

No. 721,562.

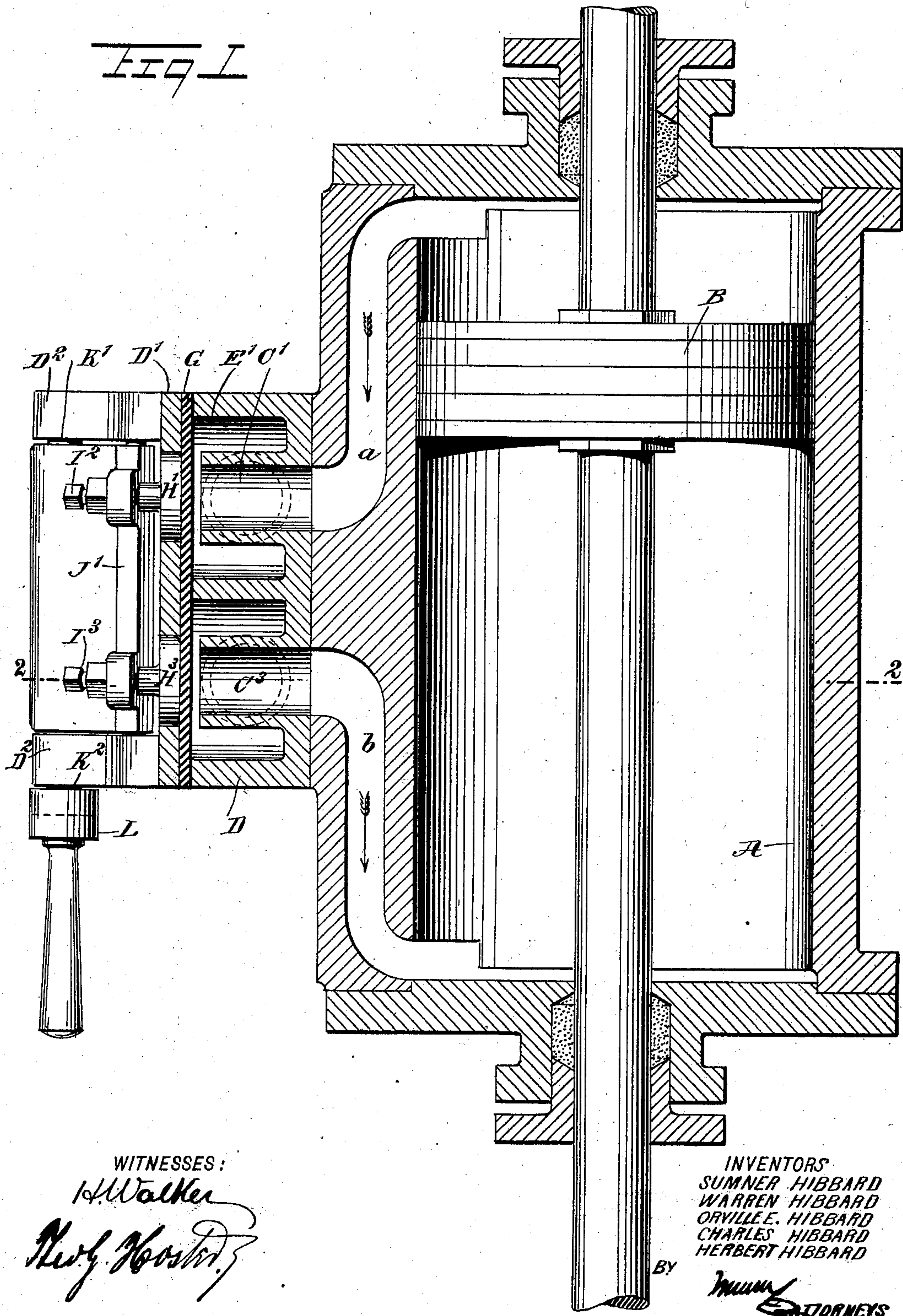
PATENTED FEB. 24, 1903.

S., W., O. E., C. & H. HIBBARD.
CONTROLLING DEVICE FOR HYDRAULIC CYLINDERS.

