H. C. CHAMBERS.

HYDRAULIC MOTOR.

APPLICATION FILED OCT. 28, 1911.

1,037,865.

Patented Sept. 10, 1912.

Fig. 1.

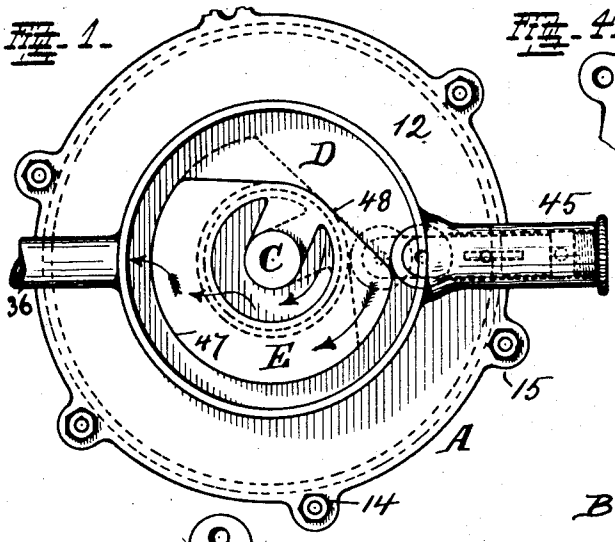


Fig. 4.

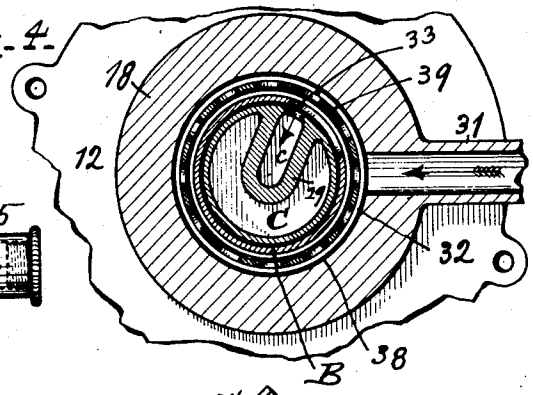


Fig. 5.

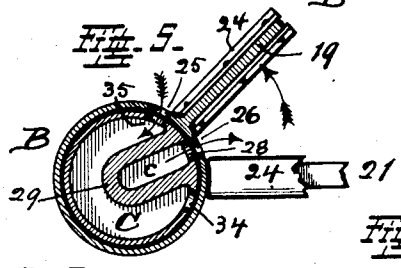


Fig. 2.

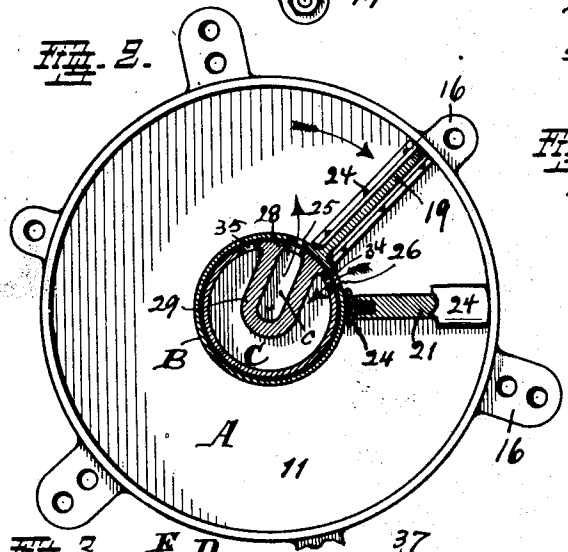


Fig. 6.

