(No Model.)

J. W. JOHNSON.

HYDRAULIC MOTOR FOR ORGANS.

No. 475,776. Patented May 31, 1892.

FIG. 1.

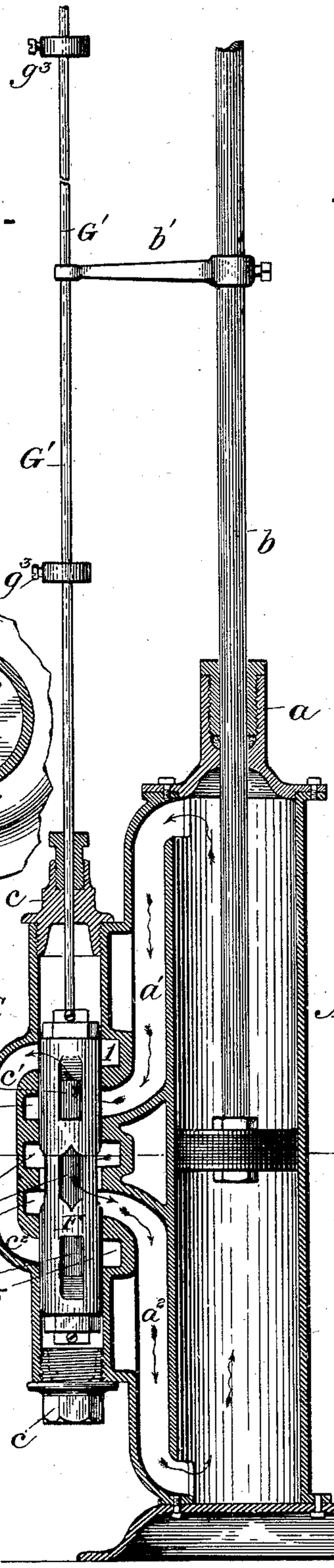


FIG. 2.

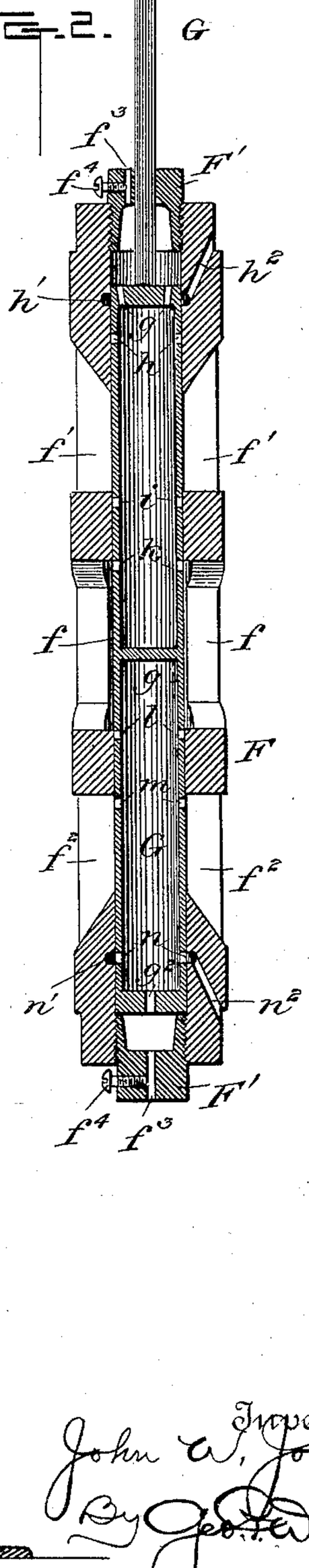
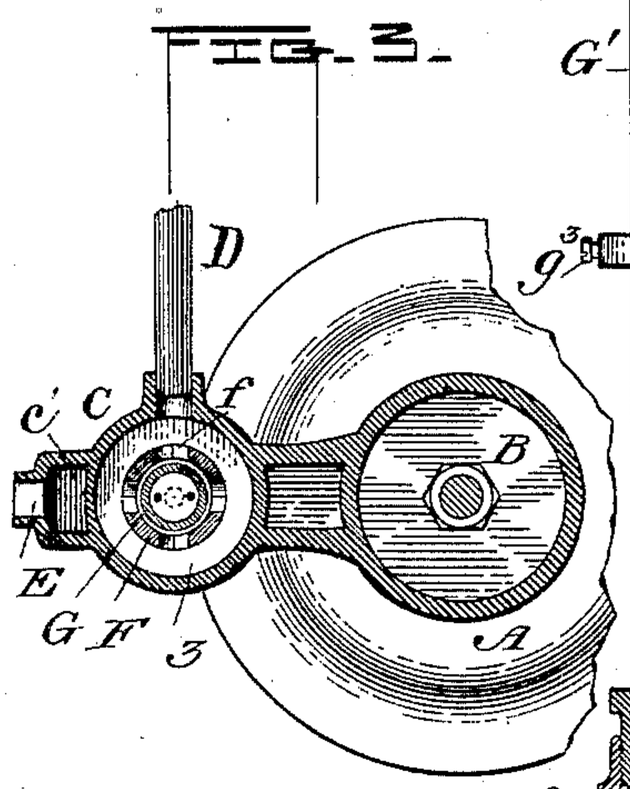


