No. 656,740. Patented Aug. 28, 1900.

J. W. JOHNSON.

VALVE FOR HYDRAULIC MOTORS.

(Application filed Nov. 21, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

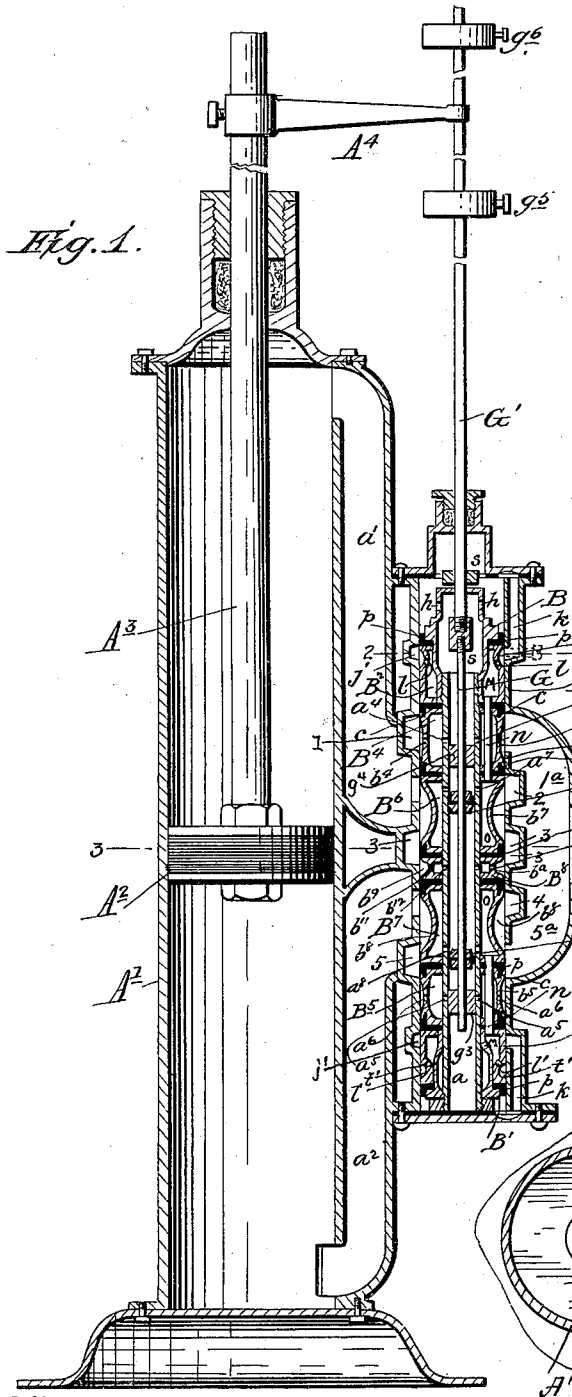


Fig. 2.

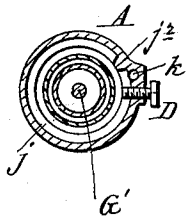


Fig. 4

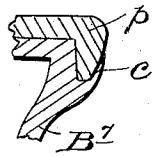
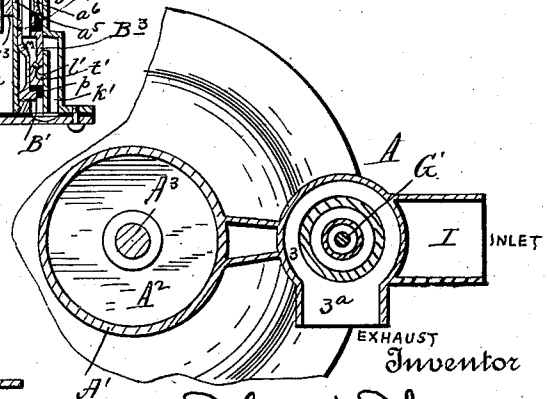


Fig. 3.



Witnesses
Franck L. Ouraud.
Carrie Brennan.

Inventor
John W. Johnson
By Geo. P. Whittlesey
Attorney

No. 656,740. Patented Aug. 28, 1900.