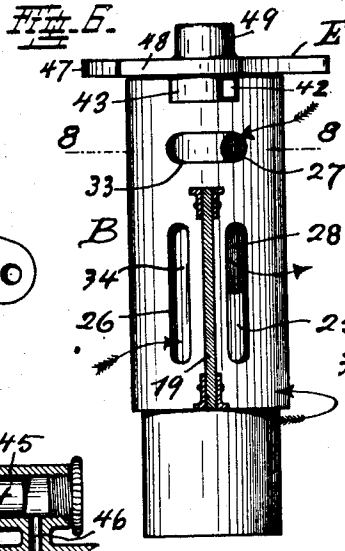


Fig. 7.

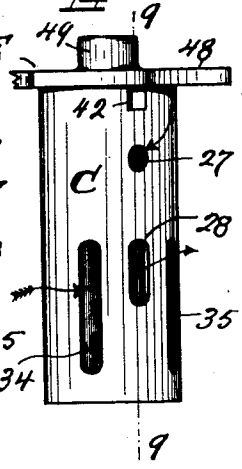


Fig. 3.

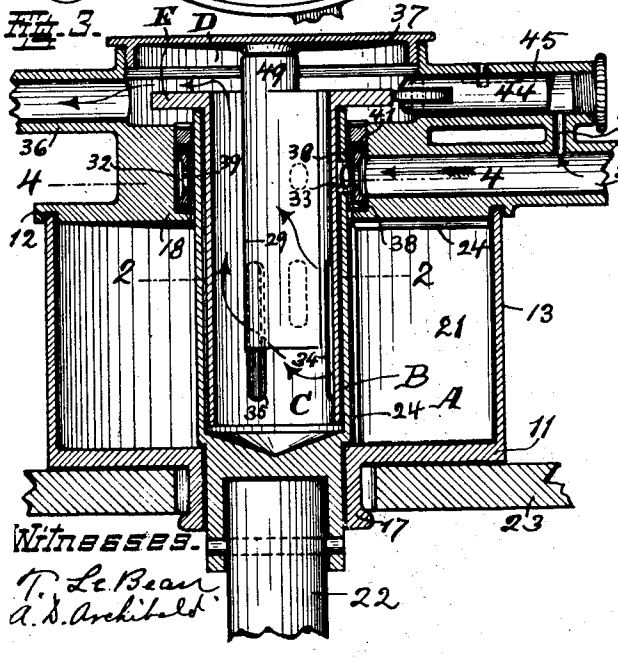


Fig. 8.

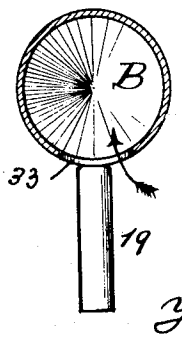
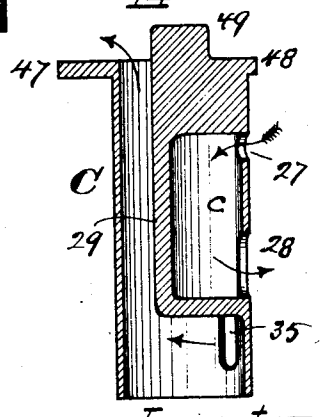


Fig. 9.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC MOTOR.

1,037,865. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed October 28, 1911. Serial No. 657,364.

To all whom it may concern:

Be it known that I, HENRY C. CHAMBERS, a citizen of the United States, and a resident of Cincinnati, Hamilton county, State of Ohio, have invented certain new and useful Improvements in Hydraulic Motors; and I do declare the following to be a clear, full, and exact description of the invention, attention being called to the drawing which accompanies this application and forms a part thereof.

This invention relates to improvements in hydraulic motors of the type in which an oscillating element is used for converting the pressure of the liquid into motion.

The invention concerns more particularly the means whereby the action of the pressure medium is controlled and it consists of the construction of these means as well as of the construction of related parts which co-act therewith.

