L. PURPURA.

HYDRAULIC MOTOR.

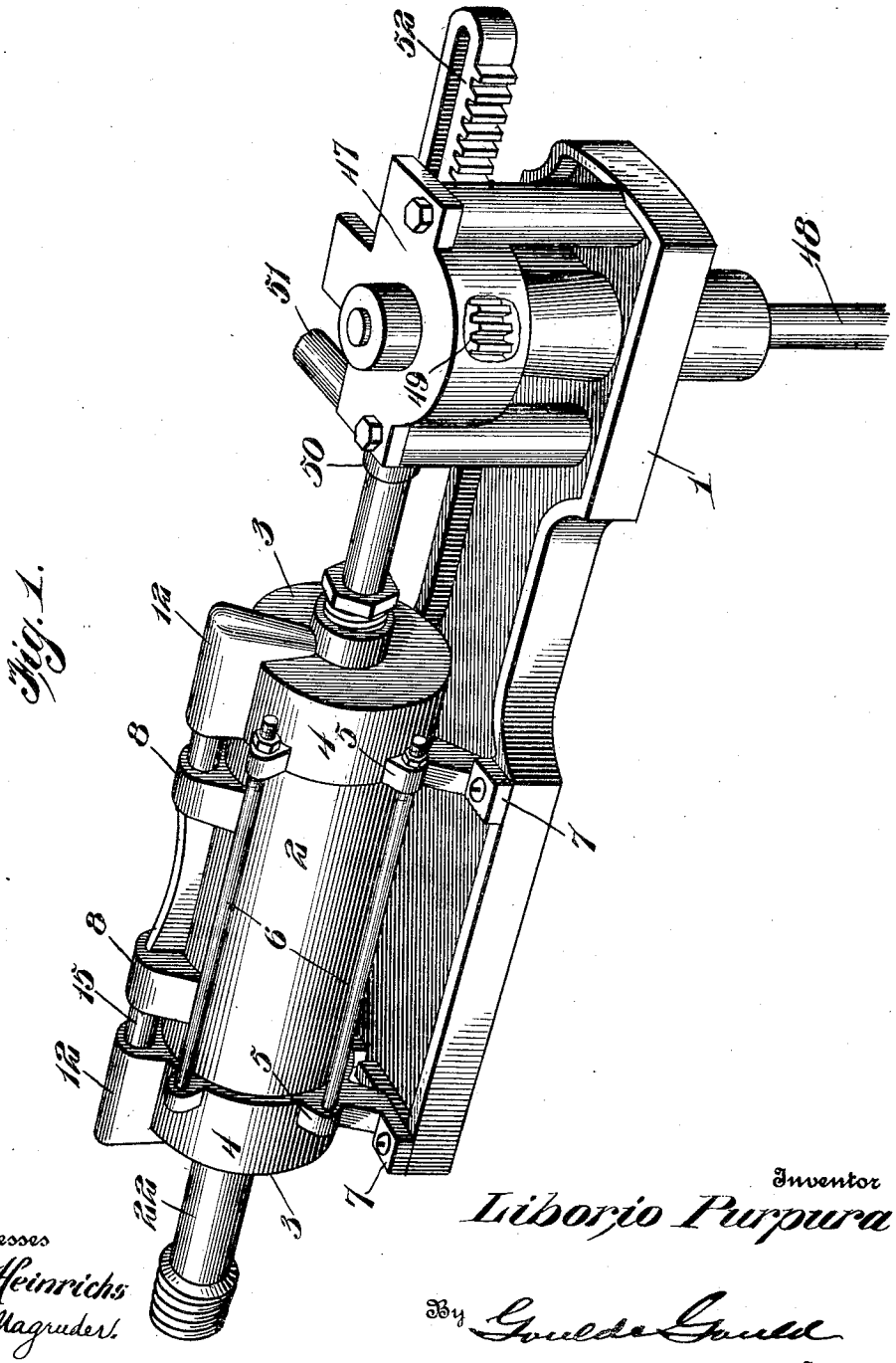
APPLICATION FILED MAY 22, 1914.

