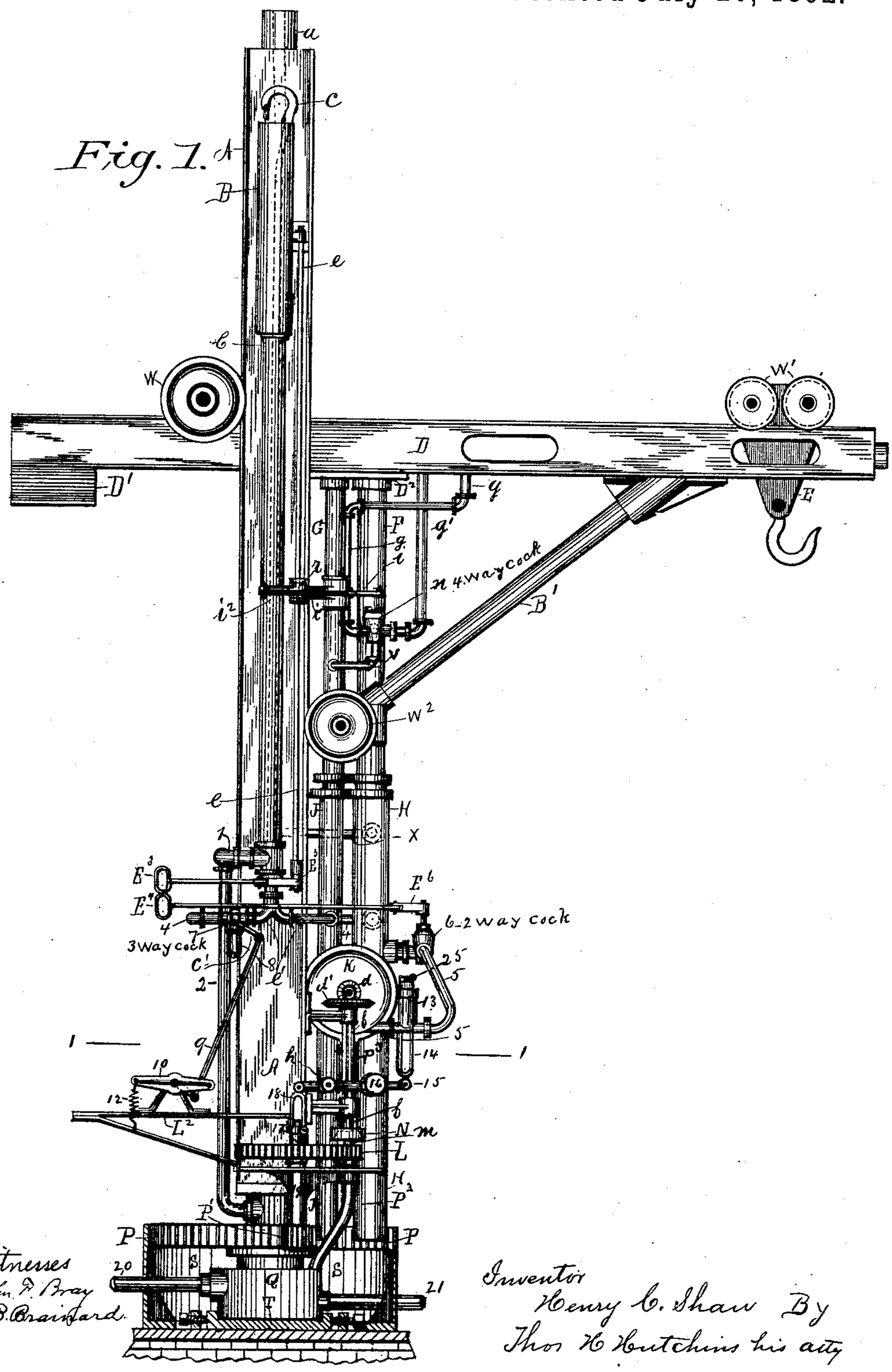
4 Sheets—Sheet 1.

H. C. SHAW.

HYDRAULIC CRANE.

No. 479,468. Patented July 26, 1892.

Fig. 1.



Witnesses
John F. Bray
C. B. Brainard.