In the following specification and particularly pointed out in the claims at the end thereof, will be found a full description of my invention, together with its operation, parts and construction, which latter is also illustrated in the accompanying drawing, in which:—

Figure 1, is a top-view of the motor. Fig. 2, shows the working chamber of the same as it appears after a removable head has been detached, certain parts contained in the chamber being shown in section, on a line shown at 2—2 in Fig. 3. Fig. 3, is a vertical central cross-section of the motor. Fig. 4, is a horizontal section of the same taken on a line shown at 4—4 in Fig. 3. Fig. 5, in a view similar to Figs. 2 and 4, shows a part appearing in said views in its alternate position. Fig. 6, shows in elevation inter-engaged members contained in the working chamber, a cross-section of said members being shown in Figs. 2, 4 and 5. Fig. 7, is an elevation of one of these members, it being more particularly the valve which controls the movement of the pressure-fluid. Fig. 8, is a cross-section of the member which contains this valve, the section being taken on a line 8—8 of said member as shown in Fig. 6. Fig. 9, is a vertical section of Fig. 7 and on line 9—9 thereof.

In the drawing, A is the pressure-chamber substantially cylindrical. Its inclosure consists of the two opposite ends 11 and 12, and an annular side 13 between them. This inclosure is made in parts to facilitate construction and suitably divided for necessary access. It might be parted between the ends or one of them might be formed detachable. Accordingly one of the ends (end 12) is arranged to form a detachable head and bolts 14 are provided for the purpose of holding it in place, they being seated in lugs 15 and 16 respectively.

B is a hollow stem supported in bearings to permit it to rotate. These bearings are provided in the opposite ends of chamber A, 17 being the bearing in end 11 and 18 being the bearing in head 12. 19 is a wing which extends radially from the stem into chamber A and is closely fitted against the inner side of the inclosure (ends and sides of the same).

21 is a partition radially arranged with reference to stem B and extending from the inside of side 13 toward said stem and in contact therewith so as to completely divide the chamber on one side of said stem.

The actuating medium, water in this case, which is under pressure, is alternately admitted to, and exhausted from the space between one side of wing 19 and the side of partition 21 opposite it and the space between the other sides of said wing and partition thereby oscillating said wing and converting the pressure of the water into a reciprocating, rotary motion, effective on stem B. This motion is rendered mechanically available for practical purposes by extending stem B beyond its lower bearing, and by arranging it to permit connection of a machine-element 22. This may be for instance the dolly shaft of a washing-machine, or any other machine-element according to the use of the motor.

The motor is firmly held in position, it being seated by its lower head upon a base 23, to which it is rigidly secured by screws for instance which may engage lugs 16, some of these being enlarged for this purpose.

Packing as shown at 24 is provided between the edges of wing 19 and the inclosure of chamber A and between the inner edge of partition 21 and the stem to prevent leakage.

25 and 26 are two ports in the stem separated by wing 19, the live water entering alternately chamber A through either one of them and leaving it through the other one. As shown in Fig. 2, observe also Figs. 3 and 6, the live water enters chamber A through

port 25, driving wing 19 toward partition 21, and the exhaust leaves it through port 26, the wing having about arrived at the end of its oscillation in one direction. The control of this flow in opposite directions whereby it is shifted alternately from one port to the other, is by a hollow, cylindrical valve C, fitted into stem B and provided in its side with an axially elongated conduit *c*, outwardly open at both ends 27 and 28 respectively, said conduit being subdivided from the interior of the valve by a partition 29. Water under pressure is supplied through a duct 31 located above the working-chamber and enters a space 32 provided in bearing 18 and surrounding stem B. An opening 33 is provided in stem B, so that the water from inlet 31 has at all times access to conduit *c* through the upper open end of the same. This conduit through its lower open end 28 feeds continually live water to chamber A, through either one of ports 25 and 26 in the stem, it being at all times opposite either one or the other of them. The spent water leaves chamber A continually through the other one of these ports and enters hollow valve C through either one of two ports 34 and 35 in the wall of this latter. As shown in Figs. 2 and 6, ports 26 and 34, are now in communication. The valve being open endwise, free outlet is given to the spent water which passes through it and into an exhaust chamber D, provided above the working chamber and from whence it is led away by a waste-duct 36. Chamber D is preferably closed by a cap 37. Leakage of live water past stem B into either one of chambers A or D is prevented by packing rings 38, held spaced on either side, that is above and below opening 33, by a perforated spacer or cage 39, the rings and the cage being held in place by a gland 41.

