L. SWENINGSON & W. H. WOODWARD.

HYDRAULIC MOTOR.

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1,166,491.

Patented Jan. 4, 1916.

Fig. 1.

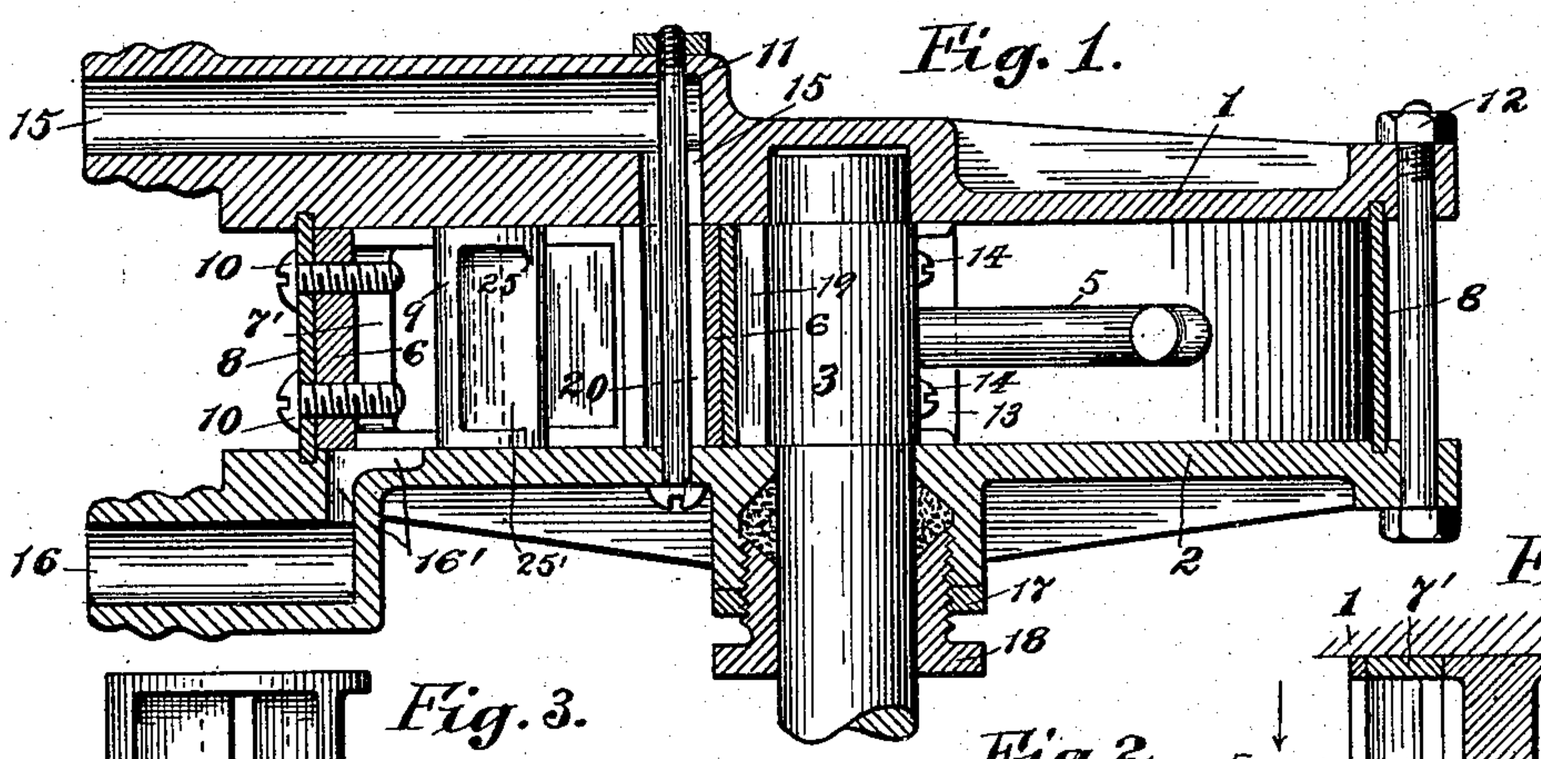

Fig. 3.