Inventor
Henry C. Shaw By
Thos H Hutchins his atty

(No Model.)

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H. C. SHAW.

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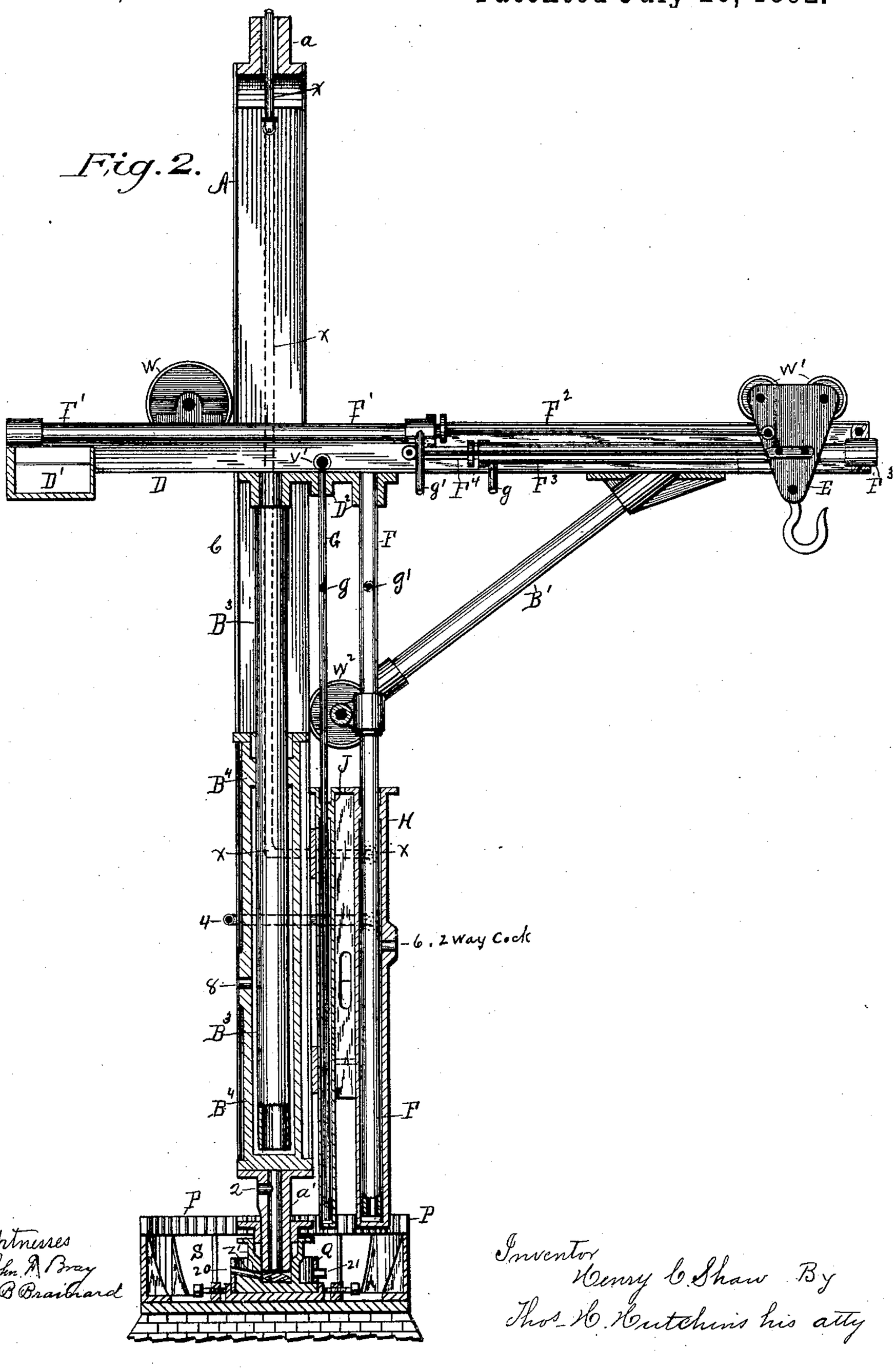
Fig. 2.



Witnesses
John A. Bray
C. B. Brainard

Inventor
Henry C. Shaw By
Thos. H. Hutchins his atty

(No Model.)

