(No Model.) 2 Sheets—Sheet 1.

I. H. VENN.

STOP FOR HYDRAULIC MOTORS.

No. 431,087. Patented July 1, 1890.

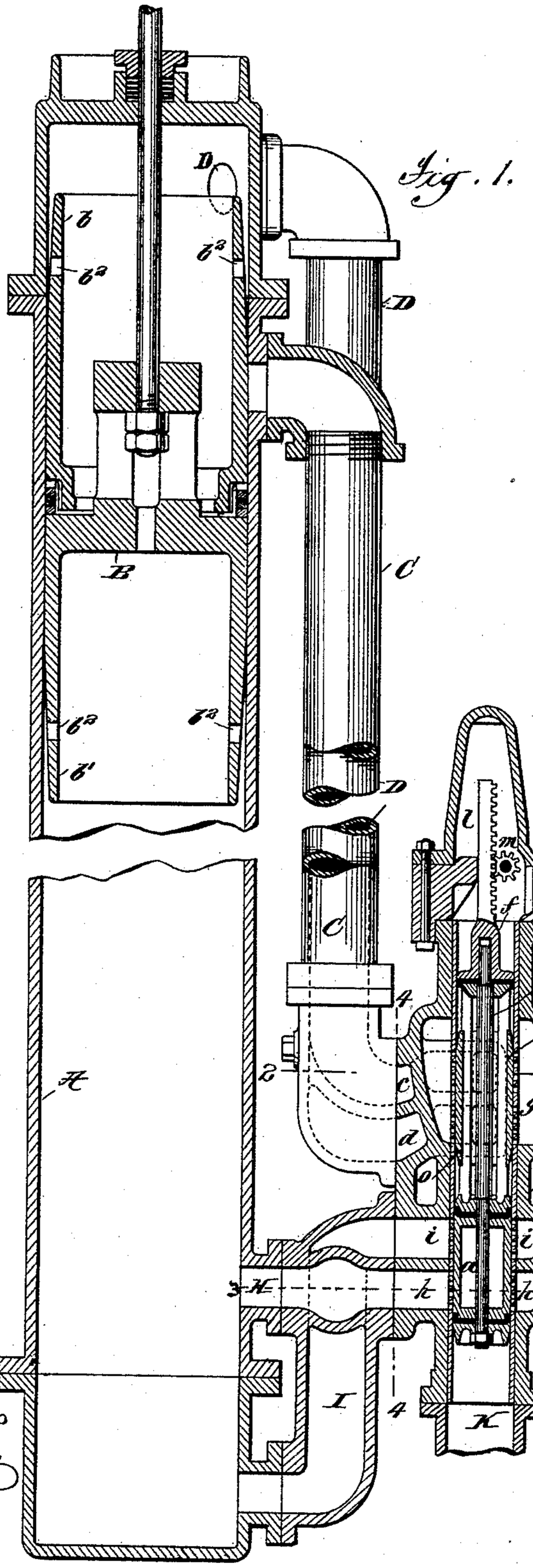

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