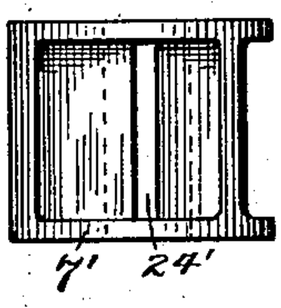

Fig. 2.

Fig. 4.

Fig. 5.

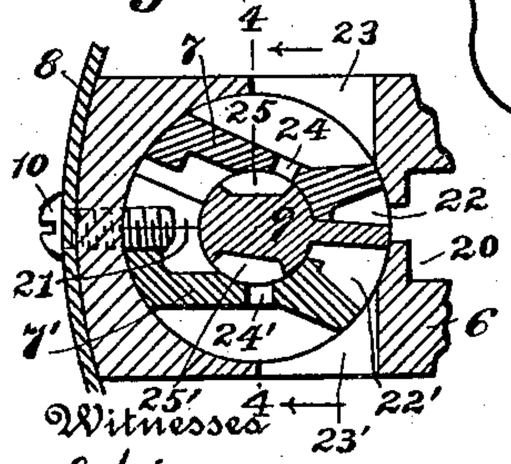

Fig. 6.

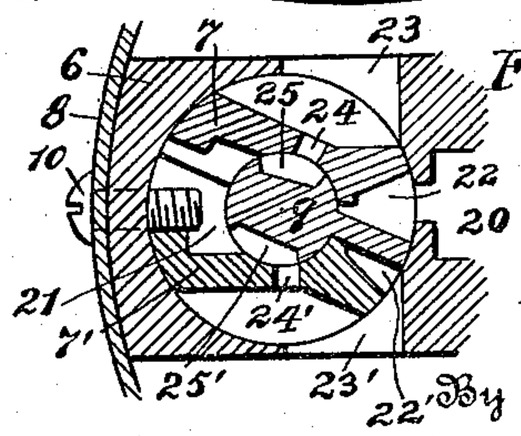

Fig. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

LOUIS SWENINGSON AND WILLIAM H. WOODWARD, OF CLEVELAND, OHIO.

HYDRAULIC MOTOR.

1,166,491. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed September 14, 1914. Serial No. 861,566.

To all whom it may concern:

Be it known that we, LOUIS SWENINGSON and WILLIAM H. WOODWARD, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Hydraulic Motors, of which the following is a specification.

Our invention relates to hydraulic motors, and includes an improved valve mechanism, and while we have shown the valve mechanism in use in a motor of the oscillating type the invention is not limited to its use in this particular type of motor, as it is adaptable to other types of motors.

The object of the invention is to provide improved means of controlling the valve arrangement whereby the water pressure will be employed to alternately reverse the power piston at the end of each effective stroke of said piston and without the use of springs.

A further object of our invention is to provide a springless motor with valve mechanism so constructed as to insure the shifting of all parts of the valve without finding a balancing position, thereby insuring perfect operation of motor when in use in unskilled hands.

Referring to the accompanying drawings: Figure 1 is a vertical sectional view on line 1—1 of Fig. 2. Fig. 2 is a plan view showing all parts assembled for operation, with the cover removed. Fig. 3 is a side elevation of a valve member removed from its support, showing flanges on top and bottom which serve as bearings for said member. Fig. 4 is a vertical sectional view of the valve taken on line 4—4 of Fig. 5 showing flange bearings on all three parts of the valve. Fig. 5 is a broken horizontal section of the valve taken on line 5—5 of Fig. 4 showing valves in a cut off position. Fig. 6 is a similar sectional view showing the center member 9 of the valve in position for reversing the valve section 7. Fig. 7 is a similar sectional view and shows all members of the valve in their final positions for reversing the piston or oscillator 4.