In order to cause the water to act alternately first against one side of wing 19 and then against the other side thereof by admitting it to chamber A alternately through one of ports 25 or 26 in stem B, and by exhausting it from said chamber alternately through the other one of these ports, valve C is actuated for the purpose in a manner that the outlet-opening 28 of its conduit *c* registers alternately with either one of these ports in stem B, thereby admitting the water to chamber A in the manner indicated. At the same time one of the outlet-ports in valve C, either port 34 or port 35, registers with the other one of the ports in stem B, the one which is not in register with opening 28. This actuation consists of an adjustment of the position of the valve, the movement being one about its axis within stem B and in a way that its ports co-act with the ports in said stem in the manner described. For such purpose valve C is provided with a projection 42 which extends into a notch 43 in stem B, so that valve C moves with this stem when this latter is moved by wing 19. The parts so engaged are so positioned and arranged with reference to each other, that valve C, when so moving, is held in an operative position, that is one in which water is admitted to chamber A against one side of wing 19 and exhausted from the other side thereof. Observe for instance Figs. 2, 3 and 6, where the valve is shown as moving with stem B and has opening 28 in it in register with port 25 in the stem to admit water to chamber A and port 34 in it registers with port 26 in the stem to exhaust water from chamber A.

E is a cam rigidly secured to the upper edge of valve C and moving with it. It is substantially a flat disk which projects over the upper edge of stem B and the edge of which forms the cam and is, while moving, in contact with a trip in form of a plunger 44, a roller being interposed to reduce friction. This plunger is held against the edge of the cam by suitable means permitting it to yieldingly follow the shape of the same.

Means exerting pressure like springs may be used, but I prefer a pressure which is more even and constant and therefore use water-pressure. This action is obtained by fitting plunger 44 into a housing 45, into which water under pressure is admitted back of and against the end of said plunger as best shown in Fig. 3. This water may be obtained from the supply which runs the motor and accordingly said housing 45 is connected with supply-duct 31 by means of a by-pass 46.

The edge of cam E is shaped as best shown in Fig. 1; that is so that for the larger part of its movement with valve C, it is concentric with the axis about which the valve moves, so that while this part is opposite the plunger no action whatever takes place.

When wing 19, stem B, valve C and cam E, all moving together by reason of the engagement between projection 42 and notch 43, (see Fig. 6) approach a position as shown in Figs. 1, 2, 3, 4 and 6, note arrows in Figs. 1, 2 and 6, a flattened non-concentric portion 48 of the edge of the cam moves opposite the end of the plunger as best shown in Fig. 1. As a result cam E is affected by the action of plunger 44 which by reason of the pressure behind it throws said cam instantly into a position shown in dotted lines in Fig. 1, which movement is shared by valve C, which now occupies a position as shown in Fig. 5. This independent movement of the valve within stem B is positively limited by the width of notch 43 in said stem, the ends of which form stops to the movement of projection 42 on valve C. This width of said notch is so arranged that when the plunger-induced movement of the valve has been

stopped, the ports in it occupy their alternate positions with reference to the ports in stem B and as shown in Fig. 5, so that the flow of the water with reference to wing 19 is reversed, the water entering chamber A now through port 26 and leaving it through port 25. As a result the motion of wing 19 is reversed and proceeds now in a direction opposite to that shown by the arrow in Fig. 2.

The central part of the valve C is upwardly extended as shown at 49, to fill the space between said valve and cap 37, whereby displacement of the valve is prevented.