FIG. 3.



Witnesses
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JOHN WEBSTER JOHNSON, OF LEAVENWORTH, KANSAS.

HYDRAULIC MOTOR FOR ORGANS.

SPECIFICATION forming part of Letters Patent No. 475,776, dated May 31, 1892.

Application filed July 16, 1891. Serial No. 399,745. (No model.)

To all whom it may concern:

Be it known that I, JOHN WEBSTER JOHNSON, a citizen of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented certain new and useful Improvements in Hydraulic Motors for Organs; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to hydraulic motors, having especial reference to those used for operating organ-bellows, or for other purposes where a steady reciprocating motion is required.

The object of my invention is to prevent a too sudden reversal of the piston at the ends of the stroke, which produces a disagreeable bumping noise and causes the tone of the organ to tremble at each stroke of the piston.

My invention consists in certain features of construction hereinafter set forth, and particularly pointed out in the claims.

In the drawings, Figure 1 is a vertical section of a hydraulic motor equipped with my improved valve. Fig. 2 is a similar section of the valve; and Fig. 3 is a cross-section on line 3 3, Fig. 1.

The cylinder A contains the piston B, which is provided with the usual piston-rod *b*, working through a stuffing-box *a*. The valve-chest C is bored out cylindrically, being closed at each end by a screw-plug *c*, the upper one of which is provided with a stuffing-box for the valve-rod. In the interior of the chest are formed five annular grooves 1 2 3 4 5. The middle groove 3 communicates with the water-supply inlet D. Grooves 2 and 4 communicate with each end of the cylinder by means of the passages a' a^2, respectively. Grooves 1 and 5 communicate with the exhaust or outlet E by means of the passages c' c^2, respectively.

The valve F is a hollow cylinder closed at each end by a screw-plug F′. It fits snugly the internal bore of the valve-chest and is shorter than the chest, so as to be capable of reciprocation therein. At the middle of the valve one or more ports *f* are cut through the sides thereof, preferably with V-shaped ends, as shown. These ports are long enough to connect the supply-groove 3 with the groove 2 or the groove 4 when the valve is at the end of its upward or downward stroke, respectively. Between the ports *f* and each end of the valve is a set of ports f' f^2, the former adapted to connect the groove 2 with the groove 1 when the valve is down and the latter adapted to connect the groove 4 with the groove 5 when the valve is up. It will be seen that the reciprocation of the valve F admits the fluid-pressure above and below the piston B alternately, the exhaust taking place simultaneously.

In order to actuate the valve F, I so arrange the parts that the piston B moves the valve positively to shut off the supply from one side of the piston and thereby arrest the movement of the piston, the fluid-pressure completing the movement of the valve to admit said pressure to the other side of the piston to effect its return stroke.