In the construction of the motor we employ a casing or cylinder 8, preferably a tubing. This contains a central shaft 3, and a piston or wing 4 of the oscillating type. A casting 1 forms the top or cover for the casing 8 and is provided with inlet passages 15 and 15′ and also a boss at the center forming an upper bearing for the piston shaft 3. The bottom of casing 8 is closed by a casting 2 which contains passages 16 and 16′ for exhausting waste fluid from motor, and has a central boss as in casting 1 and corresponding with same, thereby forming the opposite or lower bearing for the piston shaft 3, said boss on casting 2 being of sufficient length to form means for the usual packing nut 18 and lock nut 17. The shaft 3 may be connected to any desired machine to operate the latter. The cylinder 8 also contains a valve casing 6 which extends vertically from top 1 to bottom 2, and extends horizontally and radially from cylinder 8 to the hub of the piston shaft 3, packing 19 being interposed, and the valve casing is fastened to casing 8 by screws 10, and to top 1, and bottom 2, by screw 11.

The casing 6 contains the three valve members 7, 7′ and 9, which oscillate as hereinafter described, the member 9 being confined between the side members 7, 7′.

The motor cylinder is divided by the valve casing 6, shaft hub 3, and its piston 4, into two compartments 26 and 27, which alternately receive and discharge the motive fluid according to the operation of the valve contained in casing 6. The piston or wing 4, hub and shaft 3 preferably comprise one casting the hub being of larger diameter between the top and bottom plates 1 and 2, so as to prevent the shaft 3 from working up or down and causing unnecessary wear on the leather piston packing 13 and 13′.

The piston 4 on shaft 3 moves about its pivotal point, conforming with the interior walls of cylinder 8, and moving toward opposite sides of casing 6 alternately, the motive fluid being directed alternately to its opposite sides by the action of the valve members 7, 7′ and 9 contained in the casing 6. The piston 4 is provided with the necessary cup packing 13 and 13′ on its opposite sides, said packing being firmly held in place by plates 5^a, and bolted securely to said piston 4 by bolts 14. Plates 5^a are provided with extensions or arms 5 and 5′ respectively which enter openings 23 and 23′ in the casing 6 at the end of each effective stroke of the piston 4, and move the valves to cutoff edge, as indicated in Fig. 2. Each member 7, 7′ has port 24 and 24′, and the member 9 has opposite side recesses 25 and 25′.

In operation, the motive fluid enters motor through openings 15 and 15′ in lid or

cover 1, and thence through communicating inlet chamber 20 in casing 6, and thence through the valve between inner ends of members 9 and 7′, thence over inner end of section 7′ of valve and through opening 23′ in casing 6, and into compartment 27 driving piston 4 around to opposite side of casing 6, and exhausting used fluid from opposite side of piston 4, or compartment 26, through opening 23 in casing 6, thence through communicating port 24 in section 7 into communicating port 25 of casing 9 thence into communicating exhaust chamber 21 between the outer ends of valve 7 and 7′, and out of motor through exhaust ports 16 and 16′ contained in lower casting 2.

In the position shown in Fig. 2, the piston 4 has almost completed its effective stroke, and arm 5′ has entered casing 6 through its opening 23, and come in contact with valve section 7, thereby moving said valve section 7, and valve section 9 around to position shown in Fig. 5 thereby placing the inner end or tongue of section 9 between inlet chamber 20 in casing 6, and opening 23′ in said casing 6 thus cutting motive pressure out of the compartment 27.

It will be noted that the inlet chamber 20 always contains motive pressure, therefore when valve members 7 and 9 are in cut off position as shown in Fig. 5 the motive pressure from chamber 20 will enter small chamber 22 between inner ends of members 7 and 9 and thereby oscillate member 9 to the position shown in Fig. 6, and being still confined in chamber 20 of casing 6 and chamber 22, between members 7 and 9 of the valve, and having moved member 9 to the limit of its stroke, will in turn move member 7 back to its original position as shown in Fig. 7, and thereby reverse the stroke of the piston 4. It will also be noted that as arm 5′ initially moves valve sections 7 and 9 to the cut off position shown in Fig. 5, the valve members are so constructed so as to maintain an open exhaust from compartment 26 through opening 23, into exhaust chamber 21 through port 24 in valve member 7, and communicating recess 25 in valve member 9, so while the pressure is cut out of compartment 27 as in Fig. 5 the exhaust for compartment 26 is still open. However, when the oscillating member 9 has moved to the position shown in Fig. 6 and member 7 has moved to the position as shown in Fig. 7, the exhaust from compartment 27 when piston 4 was traveling to a position opposite to the position shown in Fig. 2 would be effected through opening 23′ in casing 6, port 24′ in valve member 7′, communicating port 25′ in valve member 9, thence into exhaust chamber 21 and out of the motor through exhaust ports 16 and 16′ of the casting 2.