APPLICATION FILED JAN. 28, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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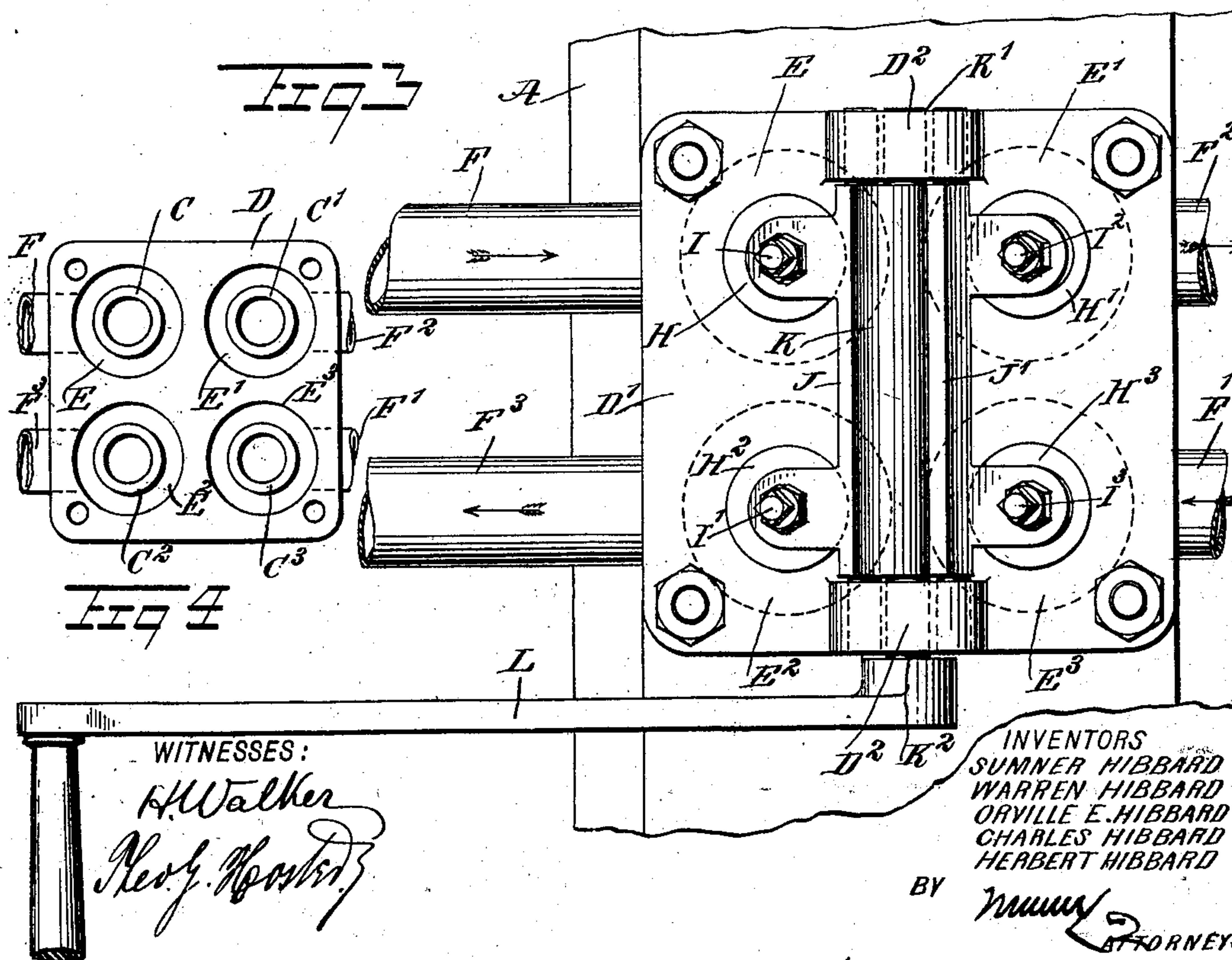
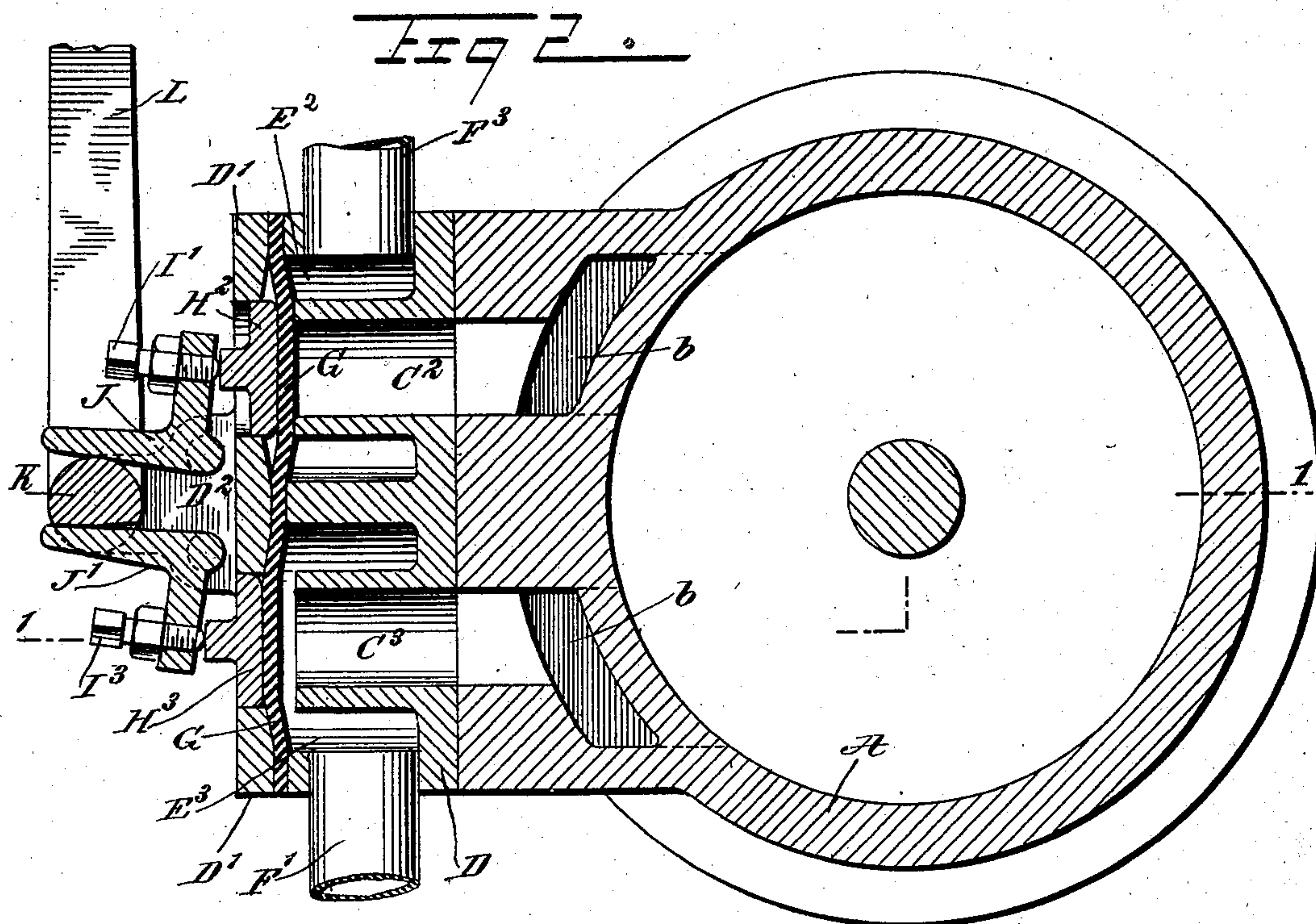
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UNITED STATES PATENT OFFICE.