Fitted inside of the valve F is an auxiliary valve consisting of a tube G, closed at each end and a little shorter than the valve F, so as to have an independent reciprocating motion therein. A diaphragm *g* divides the interior of the tube into two chambers. A rod G′ is attached to the tube and passes out through the plugs F′ *c*. In each end of the tube is one or more holes g' g^2, while in its sides are several openings or sets of openings *h i k l m n*. The openings *h n* are adapted to register, respectively, with annular grooves h' n' in the interior of the valve F, near each end thereof, when the tube is at the end of its stroke. The grooves are each connected by means of a passage h^2 n^2 with the space between the end of the valve F and the end of the valve-chest. In each plug F′ there is a duct f^3, whose cross-sectional area can be varied by means of a valve—such as the set-screw f^4—arranged transversely of the duct. These screws are so adjusted that the ducts f^3 are smaller than the holes g' g^2. On the piston-rod *b* is an arm b', arranged to strike near each end of the stroke the tappets g^3, adjustably secured on the valve-rod G′.

The operation of my device is as follows: The water-supply entering through the inlet

D fills the annular groove 3. If the valve F is down, as shown in Fig. 1, the water passes through the ports *f* and passage a^2 to the cylinder, forcing the piston upward, the water above the piston exhausting through the passage *a'*, groove 2, ports *f'*, groove 1, passage *c'*, and outlet E. When the arm *b'* strikes the upper tappet g^3, the tube G is drawn up inside the valve F until it strikes the upper plug F'. The opening *h* now registers with the annular groove *h'*, the opening *i* with the exhaust-port *f'*, and the opening *l* with the supply-port *f*, the openings *k*, *m*, and *n* being closed by the solid portions of the valve F. The water above the valve F can now escape slowly through the duct h^2, groove *h'*, openings *h i*, and port *f'*, thus permitting the valve F to move upward with the piston-rod until the ports *f* have reached an intermediate position between the grooves 2 4, the V-shaped ends of the ports cutting off the pressure gradually from the piston and bringing it to a stop with a gradually-diminishing speed. From this point the valve F is kept in motion by the water-pressure passing through the ports *f*, openings *l*, hole g^2, and duct f^3 into the space below the end of the valve. The duct f^3 being smaller than the hole g^2, the tube G is kept forced up against the upper end of the valve F. This continued movement of the valve brings the supply-ports *f* into connection with the upper end of the cylinder and the ports f^2 into position to permit the water below the piston to escape. The V shape of the ports *f* admits the water gradually to the cylinder, so that the piston starts downward with a gradually-accelerated speed. When the arm *b'* strikes the lower tappet g^3, the operation or the valves is reversed, the openings *h*, *i*, and *l* being closed and *k m n* opened, as shown in Fig. 2. By this construction I obtain an easy movement of the piston without sudden stop or start at the end of the stroke, and also prevent any possibility of the piston making too long a stroke, as might happen if the valve F were operated solely by the water-pressure.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with the valve-chest having the annular grooves 1 2 3 4 5, of the hollow valve F, having supply and exhaust ports and passages *h' h² n' n²*, and the tube G, sliding in the valve F and having openings *h i k l m n*, substantially as described.

2. The combination, with the valve-chest having the annular grooves 1 2 3 4 5, of the hollow valve F, having supply and exhaust ports, passages h^2 n^2, and ducts f^3, and the tube G, reciprocating inside the hollow valve and having the holes *g'* g^2 and the openings *h i k l m n*, substantially as described.

3. The combination, with a cylinder, of a piston and piston-rod, a valve composed of a hollow cylinder containing supply and exhaust ports, an annular groove *h'*, and passage h^2 near each end, and an adjustable duct f^3 in each end, a tube G, having the diaphragm *g*, the holes *g'* g^2, and the openings *h i k l m n*, and a valve-rod G', attached to said tube and provided with tappets adapted to be engaged by an arm on the piston-rod, substantially as described.

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

JOHN WEBSTER JOHNSON.

Witnesses:

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