It will be further noted that the exhaust opens ahead of the inlet prior to the return of the piston on each effective stroke. As member 9 of the valves has completed its movement (see Fig. 6) thus opening exhaust ports 24′ and 25′ into exhaust chamber 21, the inlet to compartment 26 will not be effected until valve member 7 has reached the position shown in Fig. 7, when it will pass into said compartment 26 through opening 23 in casing 6.

It will further be noted by the foregoing description and accompanying drawings that the inner ends of the valve members 7, 7′ and 9 alternately serve as pistons and abutments for each other, chamber 22 or 22′ acting as the cylinder for said members, For example in Fig. 5, member 7 acts as the abutment, while member 9 moves as a piston to the position shown in Fig. 6, when it in turn will become an abutment for returning valve member 7 to the position shown in Fig. 7, chamber 22 acting as the cylinder.

While the valve arrangement disclosed in the foregoing description and accompanying drawings is of an oscillating nature, said valve arrangement can be used with piston valves without departing from the spirit of the invention, and we do not wish to limit ourselves to the use of this valve to any particular type.

Another feature is that the initial movement of valves at either end of piston stroke caused by the arms on the piston coming in contact with the members of said valve, is accomplished by having the pressure surfaces of the valve members much smaller than the pressure surface of main piston.

What we claim as new is:

1. In a hydraulic motor, a valve mechanism comprising a casing having inlet and outlet chambers and side openings into the motor chambers, and a valve in said casing consisting of two oscillating side members and an oscillating member therebetween, the side members having ports communicating respectively with said openings, and the intermediate member having recesses adapted to connect said ports and the outlet chamber, and the said members being movable to alternately connect the inlet chamber and said openings, and means to oscillate said members.

2. A reversing valve for hydraulic motors, comprising a valve casing having inlet and outlet passages, and an opening at each side communicating with separate motor chambers, a pair of oscillating valve members located across said openings respectively, at opposite sides of the casing, one end of each member being movable to uncover one of said openings and connect same with the inlet passage, and each of said members having a through port communicating with one of said openings, and a middle oscillating member located between said members and having recesses at opposite sides adapted to

connect said ports alternately with the said outlet passage, and also having a projecting tongue movable across the inlet passage.

3. A reversing valve for hydraulic motors, comprising a valve casing having inlet and outlet chambers, and openings at opposite sides communicating with separate motor chambers, a pair of segmental oscillating valve members located at opposite sides of said casing and extending across said openings respectively, one end of each member being movable to connect said inlet chamber and said openings respectively, and each of said members having an outlet port communicating with one of said openings, and a middle oscillating controlling member located between said members and having a recess at each side adapted to connect one of said ports and the outlet chamber, and also having a tongue projecting between the said ends of the said side members and movable across the inlet chamber, the tongue being spaced from said ends to form inlet pressure chambers.

4. In a hydraulic motor, the combination of a cylinder, an oscillating piston therein having projecting arms at opposite sides, a valve casing extending partly across the cylinder and having openings at opposite sides and inlet and outlet passages, a pair of oscillating valve members in the casing, extending respectively across said openings and adapted to alternately connect same with the inlet passage, and having outlet ports communicating with said openings, and an intermediate oscillating valve member located between the said members and controlling said ports and having a part exposed to pressure at the inlet passage and movable across the same, the said members being located in position to be alternately struck and moved by said arms entering said openings.

In testimony whereof, we affix our signatures in presence of two witnesses.

LOUIS SWENINGSON.
WILLIAM H. WOODWARD.

Witnesses:
JOHN A. BOMMHARDT.
LOUIS A. MOSES.