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HYDRAULIC VALVE.
APPLICATION FILED JAN. 18, 1913.

1,105,947.

Patented Aug. 4, 1914.
2 SHEETS-SHEET 2.

FIG. 7

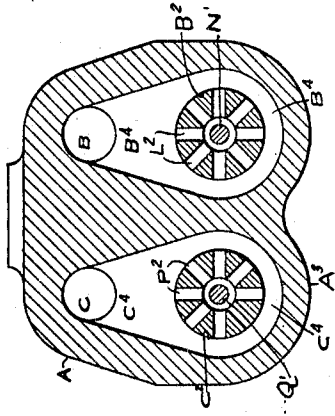


FIG. 6

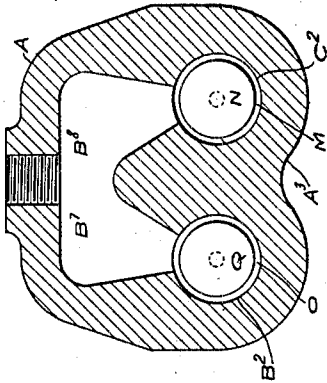


FIG. 5

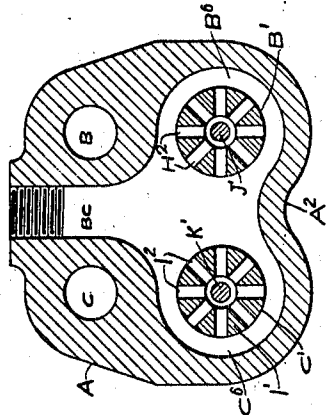


FIG. 4

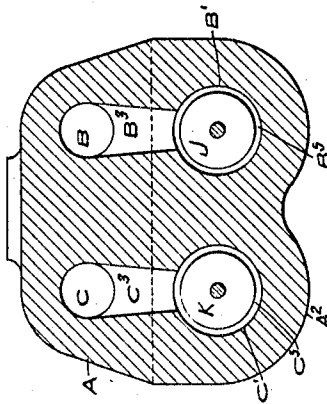
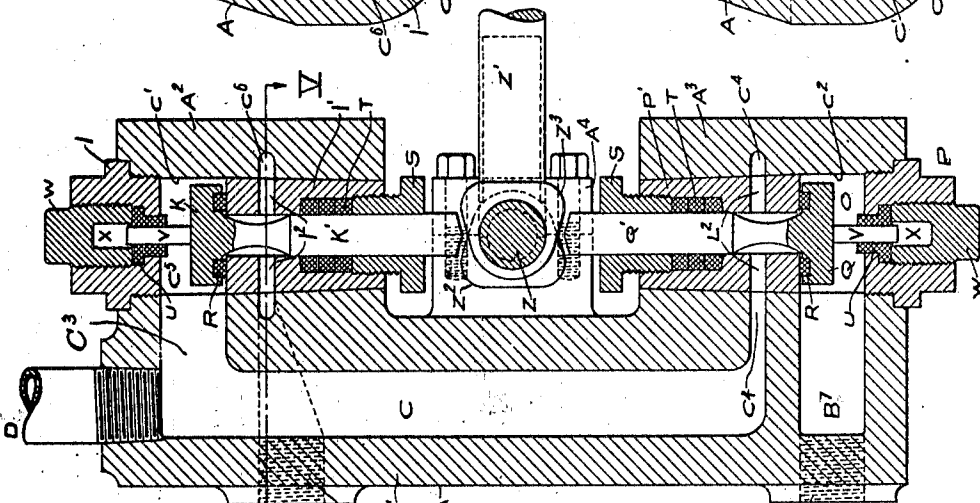


FIG. 3

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HYDRAULIC VALVE.

1,105,947.

Specification of Letters Patent.

Patented Aug. 4, 1914.

Application filed January 18, 1913. Serial No. 742,4

To all whom it may concern:

Be it known that I, HARRY WOODS, a citizen of the United States, residing at Steubenville, in the county of Jefferson and State of Ohio, have invented new and useful improvements in Hydraulic Valves, of which the following is a specification.

My invention relates to hydraulic valves for controlling hydraulic motors, such as motors for pressing or baling, opening and closing furnace doors, reciprocating draw-benches in front of welding furnaces, and the like.

The object of my invention is to provide a hydraulic valve having but few parts which are arranged and constructed to receive but little wear and to require but few replacements of parts and then only after long use.

Another object is to provide controlling valves which may be easily unseated against the pressure of the motor fluid irrespective of the value of the pressure tending to hold them on their seats.