1,274,588.

Patented Aug. 6, 1918.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

L. R. Heinrichs

S. W. Magruder.

Inventor

Liborio Purpura

By Gould & Gould

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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3 SHEETS—SHEET 2.

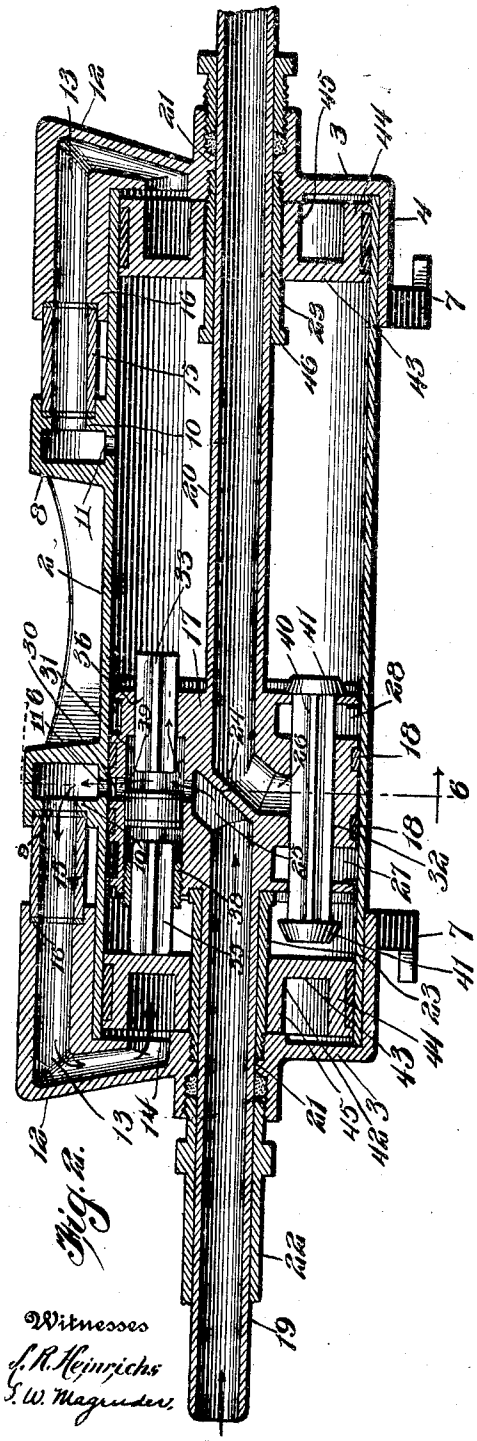


Fig. 2.

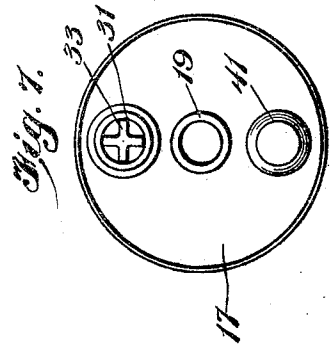


Fig. 7.

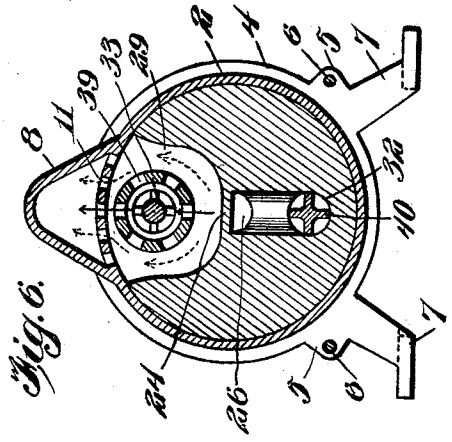


Fig. 6.