4 Sheets—Sheet 3.

H. C. SHAW.

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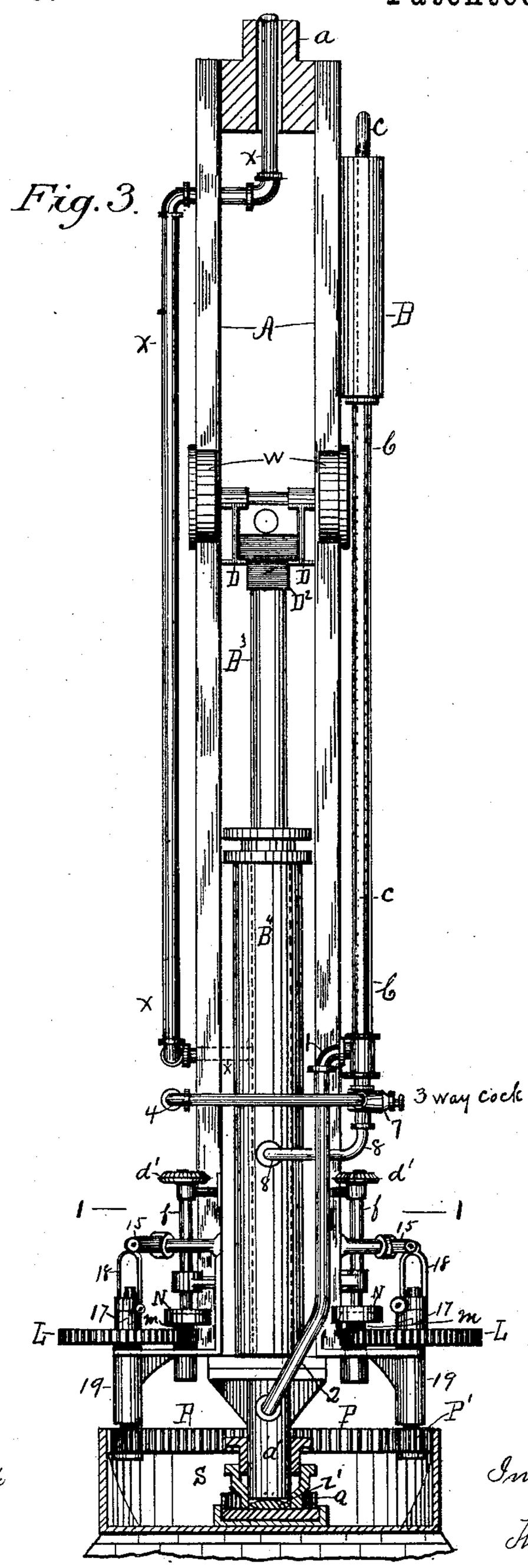
Fig. 3.



Witnesses
John F. Bray
C. B. Brainard

Inventor
Henry C. Shaw. By
Thos. H. Hutchins his atty

(No Model.)

4 Sheets—Sheet 4.

H. C. SHAW.

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Fig. 4.