Another object is to improve the manually-operated means for controlling the valves proper.

Other objects will appear hereinafter.

Referring to the accompanying drawings, Figure 1 is a horizontal longitudinal section of a hydraulic valve embodying my invention, the section being taken on the line I—I, Fig. 2. Figs. 2 and 3 are vertical longitudinal sections on the lines II—II, and III—III respectively, Fig. 1. Fig. 4 is a cross-section on the line IV—IV, Fig. 1. Fig. 5 is a cross-section on the line V—V, Fig. 3. Fig. 6 is a cross-section on the line VI—VI, Fig. 2. Fig. 7 is a section on the line VII—VII, Fig. 1. Fig. 8 is an end view in combination with a hydraulic motor.

On the drawings, A represents a casing, composed of the horizontal member A' and the upwardly projecting end members A² and A³.

In the member A' there are two parallel horizontal passages B and C lying on opposite sides of a vertical plane. One end of the passage B is connected by the pipe F to one end of the hydraulic cylinder E; and the corresponding end of the passage C is connected by the pipe D to the other end of the cylinder E, having between its ends the piston G which actuates the piston rod (G'). The members A' and A² are provided

with the bores or openings B', B², C', and C², parallel with one another and with the passages B and C. The openings B' and B² lie directly over the passage B, to which they are connected at one end by the passage B³ and at the other end by the passage B⁴, the upper end of the latter passage being enlarged so as to form an annular passage encircling the opening B².

The ends of the opening B' are provided with the screw plug H and the bushing H', their opposing or inner ends leaving between them a space B⁵ into which the passage B³ opens. Similarly a space C⁵ is provided between the plug I and the bushing I' in the opening C'.

In the space B⁵ is the reciprocatory valve J employing the inner end of the bushing H' as a seat. The stem J' of the valve reciprocates in a central bore in the bushing. The bushing H' is provided with a series of radial passages H² extending from its central bore to its periphery where they communicate with the passage B³ in the member A², which passage B³ surrounds the bushing H'.

In the space C⁵ is the reciprocatory valve K having its seat against the inner end of the bushing I'. The valve K has the stem K' which works in the central bore in the bushing I', provided with the radial passages I² communicating with the central bore and the passage C³ surrounding the bushing. The passages B³ and C³ communicate with each other at their adjacent sides and with the common passage or waste outlet BC.

The valve stems J' and K' have their diameters reduced from their connections with the valves to a distance beyond the passages B³ and C³ at least equal to the displacement of the valves from their seats, so that water or other controlled fluid may pass between the space B⁵ and the passage B³; and between the space C⁵ and the passage C³.

The ends of the opening B² are provided with the screw plug L and the bushing L', their opposing or inner ends leaving between them a space M, in which the reciprocatory valve N works. The stem N' of the valve slides in the central bore in the bushing L', which is provided with the radial passages L² leading from the central bore to the annular portion of the

passage B⁴. The valve N seats on the end of the bushing L'. Similarly, a space O is provided between the opposing ends of the screw plug P and the bushing P' in the opening C². The reciprocatory valve Q works in the space O and has its stem Q' working in a central bore in the bushing P', which is provided with the radial passages P² leading from the central bore to the annular portion of the passage C⁴. The valve Q seats against the inner end of the bushing P'.

The stems N' and Q' have their diameters reduced from the valves N and Q to a distance beyond the passages L² and P² at least equal to the displacement of the valves from their seats.

Each of the valves J, K, N, Q is provided with a washer or packing R, composed of leather or other suitable material and adapted to make the valves form water-tight connections with their seats.

Each of the bushings H', I', L', P', is provided with a gland S around its corresponding valve stem to make the packing T water-tight around the said stem.

Each of the plugs H, I, L, P, has a central bore with the inner end reduced in diameter. This central bore contains a packing U having its inner end in the contracted portion of the bore and its outer larger end in the larger portion thereof. The outer end of each valve has a pressure reducing projection V extending through the corresponding packing U, each of which is held in place by a screw plug W, acting also as a gland on the said packing to make it fit the projection V water-tight. Each plug has a recess X to receive the projection V of the corresponding valve.

The passages M and O open into a common passage B⁷ (Fig. 6) which communicates with the pressure inlet B⁸.

Z represents a rock-shaft lying transversely of the casing and between the valve stems J' and K' on one side and the valves N' and Q' on the other. The shaft Z is mounted in bearing boxes A⁴ and operated by the lever or handle Z'. The shaft Z carries two cams Z² and Z³, the former being between the valve stems J' and N', and the latter between the valve stems K' and Q'. The sides of the cam Z² diverge downwardly or toward the member A' and the sides of the cam Z³ diverge upwardly or away from the member A'. The ends of the valve-stems next to the cam are beveled so that, when the handle Z' is vertical or in its central position (Fig. 3), the said ends will be parallel with the adjacent sides of the cams. When the handle is in its central position all four valves are free to close without obstruction from the cams.