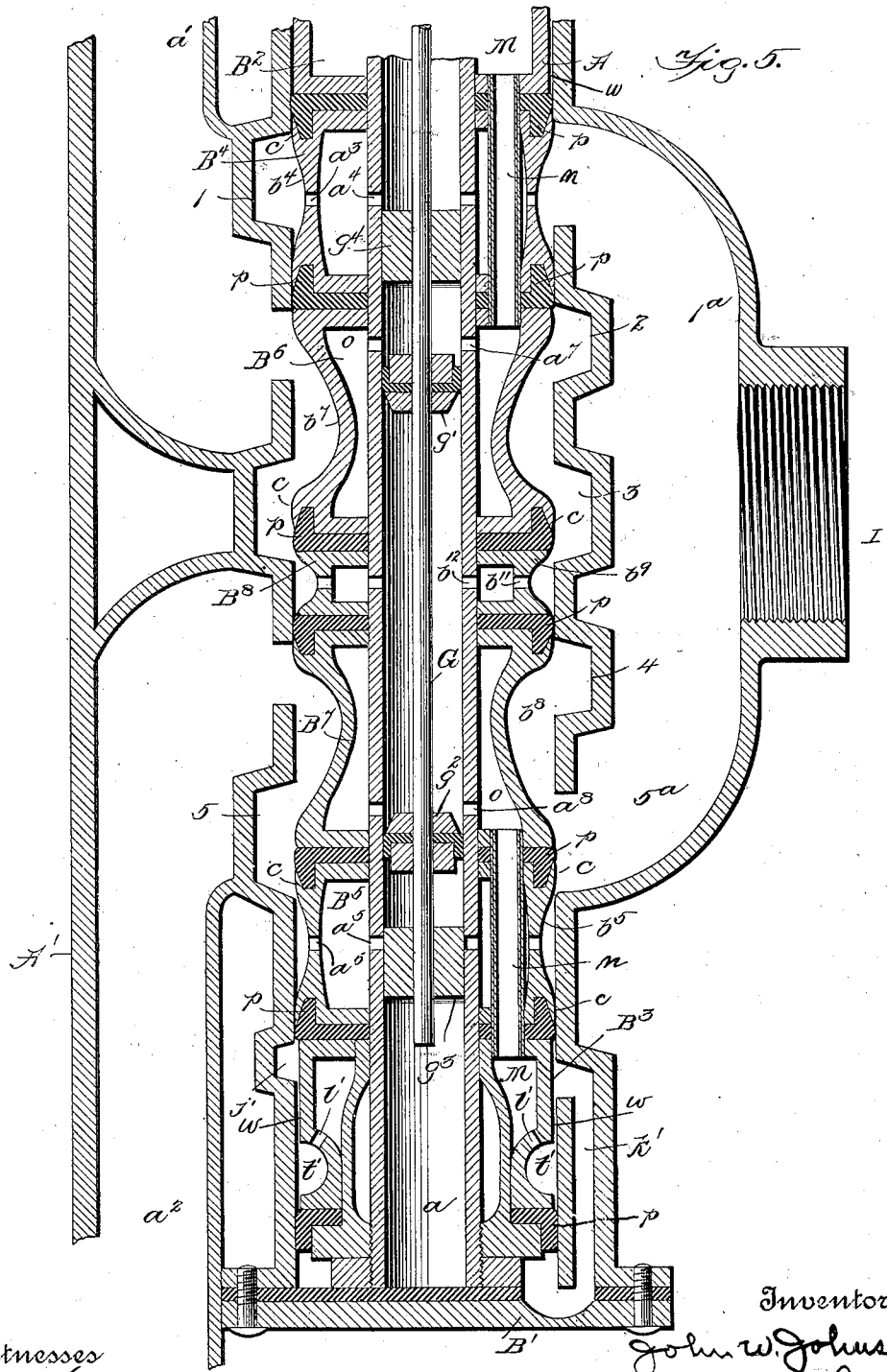
J. W. JOHNSON.

VALVE FOR HYDRAULIC MOTORS.

(Application filed Nov. 21, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 5.



Witnesses
D. L. MacCabe
Grace P. Brereton

Inventor
John W. Johnson
By Geo. P. Whittemore
Attorney

UNITED STATES PATENT OFFICE.

JOHN WEBSTER JOHNSON, OF LEAVENWORTH, KANSAS, ASSIGNOR OF ONE-HALF TO CARL HOFFMAN, OF KANSAS CITY, MISSOURI.

VALVE FOR HYDRAULIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 656,740, dated August 28, 1900.