A valve-movement for hydraulic motors where the valve which controls the admission of water is actuated by a device rendered operative by the pressure of water as here shown may also be used in that type of hydraulic motors in which a reciprocatory piston takes the place of the oscillating wing here shown.

A compact construction results by reason of supplying and discharging the water above the working-chamber so that the motor takes up very little room vertically considered. The working-chamber may be seated directly upon the supporting base and the connection of element 22 operated by the motor, to stem B may be made close to wing 19 where the water-pressure is applied.

Having described my invention, I claim as new:

1. In a hydraulic motor, the combination of an inclosure which forms a working chamber and consists of a cylindrical side and of upper and lower heads, the latter head forming a supporting base which serves to connect the motor in position, a wing in the inclosure fitted against the inner sides of the same, a hollow stem open at its upper end of which this wing forms a rigidly connected part, bearings in which this stem is mounted for oscillation, one in each of the heads from which they extend outwardly, said stem being provided with an inlet-opening in the upper part of its side which is located above the upper head of the inclosure, and with two ports below this head, so as to be in open communication with the working-chamber, one port on each side of the wing on the stem, an inlet duct for live water in open communication with said inlet-opening in the stem, a waste-duct above the upper head, a hollow valve in open communication with the inlet-opening in the stem and with the waste-duct and means for actuating this valve so as to alternately shift communication between the inlet-duct and the working-chamber and between this latter and the waste-duct from one port in the stem to the other.

2. In a hydraulic motor, the combination of a cylindrical inclosure which forms a working-chamber, a hollow stem at its upper end mounted concentric with the axis of the inclosure for oscillation therein, a wing carried by this stem and fitted against the inner sides of said inclosure, said stem being provided with an inlet-opening in the upper part of its side and located so as to be outside of the working-chamber, and with two ports below this inlet-opening and within the working-chamber, so as to be in open communication with the same, an inlet-duct for live water in open communication with the inlet-opening in the stem, a hollow, cylindrical valve fitted into this stem and in open communication with the inlet-duct and having two ports adapted to register with the ports in the stem, means causing said valve to move with the stem but permitting it also to move independent thereof, a waste duct in open communication with the hollow valve, a disk-shaped cam at the upper end of the valve of which it forms a rigidly connected part which projects over the edge of the stem, the edge of the cam being shaped in part concentric and in part eccentric with the axis of the valve, a plunger radially arranged opposite the edge of this cam, a housing in which it is supported and a bypass whereby this housing is in open communication with the inlet duct back of the plunger, so that this latter is held at all times in contact with the edge of the cam whereby, when the eccentric portion of the cam is opposite the plunger, the valve is actuated within the stem so as to alternately shift communication, through its ports and through the ports in the stem, between the inlet-duct and the working-chamber and between this latter and the waste-duct.

3. In a hydraulic motor, the combination of an inclosure which forms a working-chamber, an inlet-duct whereby water is supplied to the motor, a hollow stem open at one end and supported for rotation between opposite sides of said inclosure, it being provided with a wing fitted against the inner sides of the inclosure and having in its sides an opening always in open communication with the inlet-duct and two ports one on each side of said wing in open communication with the chamber, a stationary partition dividing the chamber between said stem and the inclosure of the chamber, a hollow valve open at its upper end fitted into the stem and provided with two outlet-ports and a non-communicating inlet conduit, means whereby this valve is caused to move to a certain extent with the stem and is also left free to move independently thereof, a cam rigidly connected to the valve, a plunger, a housing in which it is contained, and a bypass whereby this housing communicates with the afore-

said inlet duct and whereby water is admitted to it, to cause the plunger therein to actuate the valve by means of the cam and to move it independently of the stem so that its inlet conduit registers alternately with either one of the ports in the stem and one of its outlet ports alternately with the other port in the stem.

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

HENRY C. CHAMBERS.

Witnesses:
C. SPENGEL,
T. LE BEAU.