If the parts be as shown in Fig. 3 and water under pressure be admitted to the in-

let B⁸, it will be confined in the passage B⁷ and the spaces M and O, and if the valves N and Q are open, the water will close them on their seats, and no water can pass to the hydraulic cylinder E. If the handle Z' be now moved to the position shown on Figs. 1 and 2, the cam Z² will unseat the valve N, and the cam Z³ will unseat the valve K (Fig. 1), whereupon the water will flow from the inlet B⁸ through the passage B⁷, the space M, around the reduced portion of the valve-stem N; through the passages B⁴ and B, and the pipe F into the right-hand end of the cylinder E. The pressure of the water against the piston G will force the piston to the left, causing the piston rod G' to transmit power in a well-known manner. If now the handle be moved to a corresponding position on the other side of its central position, the valve stems K' and N' will be freed from engagement with the cams Z² and Z³, and the valve stems J' and Q' will be operated by the cams Z² and Z³ to unseat the valves J and Q. The pressure of the water will close the valve N, and the water will flow from the inlet B⁸ through the passage B⁷, around the reduced portion of the valve stem Q', and through the passage P², C⁴ and C and the pipe D to the cylinder E. The piston G will be forced to the right causing water forced into the cylinder by the previous operation to flow back through the pipe F into the passage B, from which it escapes through the waste passage BC by way of the space B⁵, the space around the reduced portion of the valve stem J' and the passages H² and B⁶. The pressure of the water in the spaces C⁵ and M will close the valves K and N as soon as the cams have moved far enough to permit them to do so. If the handle Z' be again moved to the position shown on Figs. 1 and 2, the water from the inlet B⁸ will flow as hereinbefore described and the valves J and Q being freed from the cams will be closed by the pressure of the water in the spaces B⁵ and O. At the same time that the piston is being forced to the left, the piston is driving the water in front of it out through the waste outlet BC by way of the pipe D, the passage C³, the space around the valve-stem K', and the passages I² and C⁶.

The operation described may be repeated as desired and the operation may be stopped at any selected place by moving the handle Z to its central position, whereupon the two open valves will be closed by the excess of pressure on their outer ends, and the already closed valves will remain closed.

The diameter of the extensions V will vary with the increase in the size of the valves to which they are attached or with the increase of the pressure of the motor fluid. The extensions V are for the purpose of lessening the pressure against the

outer ends of the valves. It is readily seen that, when the pressure of the motor fluid is high, it would require a considerable force on the handle Z' to open the valves as the valves when closed are far from being balanced. As the ends of the extensions V are not in contact with the water acting on the outer ends of the valves, the seating pressure against the valves is reduced in the ratio of the cross sectional areas of the extension and the valve.

When the piston of the hydraulic cylinder is to be operated in only one direction, only one side or lateral half of my double or twin valve need be made or used.

I claim—

1. In a hydraulic motor controller, a casing having a base member and a lateral member on each end of the base member, an inlet chamber and an exhaust chamber in the base member, a pair of passages in the base member, a separate valve in one lateral member between each passage in the base and the exhaust chamber, a valve between each passage in the base and the inlet chamber, and means for opening the inlet valve to one passage in the base and the exhaust valve from the other passage in the base.

2. In a hydraulic motor controller, a casing having a base member and a lateral member on each end of the base member, an inlet chamber and an exhaust chamber in

the base member, a pair of passages in the base member, a separate valve in one lateral member between each passage in the base and the exhaust chamber, a valve between each passage in the base and the inlet chamber, opposing valve stems for the said valves extending in the space between the lateral members, and a pair of cams arranged between the ends of the opposing valve stems.

3. In a hydraulic motor controller, a casing having a base member and a lateral member on each end of the base member, an inlet chamber and an exhaust chamber in the base member, a pair of passages in the base member, a separate valve in one lateral member between each passage in the base and the exhaust chamber, a valve between each passage in the base and the inlet chamber, opposing valve stems for the said valves extending in the space between the lateral members, and a pair of cams arranged between the ends of the opposing valve stems, the said cams being shaped and arranged to permit all the valves to be seated simultaneously.

Signed at Steubenville, Ohio, this 16th day of January, 1913.

HARRY WOODS.

Witnesses:

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HUGH W. PATTERSON.