Application filed November 21, 1899. Serial No. 737,788. (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 Valves for Hydraulic Motors; 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.

The invention relates to that class of motors shown in United States Patent No. 475,776, granted to me May 31, 1892.

The objects of the invention are to improve the valve shown in said patent by forming it in a series of sections mounted fixedly, but removably, on a central tube, with cup-packings between the several sections, said central tube forming the cylinder of an auxiliary piston-valve which reciprocates therein; also, to provide a retaining-lip which extends over the edge of the cup-packing to prevent the cup part of the packing from flaring out and catching in the chest-ports and so interfering with the motion of the valve. These objects I accomplish by the mechanism shown in the accompanying drawings, in which—

Figure 1 is a central vertical section of the motor with my improvements applied. Fig. 2 is a horizontal section on line 2 2, Fig. 1. Fig. 3 is a similar section on line 3 3, Fig. 1. Fig. 4 is a detail view to better show the lip *c* of one of the valve-sections. Fig. 5 is a view, on an enlarged scale, of the lower end of the valve-casing and valve.

A represents the valve-chest, provided with five internal annular grooves or channels, of which grooves 3 is the exhaust opening into the outlet 3^a. 1 and 5 are the inlet-grooves opening into the inlet-branches 1^a and 5^a of the inlet or supply I, and 2 and 4 are the grooves which communicate with the passages a' and a^2, which lead to the end of the cylinder A in which is mounted the piston A^2 on the rod A^3.

Within the chest or chamber A reciprocates a valve which controls the grooves or passages 1, 2, 3, 4, and 5. This valve is formed of an inner tube *a*, externally threaded at its open ends, and upon which threaded ends are screwed the end sections B B′ of the valve. These valve-sections B B′ are hollow, and the section B extends above the upper end of the tube *a*, while the lower hollow section B′ surrounds the tube and terminates flush with the lower end thereof. Next to the end sections B B′ are the hollow valve-sections B^2 B^3, between the ends of which and the ends of the sections B B′ are placed the cup-packings *p*. Next to the sections B^2 B^3 are placed the hollow hour-glass-shaped sections B^4 B^5, having external annular concavities or grooves b^4 b^5, and these concavities or grooves connect with the interior of the tube *a* by means of the ports a^3 a^4 and a^5 a^6, respectively. Next to the valve-sections B^4 and B^5 are placed the hollow hour-glass-shaped valve-sections B^6 B^7, also having external concavities or grooves b^7 b^8 and communicating at their interiors O with the interior of tube *a* through ports a^7 a^8, respectively, and with the interior M of sections B^2 and B^3, respectively, by means of the longitudinal passages *n n*, which extend through the sections B^4 and B^5 into the interior of the sections B^2 B^3. These hollow valve-sections B^2 B^3 are slightly smaller than the casing, so as to leave an annular passage-way *w* between them. The sections are provided at their outer ends with annular grooves *t t′*, connecting with their interiors through ports *l l′*. The upper groove *t* is adapted to register with an annular groove *j* in the valve-chest A, which groove is connected with the upper end of the valve-chest by a longitudinal passage *k*, while the lower groove *t′* is adapted to register with a similar groove *j′*, connected with the lower end of the chest A by a longitudinal passage *k′*. The lower end of the tube *a* opens directly into the lower end of the chest A, and the upper end of said tube opens into the upper end of the chest through ports *h* in the upper valve-section B.

B^8 is the central valve-section, and it is also formed hour-glass shaped and hollow and provided with an annular concavity or groove

b^9, connected with the interior of the valve-section and tube a by ports b^{11} and b^{12}, respectively.

The abutting ends of the several valve-sections clamp between them the packing-cups p, and to prevent the edges of certain of these packings from flaring out and catching in the ports or passages which they operate over or across I provide the valve-sections with annular lips or flanges c, which overlie the said edges and hold them in place.

The annular grooves j j' are each interrupted by an abutment j^2 and a set-screw D, between which screw and abutment the groove j communicates with the passage k. (See Fig. 2.)