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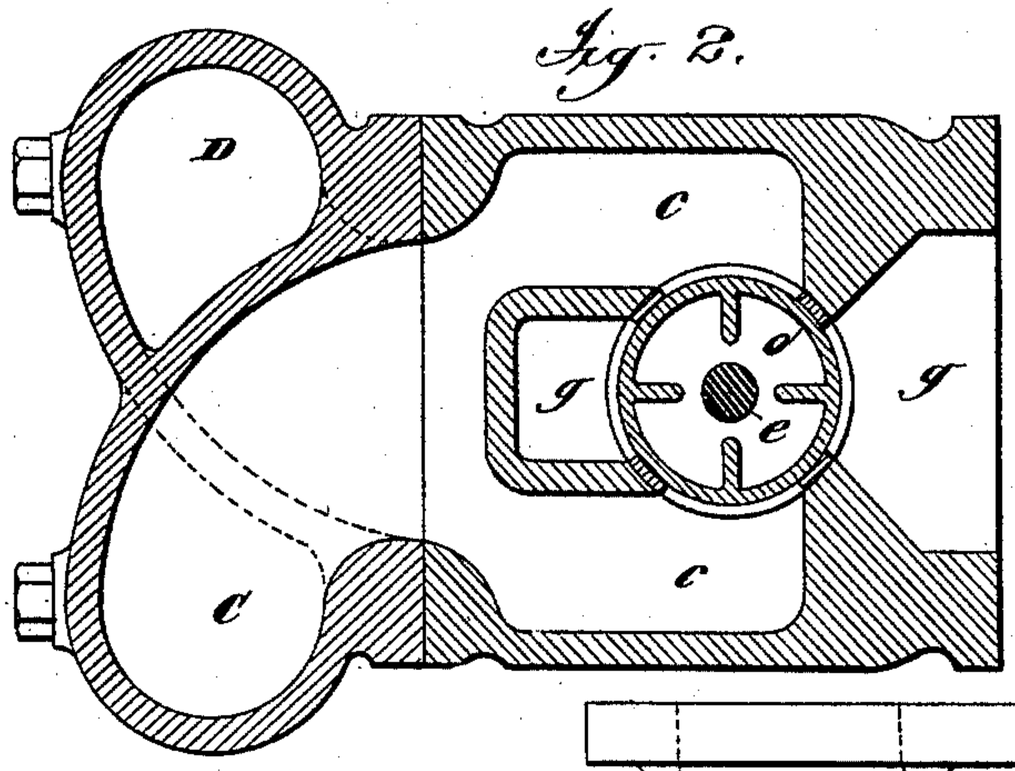
Fig. 2.



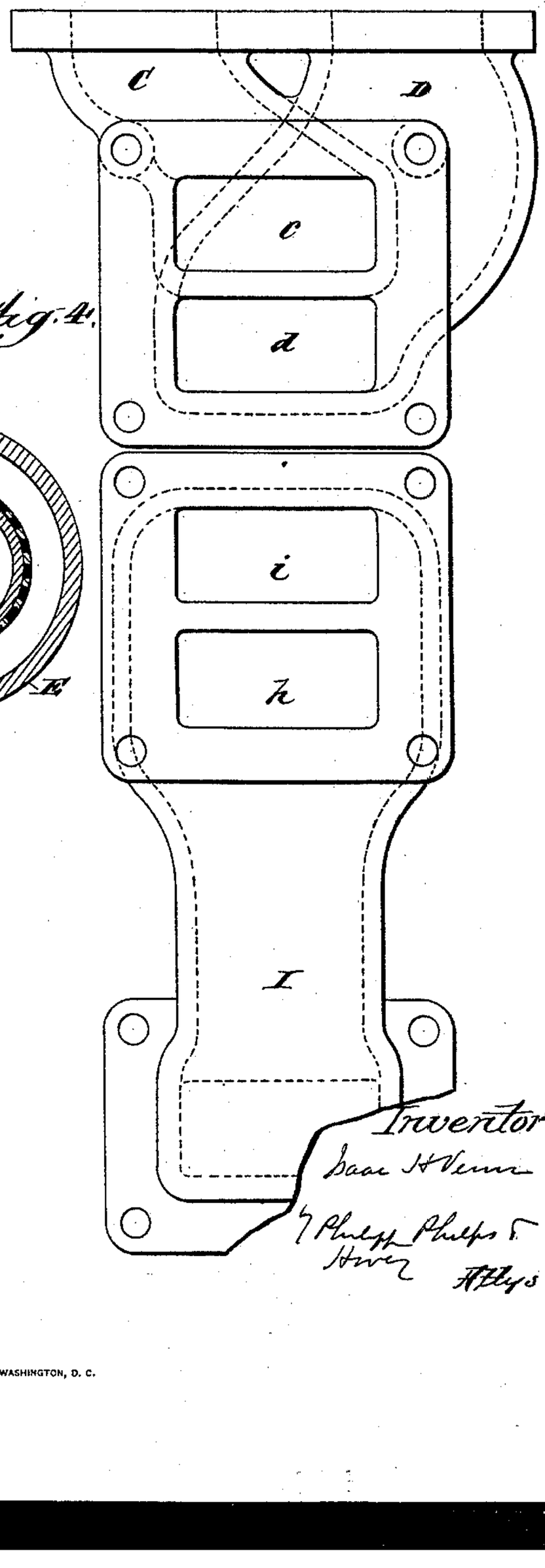


Fig. 3.