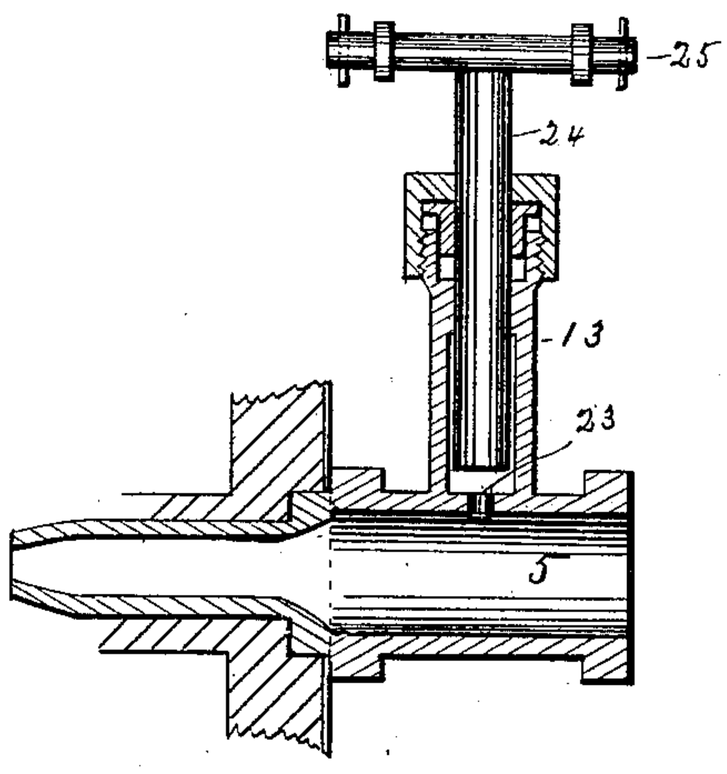
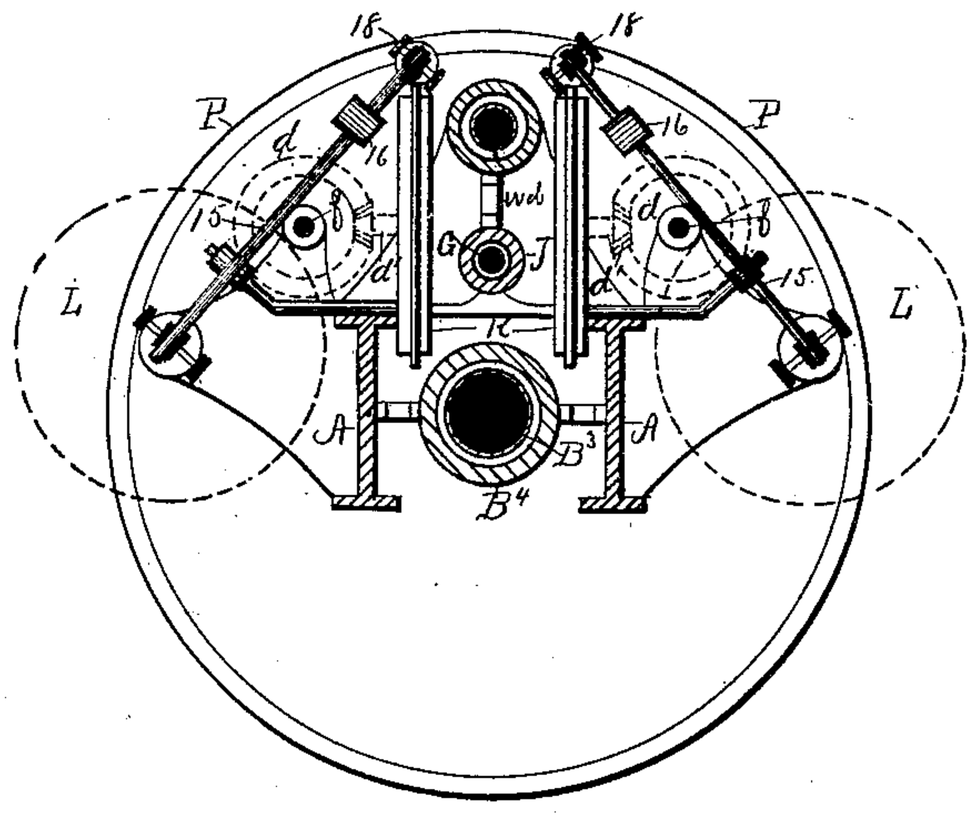


Fig. 5.



Witnesses.
John F. Bray
C. B. Brainard

Inventor
Henry C. Shaw By
Thos A Hutchens his atty

UNITED STATES PATENT OFFICE.

HENRY C. SHAW, OF JOLIET, ILLINOIS.

HYDRAULIC CRANE.

SPECIFICATION forming part of Letters Patent No. 479,468, dated July 26, 1892.

Application filed January 28, 1892. Serial No. 419,561. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SHAW, a citizen of the United States of America, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful Improvements in Hydraulic Cranes, of which the following is a specification, reference being had therein to the accompanying drawings and the letters and figures of reference thereon, forming a part of this specification, in which—

Figure 1 is a side elevation. Fig. 2 is a central vertical section. Fig. 3 is a rear elevation. Fig. 4 is a central vertical section of the inlet-pipe of one of the water-motors; and Fig. 5 is a horizontal section of Figs. 1 and 3, taken on line 1, looking down.