The tube a forms the cylinder of an auxiliary valve which controls the ports a^4, a^7, a^8, and a^5 by means of the valve-sections g', g^2, g^3, and g^4, all mounted on a valve-rod G, coupled at its upper end to an operating or tappet rod G', working through the upper end of valve-section B and a gland on the upper end of valve-chest A, said rod G' being provided above and below the top of valve-section B with tappets s s, adapted to shift the main valve, of which B is a section, the lower tappet s being formed of the coupling which connects the rods G G'. The rod G' is provided with collars g^5 g^6, between which works the arm A^4 of piston-rod A^3, as in my patent before referred to.

The operation of the device is as follows: When the valve-rod G is forced down, the auxiliary valve moves down until the perforations a^4, a^7, and a^8 are opened. The water then flows from the supply-pipe I through passage 1^a, chamber 1, and port a^8 into the annular space inside the valve-section B^4 and through the port a^4 into the tube a and up through the ports h into the space above the upper valve-section B and forces the entire valve down into the position shown in Fig. 1. At the same time the water in the space below the valve is forced out through the passage k' and the annular groove j'. At the beginning of the downward stroke the space l' is opposite the groove j' and the water flows freely through the ports l' into the chamber M inside the valve-section B^3, thence through the tube n up to the interior O of the valve-section B^7, thence through ports a^8 into the space inside the tube a between the valve-sections g' g^2, out through ports b^{12} into valve-section B^8, and thence through ports b^{11} and groove b^9 into the exhaust-chamber 3. When the valve has descended so far that the groove l' has passed below the groove j', the water can escape only through the narrow annular space w between the valve-section B^3 and the cylinder A, and the speed of the valve is thus materially checked. By adjusting the screw D the rapidity of escape through the groove j' and the passage k' can also be regulated and the speed of the valve controlled. This retarded movement of the valve and the fact that the water enters the cylinder A' gradually at first, owing to the taper of the valve-section B^7, prevents any pounding or jerking of the bellows-lever.

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

1. A valve for a hydraulic motor, comprising a central tube having substantially-open ends and a port near its middle, also two inner and two outer ports, one of each pair being on each side of said middle port, a rod passing into said tube, two pistons on said rod adapted to put the middle port into communication with the inner ports alternately, and two other pistons on said rod arranged to alternately close the outer ports and open them to the ends of the tube, and a series of hollow valve-sections mounted on said tube, and each communicating with one of the ports in said tube.

2. A valve for a hydraulic motor, comprising a tube open at each end, and having a port near its middle, also an inner pair of ports on each side of the middle port and an outer pair of ports nearer the ends of the tube, seven hollow valve-sections mounted on the tube, the middle one communicating with the middle port, and having openings in its walls, the sections on each side of the middle one communicating with the inner pair of ports and having imperforate walls, the next pair of sections communicating with the outer pair of ports and having openings in their walls, end sections having openings in their outer walls, and passage-ways connecting each end section with the one next to the middle one.

3. A valve for a hydraulic motor, comprising a casing having internal circumferential grooves, the middle one being the exhaust-port, the adjacent ones the cylinder-ports and the outer pair the supply-ports, a central tube, and hour-glass-shaped hollow valve-sections mounted on said tube, the middle one being always in communication with the exhaust-port, and the adjacent sections controlling the supply and exhaust alternately, and end sections controlling the exhaust of pressure from the ends of the casing.

4. A valve for a hydraulic motor, comprising the combination with a casing A, having the supply-ports 1, 5, the cylinder-ports 2, 4, the exhaust-port 3, the grooves j j', and the passages k k' connecting said grooves with the ends of the casing, of a central tube a, containing ports a^4, a^5, a^7, a^8, and b^{12}, the rod G carrying pistons g^4 g' g^2 g^3, the valve-sections B^2 B^3 B^4 B^5 B^6 B^7 B^8, containing respectively the ports l, l', a^3, a^6, b^{11}, and the tubes n connecting the sections B^2 B^6 and B^3 B^7, the sections B^2 B^3 being slightly smaller than the casing and having grooves t t' communicating by the ports l l' with the interior of said sections.

5. The combination with a valve-chest or

casing A, having an annular groove *j* and a passage *k* connecting the same with the end of the casing, of an abutment closing said groove on one side of said passage, a screw controlling said groove on the other side of said passage, a valve having a groove *t* communicating with the exhaust, and a passage-way *w* connecting the grooves after they have passed out of alinement, substantially as described.

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

JOHN WEBSTER JOHNSON.

Witnesses:

L. C. WELLS,

B. R. Y. KNIGHT.