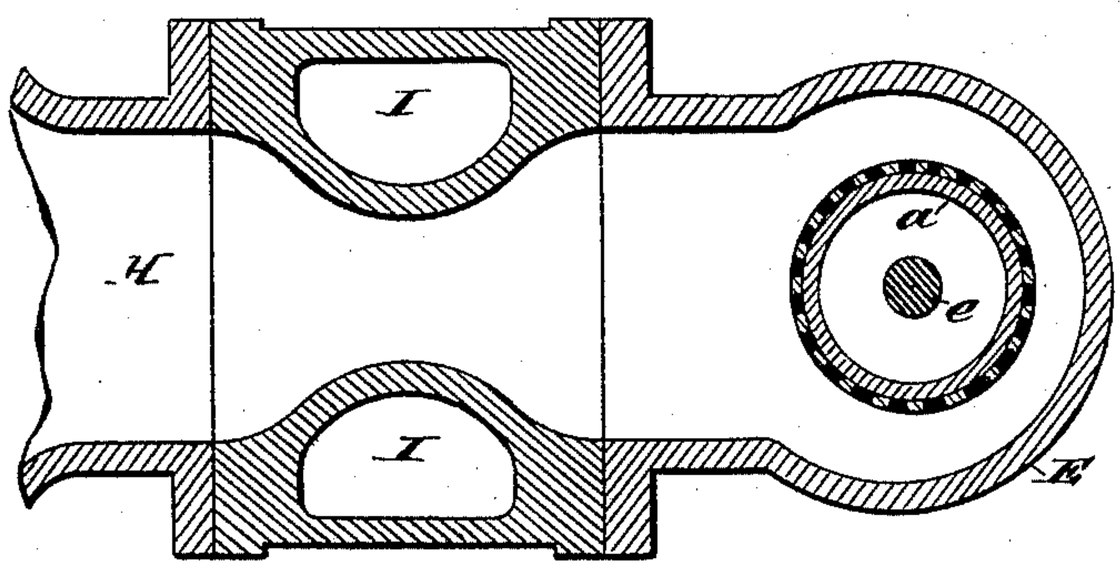


Fig. 4.

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UNITED STATES PATENT OFFICE.

ISAAC H. VENN, OF YONKERS, ASSIGNOR TO OTIS BROTHERS & COMPANY, OF NEW YORK, N. Y.

STOP FOR HYDRAULIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 431,087, dated July 1, 1890.

Application filed October 31, 1889. Serial No. 328,806. (No model.)

To all whom it may concern:

Be it known that I, ISAAC H. VENN, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Stops for Hydraulic Motors, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to hydraulic elevators and other hydraulic-motor apparatus of similar character, and especially to apparatus of this class using what is known as the "circulating system."

The object of the invention is to provide means for automatically and positively stopping the piston at the end of its stroke by the gradual closing of the eduction-port without interfering with the reverse circulation of the water as the valves are shifted for movement of the piston in the opposite direction.

In the construction heretofore in use, in which there is a single pipe at each end of the cylinder, which acts alternately as an induction and eduction pipe, it is impossible to make the automatic stop positive without interfering with the reverse movement, because the closing of the eduction-port prevents the circulation of the water in the opposite direction as the valves are shifted.

A full description of my invention will now be given, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of a hydraulic-motor apparatus, it being shown as of the character used in hydraulic elevators. Fig. 2 is a cross-section taken on the line 2 2 of Fig. 1. Fig. 3 is a similar section taken on the line 3 3 of Fig. 1; and Fig. 4 is a view looking to the left on the line 4 4 of Fig. 1, showing the ports *c d* and *h i*.