This invention relates to certain improvements in hydraulic cranes, which improvements are fully set forth and explained in the following specification and claims.

Referring to the drawings, A is the pillar, and D the jib of the crane, which are intended to be made of wrought-iron beams and revolve on the top and bottom bearings *a a'*. The jib D is located between the beams A, forming the pillar, and is supported on the upper ends of the rams B^3, G, and F, through the medium of the plate D^2, secured to the under side of the jib and to said rams, and by means of the brace B', connecting at its outer end with ram F.

B^4 is the cylinder of the ram B^3. H is the auxiliary receiving-cylinder of ram F, and J is the cylinder of ram G.

F' and F^3 are cylinders arranged in and horizontally with the jib and are provided, respectively, with the rams F^2 and F^4, connected directly with the traveling carriage E, that is supported and travels on the jib, by means of the flanged wheels W.

Q is a step-box in which stands the hollow lower bearing *a'* of the pillar A on the lenticular-shaped bearing Z', the form of said bearing being such as to lessen friction of the pillar in said box.

X is the inlet-pipe leading from a supply of water under constant pressure to the receiving auxiliary cylinder H. The line of said pipe is shown principally in broken lines in Figs. 1 and 2, and in full lines in Fig. 3, and its upper end is arranged to pass in through the center of the upper bearing *a* of the pillar and be fitted with a trunnion-joint in or near said bearing, so as to permit rotation of the crane. It is intended that the pressure of water in this pipe and in the cylinder H will always be a little less than sufficient to sustain the weight of the jib and its appendages.

4 is a pipe leading from the auxiliary cylinder H to the three-way cock 7, and 8 is a pipe leading from said cock to the lifting-cylinder B^4, so that water is supplied to the said lifting-cylinder from the said receiving-cylinder H, through the medium of said pipes 4 and 8 and said cock.

e' is a branch pipe for connecting both the three-way cock 7 and the cylinder J with the discharge-pipe *c*. This discharge-pipe is shown particularly in Fig. 1 in broken lines, and is shown as passing up centrally through the larger pipe C and discharging into the tank B, located on the upper end of said pipe C and secured to the side of the pillar A. The pipe C conducts the discharge from tank B downward into pipes 1 and 2, leading to the hollow bearing *a'* of the pillar, and from thence through the medium of pipe 20 to an adjacent supply-tank, from which the pump or other pressure device may draw its supply, so that the water may not be wasted, and the tank B is placed in its elevated position, so that the waste water may be conducted to a supply-tank located above the pump or pressure device. (Not necessary to be shown.) The water is let into and out of the lifting-cylinder B^4 by means of turning the cock 7, which is operated by an attendant who may stand on the platform L^2, with a foot on the pedal 10, which is connected with said cock by means of the pitman 9 and crank C'.

S is the circular base of the crane, resting on proper masonry and supporting at its center the pillar A, and is provided with an annular gear P for meshing with the pinions P' on the lower ends of the shafts of the gear-wheels L, passing through the boxes 19. The gear-wheels L are loose on their shafts and mesh, respectively, with a pinion on the lower end of the shaft *m*.

N are ordinary bell-shaped friction-clutches connecting the shafts *m* with the shafts *f*, which shafts *f* are respectively and alternately

driven through the medium of the bevel-gears *d* and *d'* by the water-motors K, by means of which water-motors the crane is rotated alternately in either direction through the medium of the aforesaid parts connecting them with said annular gear P.

In the drawings only one water-motor K is shown; but it is intended to have two—one for driving each mechanism shown for rotating the crane.

The upper ends of the shafts of the gears L are each provided with a clutch 17. These clutches are connected, respectively, by means of the yokes 18 with one end of the levers 15, pivotally connected at *h* to the side of cylinder J. The opposite ends of said levers are connected by means of the yokes 14 with the upper end of plungers 24 of cylinders 13 through the medium of the cross-head 25. These cylinders 13 are connected with and by means of apertures 23, open into the supply-pipes 5, leading from cylinder H to the water-motors. (See Fig. 4 for a detail of said cylinder and pipe.) Said levers 15 are provided with weights 16 for the purpose of holding clutches 17 disconnected when there is no water-pressure in the water-motors.