SUMNER HIBBARD, WARREN HIBBARD, ORVILLE E. HIBBARD, CHARLES HIBBARD, AND HERBERT HIBBARD, OF SANDYHILL, NEW YORK.

CONTROLLING DEVICE FOR HYDRAULIC CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 721,562, dated February 24, 1903.

Application filed January 28, 1902. Serial No. 91,637. (No model.)

To all whom it may concern:

Be it known that we, SUMNER HIBBARD, WARREN HIBBARD, ORVILLE E. HIBBARD, CHARLES HIBBARD, and HERBERT HIBBARD, citizens of the United States, and residents of Sandyhill, in the county of Washington and State of New York, have invented a new and Improved Controlling Device for Hydraulic Cylinders, of which the following is a full, clear, and exact description.

The invention relates to hydraulic cylinders such as are used on wood-pulp grinders and other machines and such, for instance, as shown and described in the application for Letters Patent of the United States No. 86,507, filed December 19, 1901, by Warren Hibbard, Charles Hibbard, Sumner Hibbard, and Orville E. Hibbard.

The object of the invention is to provide a new and improved controlling device or valve for hydraulic cylinders arranged to cause the inflow and outflow of the water to and from the cylinder without danger of leaking and to permit of equalizing the pressure on both sides of the cylinder-piston to stop the piston whenever it is desired to do so.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a sectional side elevation of the improvement as applied, the section being on the line 1 1 of Fig. 2. Fig. 2 is a sectional plan view of the same on the line 2 2 of Fig. 1. Fig. 3 is a face view of the same; and Fig. 4 is a reduced face view of the chest, the cover and diaphragm being removed.

In the cylinder A is mounted to reciprocate the piston B, and the ends of said cylinder are provided with the cylinder-ports *a* and *b*, leading to nipples or short tubes C C' and C² C³, respectively, formed in the chest D, bolted or otherwise secured to the cylinder A. The nipples C, C', C², and C³ open into separate chambers E, E', E², and E³, respectively, formed in the chest D, of which chambers the

chambers E and E³ are connected by pipes F and F' with a source of water-supply, and the chambers E' and E² are connected with pipes F² and F³ for carrying the exhaust-water to a suitable place of discharge.

In the chest D, between its cover D' and the outer edge of the chest, is clamped a diaphragm G, made of rubber, leather, or other suitable flexible material, adapted to open or close the nipples C, C', C², and C³, as hereinafter more fully described, to alternately connect the supply-pipes F and F' with the corresponding nipples to direct water under pressure alternately into the ends of the cylinder A by way of the ports *a* and *b* to impart a reciprocating motion to the piston B. The exhaust-water from the cylinder A is at the same time directed through the ports *b* and *a* to the corresponding chambers E² E' and pipes F³ F² for carrying off the exhaust-water to a suitable place of discharge. The diaphragm G is adapted to be engaged by disks H, H', H², and H³, mounted to slide in openings formed in the chest-cover D' and arranged in alinement with the corresponding nipples C, C', C², and C³, so that when a disk is pressed inward against the diaphragm G then this diaphragm closes the corresponding nipple-opening, and when it is relieved of external pressure then the diaphragm moves away from the nipple under pressure of water passing through the nipple from the cylinder, thus opening the nipple to its corresponding chamber. The disks H and H² are adapted to be engaged at their outer faces by bolts I and I', held adjustably in a bell-crank lever J, fulcrumed in projections D², formed on the cover D', as plainly shown in Fig. 3. The other two disks H' and H³ are likewise engaged at their outer faces by bolts I² I³, held adjustably in a bell-crank lever J', spaced from the bell-crank lever J and likewise journaled in the projections D².

Between the adjacent members of the bell-crank levers J and J' is arranged a cam K, having trunnions K' K², journaled in the projections D², and on the trunnion K² is secured a handle L, under the control of the operator, for turning the cam K, so as to impart a swinging motion to the bell-crank levers J and J' alternately in opposite directions to