A is the motor-cylinder, and B the piston, the latter being provided with a piston-rod passing through a stuffing-box in the end of the motor-cylinder and connected by suitable mechanism to the elevator-car, as is usual in this form of apparatus. As shown in the drawings, the cylinder is vertical; but it is to be understood that the cylinder may be placed in a horizontal or other position.

D is an induction-pipe opening into one end of the cylinder and connecting at its other end by the ports *d* with the valve-chest E. At its other end the cylinder is provided with a port opening into a short eduction-pipe H, which connects with the valve-chest E through the port *h*, and through the valve-chest E with the pipe K, the pipes H and K thus forming a discharge-pipe.

The valve-chest E is provided with a valve *a*, connected by rod *e*, passing through the valve-chest, with the balancing-piston *f*, to which is attached the rack *l*, operated by the pinion *m*, which is connected with any suitable means for opening and closing the valve. Between the balancing-piston *f* and the valve *a* is the valve *o*, controlling the ports *d* of induction-pipe D. As shown in Fig. 2, the valve *o* is connected to the rod *e* by means of short ribs, thus making a hollow valve through which the water may circulate. The supply-pipe G connects with the valve-chest E by the ports *g*, controlled by the valve *o*.

The parts thus far described are of the usual form, except the valve-chest E and the valves *a o* and balancing-piston *f*, which are substantially the same in construction as those claimed in the joint application of myself and Rudolph C. Smith, No. 298,479, filed February 2, 1889, and in themselves form no part of the present invention.

Referring now to the parts constituting my automatic stop, the piston B is provided with the hollow extensions *b b'*, tapering inward, and provided with perforations b^2 to allow the slow passage of the water from the interior of the extensions to the chamber formed between the tapered surface of the latter and the cylinder A. The ports leading from the cylinder will not be entirely closed, therefore, until the perforations b^2 pass the ports.

The induction end of the cylinder is provided with a second port opening into a short eduction-pipe C, which connects with the valve-chest by the ports *c*, these ports being controlled by the valve *o*. At the eduction end the cylinder is provided with a second port connecting with a short induction-pipe I, opening into the valve-chest E through the ports *i*, these ports being controlled by the

valve *a*. The cylinder-ports of the eduction-pipes C and H are placed inside the ports of the induction-pipes D and I—that is, nearer the longitudinal center of the cylinder—so that the piston closes the eduction-ports before reaching the induction-ports, thus being stopped in such a position as to leave the latter open. These two pipes C I, for convenience termed "eduction" and "induction" pipes, form the circulating-pipe between the induction and eduction ends of the motor-cylinder, and the valves *a* and *o* are so constructed as to open the pipes D H or this circulating-pipe at will, one being closed as the other is opened. The valve-chest ports of the circulating-pipe are shown as respectively outside and inside of the corresponding ports of the induction and discharge pipes; but this is not necessary, and any arrangement by which these ports are suitably controlled by valves may be substituted.

The operation of the device is as follows: If the piston B be in the position shown in Fig. 1 and the valves *a o* be shifted so as to open the ports *h* and *d* and close the ports *i* and *c*, the water will circulate from the supply-pipe G through the ports *g*, valve-chest E, and induction-pipe D to the induction end of the cylinder, thereby forcing the piston downward, the water escaping from the eduction end of the cylinder through the pipe H and discharge-outlet K. As the piston descends, the hollow tapered portion *b'* will gradually close the port of pipe H and prevent the passage of the water out of the cylinder A. As no circulation is possible through the circulating-pipe C I, its ports being closed by the valves *o a*, the piston will be gradually stopped by the retention of the water in the cylinder. The water inside the hollow tapered extension *b'* will pass through the perforations b^2, and as the flow is slow the piston will be stopped without shock, the port being entirely closed only when the perforations pass below pipe H. The port or pipe H being placed inside the port I, the piston is positively stopped in such a position as to leave the latter port open, thus permitting the influx of water when the valves are shifted. If, now, the valves *a o* be shifted so as to close the ports *d* and *h* and open the ports *c i*, the weight of the load will raise the piston and the water will circulate through the pipe C and the ports *c*, the hollow valve *o*, valve-chest E, ports *i*, and open pipe I to the eduction end of the cylinder. As the piston rises, the hollow tapered portion *b* will gradually close the port of circulating-pipe C I, and the water will be gradually retained within the cylinder, as before, no circulation being possible through the pipe D, valve-chest E, and pipe H, the ports *d* and *h* being closed by the valves *a o*. The piston is thus positively stopped before reaching the port of pipe D. If it be desired to use this automatic stop at but one end of the cylinder, but one additional pipe will be necessary, this being at the end of the cylinder at which the stop is desired. The single pipe at the other end of the cylinder then acts alternately as an induction and eduction pipe, as is usual in this class of motors.