A two-way cock 6 is located in the supply-pipes 5, between the water-motors and cylinder H, and is operated by means of the crank E and hand-rod E^4 by the operator to admit water to the water-motors alternately in order to rotate the crane in either direction.

When water is admitted to either one of the water-motors through pipe 5, pressure will be brought to bear on the plunger 24, so as to move it upward and cause the lever 15 to connect the clutch 17, so that pinions P' will be driven by the gears L and rotate the crane alternately in either direction.

The friction-clutches N prevent injury to the mechanism for rotating the crane at times when the water-motors are not in operation, and the crane continues rotation to some extent after water is turned off from the said motors. The cylinders F' and F^3 are respectively connected with cylinder N through the medium of the four-way cock *n* and the pipes *g* and *g'*, and V is a discharge-pipe leading from said cock to the ram G of cylinder J for discharging the water from the cylinders F' and F^3 alternately to said ram, which is hollow and open at the bottom, as is also the ram F, as the water must pass through them to or from their respective cylinders. The cock *n* is operated by means of the hand-rod E^3, pivotally attached to crank E^5 at the lower end of the square rod *e*, journaled at each end in boxes secured to the pillar A, so it can partially rotate and passes loosely through the sliding box of arm *r*, supported by arm *i'*, secured to ram G, the said arm *r* being connected to crank *i* of cock *n* by means of rod i^2.

It is necessary to permit the arm *r* to slide on rod *e* as said arm *r* must move with the cock *n* and rams F G, and such sliding connection permits said cock to be operated from the lower part of the machine by the operator from hand-rod E^3.

W is a pair of wheels boxed to the jib, as shown in Fig. 3, which roll on the back of the pillar-girders A and prevent depression of the outer end of the jib, and W^2 is a pair of similar wheels boxed to the lower end of brace B' which roll on the opposite side of the pillar and in connection with said brace support the outer end of the jib.

D' is a box for holding a weight to counterbalance the opposite end of the jib and is designed to be adjustable along the jib and loaded proportionately to the water-pressure in the auxiliary cylinder H, its load being varied as the water-pressure in cylinder H varies, so as to always cause the force of the rams to be a little less than to lift the jib.

The pipe C is caused to spill into the tank B from a short distance above its top, so that an attendant below can observe from the flow from said pipe whether the valves or cocks 7 and *n* leak or not, for if they should leak the discharge from the said pipe into the tank B would indicate it and thereby warn the attendant of their condition as to leakage.

There are three operations to be performed by the crane: first, to lift a weight attached to the traveling carriage E; second, to rotate the crane in either direction, and, third, to move the carriage E in either direction along on the jib. To cause the lifting-ram B^3 to lift a weight, water is let in through pipes 4 and 8 from the auxiliary cylinder H. As before stated, the pressure in cylinder H by means of water forced in through pipe X is always sufficient to cause ram F to sustain the weight of the jib and its appendages less that required to allow the ram to descend, and when water is let into lifting-cylinder B^4 it simply lifts the load or weight attached to the carriage E, plus that required to overcome friction, and for that reason the lifting-ram B^3 commences to lift its load at once as soon as water is let into cylinder B^4. After the load is lifted and it is desired to lower the ram B^3 the cock 7 is turned so as to stop flow of water into cylinder B^4 from cylinder H and permit it to escape through pipes 1 and 2 into the hollow bearing *a'* of the pillar A and from thence out through pipe 20 to a tank, as before stated, and during said operation water in cylinder H is forced back through the inlet-pipe X to the source of supply. To rotate the crane in either direction water is let into the water-motors K alternately from cylinder H, through cock 6 and branch pipes 5, causing the said motors to turn the crane through the medium of the gearing connecting them with the base S, as hereinbefore described, the discharge-water from the motors passing down through pipe P^3 to step-box Q, and from thence out through pipe 21, as shown in Fig. 1, and is wasted.

To move the carriage E in either direction, water is let into the cylinders F' or F^3 from cylinder H, through cock *n* and pipes *g* or *g'*.