open and close the corresponding nipples C² and C' C³, respectively, by the corresponding disks H H² and H' H³. Thus when the several parts are in the position shown in the drawings then the nipples C and C² are closed, while the nipples C' and C³ are open to allow the water to pass from the pipe F' into the chamber E³ and through nipple C³ and port b into the lower end of the cylinder A to force the piston B upward therein. The exhaust-water in the upper portion of the cylinder A passes through the port a, nipple C', and chamber E' to the exhaust-pipe F² for carrying off the water. When the piston B reaches the end of its upward stroke, then the operator throws the hand-lever L over from the left to the right, so as to cause the cam K to impart a swinging motion to the bell-crank lever J', so that the bolts I² and I³ so press the disks H' and H³ inward to cause the diaphragm G to be seated on the nipples C' C³, thus closing the same. During this movement of the cam K the other bell-crank lever J is relieved of pressure and is free to swing into an open position—that is, to move the bolts I and I' outwardly—so that the pressure of the water entering the pipe F and chamber E causes the diaphragm over the nipple C to move outward, and with it the disk H, so that the water under pressure can now pass through the nipple C into the port a and into the upper end of the cylinder A to force the piston B downward therein. The water in the lower end of the cylinder is now forced to the port b into the nipple C², and as it now exerts a pressure against the diaphragm it moves the diaphragm away from the nipple, so that the exhaust-water can pass into the chamber E² and through the pipe F³ to a suitable place of discharge. When it is desired to stop the motion of the piston B, then the handle L is thrown into a midway position, so that both bell-crank levers J and J' are caused to move their disks inwardly to force the diaphragm onto the outer ends of all the nipples to close the same, thus cutting off the supply as well as the exhaust, and hence the piston comes to a standstill.

The device is very simple and durable in construction, it is not liable to get out of order, and prevents all leakage, so that the full force of the water-pressure is utilized to actuate the piston B.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A controlling device for hydraulic cylinders, comprising a chest secured to the cylinder and provided with sets of chambers communicating with the cylinder-ports, the chambers of each set respectively receiving the water-supply and discharging the exhaust-water, a diaphragm for alternately connecting and disconnecting the sets of chambers with the cylinder-ports, and means under the control of the operator for pressing and releasing the said diaphragm, as set forth.

2. A controlling device for hydraulic cylinders comprising a chest having openings communicating with the cylinder-ports, sets of separate chambers in said chest with which the said openings communicate, the chambers of each set being connected respectively with a source of water-supply and an outlet for the exhaust-water, a diaphragm adapted to be seated over the said openings for alternately connecting and disconnecting the sets of chambers with the cylinder-ports, and means for moving the diaphragm, as set forth.

3. A controlling device for hydraulic cylinders, comprising a chest secured to the cylinder and having nipples connected with the cylinder-ports, sets of separate chambers in the said chest and into which open corresponding nipples, a diaphragm in the said chest and adapted to be seated on the said nipples, disks mounted to slide in openings in the chest-cover and adapted to engage the diaphragm, and means for pressing and releasing the disks to seat the diaphragm alternately on nipples connected with the respective sets of chambers, as set forth.

4. A controlling device for hydraulic cylinders, comprising a chest having nipples connected with the cylinder-ports, chambers in the said chest and into which open the said nipples, a diaphragm in the said chest and adapted to be seated on the said nipples, and manually-controlled means for pressing and releasing the diaphragm to seat the same on some of the nipples for closing the same, the said means comprising slidable disks, bell-crank levers for engaging the disks and a cam under the control of the operator and adapted to impart motion to the said bell-crank levers, as set forth.

5. A controlling device for hydraulic cylinders, comprising a chest on the cylinder provided with sets of chambers communicating with the cylinder-ports, the chambers of each set respectively receiving the water-supply and discharging the exhaust-water, a diaphragm clamped between the outer edge of the chest and the cover for the latter and arranged to alternately connect and disconnect the sets of chambers with the cylinder-ports, and means for pressing and releasing the diaphragm, the said means comprising disks mounted to slide in openings in the chest-cover and engaging the diaphragm, a cam under the control of the operator, and devices engaging the said disks and moved by the cam, as set forth.

6. A controlling device for hydraulic cylinders, comprising a diaphragm for controlling the inlet and exhaust of the water to and from the cylinder, a cam under the control of the operator, and a bell-crank lever having an adjustable member and moved by the said cam for pressing the said diaphragm, as set forth.