It is evident that the piston B may be of any form—such as to close the eduction-ports; but I prefer the construction shown as best adapted for causing a gradual retention of the water and preventing the shock consequent upon a sudden stoppage of the piston.

What I claim is—

1. In a hydraulic motor, the combination of a motor-cylinder, induction and discharge pipes at opposite ends of the cylinder, a circulating-pipe communicating with both ends of the cylinder and having its port at the eduction end of the cylinder outside of the discharge-port, a valve apparatus for controlling all of the said pipes, and a piston constructed to close the discharge-pipe at the eduction end of the cylinder as the piston approaches the end of its stroke, substantially as described.

2. In a hydraulic motor, the combination of a motor-cylinder, induction and discharge pipes at opposite ends of the cylinder, a circulating-pipe communicating with both ends of the cylinder and having its port at the induction end of the cylinder inside of the induction-port, a valve apparatus for controlling all of said pipes, and a piston constructed to close the circulating-pipe at the induction end of the cylinder as the piston approaches the end of its stroke, substantially as described.

3. In a hydraulic motor, the combination of a motor-cylinder, induction and discharge pipes at opposite ends of the cylinder, a circulating-pipe communicating with the induction end of the cylinder inside of the induction-port and with the eduction end outside of the discharge-port, a valve apparatus for controlling all of said pipes, and a piston constructed to close the eduction-port as the piston approaches the end of its stroke in either direction, substantially as described.

4. In a hydraulic motor, the combination of a motor-cylinder, induction and discharge pipes at opposite ends of the cylinder, a circulating-pipe communicating with the induction end of the cylinder inside the induction-port and with the eduction end outside of the discharge-port, a valve apparatus for controlling all of said pipes, and a piston having the hollow perforated extensions *b b'*, tapering inward, whereby the piston gradually closes the eduction-port as it approaches the end of its stroke in either direction, substantially as described.

5. In a hydraulic motor, the combination of a motor-cylinder, induction and discharge pipes at opposite ends of the cylinder, a circulating-pipe communicating with the induction end of the cylinder inside the induction-port and with the eduction end outside

of the discharge-port, a valve apparatus for controlling all the pipes, consisting, essentially, of a valve-chest, hollow valve *o*, and closed valve *a*, the valves being connected together and operated by a single movement, and a piston constructed to close the eduction-port of the cylinder as the piston approaches the ends of its stroke in either direction, substantially as described.

6. In a hydraulic motor, the combination of a motor-cylinder, induction and discharge pipes at opposite ends of the cylinder, a circulating-pipe communicating with the induction end of the cylinder inside the induction-port and with the eduction end outside of the discharge-port, a valve apparatus consisting, essentially, of a valve-chest, hollow valve *o*, and closed valve *a*, the valves being connected together and operated by a single movement, the valve-chest ports of the circulating-pipe being, respectively, outside and inside of the corresponding ports of the induction and discharge pipes, and a piston constructed to close the eduction-port of the cylinder as the piston approaches the end of its stroke in either direction, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ISAAC H. VENN.

Witnesses:
JAMES S. FITCH,
O. B. WARING.