When water is entering one of said cylinders, it is discharging from the other back through the pipe it entered and into ram G, through pipe V, (see Fig. 1,) and from said ram, through its hollow bottom, into its cylinder G, out through pipe e', to discharge-pipe e, and following the course of water discharged from cylinder B^4.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows, to wit:

1. In a hydraulic crane, the combination of the auxiliary cylinder H, provided with a pressure-supply pipe, the ram F, the lifting-cylinder B^4 and its ram B^3, and the pipes 4 and 8 for connecting said cylinders, and the cock 7, interposed between said pipes, substantially as and for the purpose set forth.

2. In a hydraulic crane, the combination, with the pillar A and jib D, of cylinder H, pipe X for supplying said cylinder under pressure, hollow open-bottom ram F, located within cylinder H and secured at its upper end to said jib, cylinder B^4, arranged adjacent to and connected with cylinder H by means of a supply-pipe, hollow open-bottom ram B^3, located within cylinder B^4 and secured at its upper end to said jib, pipes 4, 8, and e' for connecting said cylinders with cock 7, cock 7, pipe c, leading from said cock to tank B, tank B, pipes C, 1, and 2, leading from said tank to hollow bearing a', and the hollow bearing a', having the discharge-pipe 20, all arranged to operate substantially as and for the purpose set forth.

3. In a hydraulic crane, the combination, with the pillar and jib, of the cylinders H and J and their hollow open-bottom rams F and G, pressure-supply pipe X for supplying cylinder H under pressure, cock n, connected with hollow ram F, cylinder F', pipe g' for connecting said cylinder and cock, cylinder F^3, pipe g for connecting said cylinder and cock, rams F^2 and F^4, carriage E, hollow ram G, discharge-pipe V for connecting cock n with said ram G, pipes e' and c, and the means for operating said cock n, substantially as and for the purpose set forth.

4. In a hydraulic crane, the combination, with the pillar and jib, of the cylinder H, water-motor K, a pipe for connecting said cylinder and motor, having a cock for regulating the supply of water from said cylinder to said motor, bevel-gears d' d, shaft f m, friction-clutch N, gear-wheel L, loose in its shaft-pinion P', annular gear P, clutch 17, and the means for operating said clutch, substantially as and for the purpose set forth.

5. The combination of the pillar A, having the hollow bearings a and a', jib D, having the wheels W journaled to its inner end and adapted to roll on the back of the pillar, brace B' for supporting the outer end of said jib and having wheels W^2 boxed to its lower end and adapted to roll on the pillar on its opposite side from wheels W, the box of said wheels W' being attached to ram F, cylinders B^4, J, and H, respectively provided with the hollow open-bottom rams B^3, G, and F, connecting said cylinders and jib, cylinders F' and F^2, secured to said jib and provided, respectively, with the rams F^2 and F^3, respectively connecting said cylinders with carriage E, adapted to travel on said jib, the pipes g, g', and V, having cock N for connecting ram G with cylinders F' and F^2, and the means for rotating the crane in either direction, substantially as and for the purpose set forth.

6. In a hydraulic crane, the combination of the water-motor K, pipe 5 for feeding said motor, discharge-pipe P^3, shafts f and m, friction-clutch for connecting said shafts, bevel-gears d d', gear-wheel P, driven from shaft m and loose on its shaft, pinion P', annular gear P, base S, clutch 17 on the upper end of the shaft of gear L, lever 15, pivoted at h to cylinder J and having the weight 16, yoke 18 for connecting clutch 17 with one end of said lever, cylinder 13, connected with and opening into pipe 5, plunger 24, having cross-head 25, and yoke 14 for connecting said plunger with the outer end of said lever, substantially as and for the purpose set forth.

7. In a hydraulic crane, the combination, with its pillars and jib, of a lifting-cylinder having a ram connecting it with the jib and an auxiliary pressure-supply cylinder having a ram connecting it with the jib and connected by a pipe with the lifting-cylinder, substantially as and for the purpose set forth.

8. In a hydraulic crane, the combination of a distributing-cylinder and its ram for nearly sustaining the jib and its appendages, a lifting-cylinder and its ram, and the means for connecting and supplying said cylinders, substantially as and for the purpose set forth.

HENRY C. SHAW.

Witnesses:
A. C. WAGNER,
THOS. H. HUTCHINS.