7. The combination with a hydraulic cylinder having ports leading from opposite ends thereof, and a piston movable in said cylinder

der, of a chest on the cylinder having openings communicating with the cylinder-ports, the said chest being provided with sets of inlet and exhaust chambers communicating
5 with corresponding openings, a diaphragm for alternately opening and closing the communication between the sets of chambers and the cylinder-ports, and means for moving said diaphragm to reverse the movement of the
10 piston, as set forth.

8. The combination with a hydraulic cylinder provided with ports leading from opposite ends thereof, and a piston mounted to move in said cylinder, of a chest at one side of the
15 cylinder provided with openings communicating with the cylinder-ports, the said chest having sets of separate chambers communicating with the said openings, one chamber of each set being connected with a source of water-
20 supply and the other chamber being connected with an outlet-pipe for the exhaust-water, a diaphragm in the said chest, and means for moving said diaphragm to close the openings in the chest between one set of chambers and
25 the cylinder-ports, and to allow the diaphragm to move to open communication between the other set of chambers and the cylinder-ports to reverse the movement of the piston, the said means being also arranged to move the
30 diaphragm to a position to equalize the pressure on both faces of the piston, as set forth.

9. A controlling device for hydraulic cylinders, comprising a diaphragm, a seat for said diaphragm having sets of openings communi-
35 cating with the cylinder-ports, one opening of each set being arranged for communication with a water-supply and the other opening with an outlet for the exhaust-water, a cam under the control of the operator, and means
40 controlled by said cam for pressing and releasing the diaphragm to seat the same alternately on the said sets of openings, as set forth.

10. The combination with a cylinder and
45 piston, of a valve-chest having a plurality of distinct chambers for supply and exhaust of motive fluid, valve-ports through which said chambers communicate with the ends of the cylinder, one chamber for each end of the cyl-
50 nder being in communication with a source of supply, a diaphragm, means for actuating said diaphragm to control said ports such that either inlet-chamber may be placed in communication with the corresponding end
55 of the cylinder and simultaneously the other end of the cylinder placed in communication with an exhaust-chamber.

11. The combination with a cylinder and

piston, of a valve-chest having a plurality of distinct chambers for supply and exhaust of
60 motive fluid, valve-ports through which said chambers communicate with the ends of the cylinder, one chamber for each end of the cylinder being in communication with a source of supply, a diaphragm, means for actuating
65 said diaphragm to control said ports such that either inlet-chamber may be placed in communication with the corresponding end of the cylinder and simultaneously the other end of the cylinder placed in communication
70 with an exhaust-chamber, said means comprising a single rock-shaft.

12. The combination with a cylinder and piston, of a valve-chest having a plurality of distinct chambers for supply and exhaust of
75 motive fluid, valve-ports through which said chambers communicate with the ends of the cylinder, one chamber for each end of the cylinder being in communication with a source of supply, a diaphragm, means for actuating
80 said diaphragm to control said ports such that either inlet-chamber may be placed in communication with the corresponding end of the cylinder and simultaneously the other end of the cylinder placed in communication
85 with an exhaust-chamber, said means comprising a single rock-shaft and devices between the same and the diaphragm.

13. The combination with a cylinder and piston, of a valve-chest having a plurality of
90 distinct chambers for supply and exhaust of motive fluid, valve-ports through which said chambers communicate with the ends of the cylinder, one chamber for each end of the cylinder being in communication with a source
95 of supply, a diaphragm, means for actuating said diaphragm to control said ports such that either inlet-chamber may be placed in communication with the corresponding end of the cylinder and simultaneously the other
100 end of the cylinder placed in communication with an exhaust-chamber, said means comprising a single rock-shaft and plates mounted in the valve-chest cover.

In testimony whereof we have signed our
105 names to this specification in the presence of two subscribing witnesses.

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WARREN HIBBARD.
ORVILLE E. HIBBARD.
CHARLES HIBBARD.
HERBERT HIBBARD.

Witnesses:

JAMES F. O'DONNELL,
LOUIS E. SEXTON.