Witnesses

J. R. Heinrichs

G. W. Magruder.

Inventor

Liborio Purpura

By Goulds & Gould

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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3 SHEETS—SHEET 3.

Fig. 3.

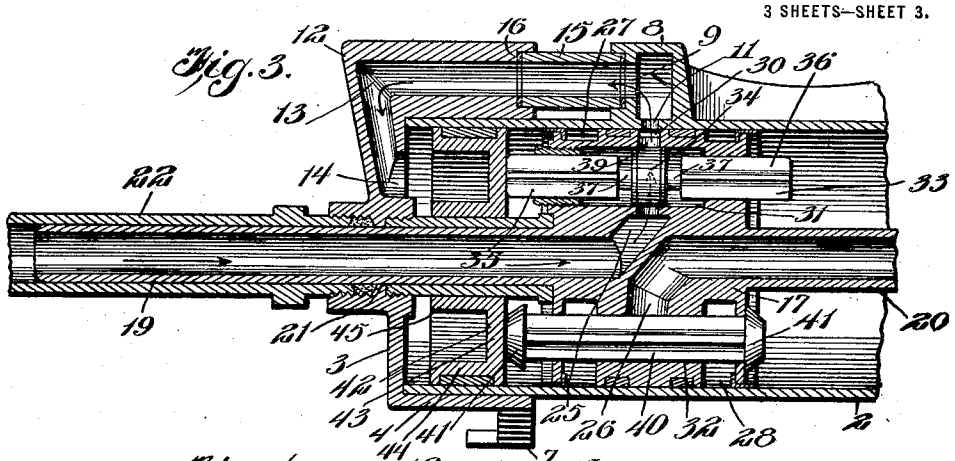


Fig. 4.

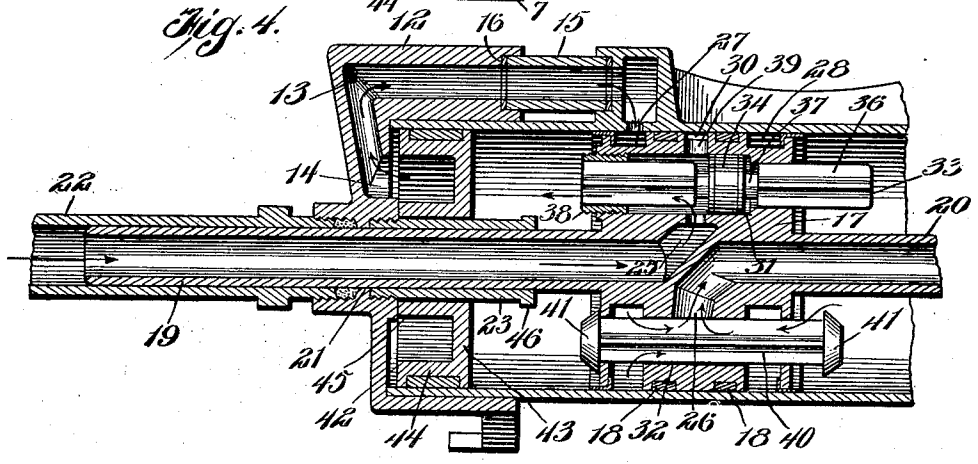
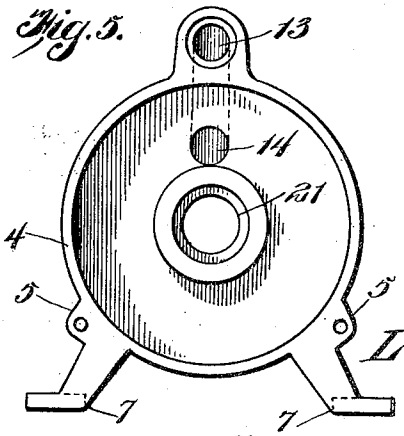


Fig. 5.



Witnesses

L. R. Heinrichs

S. W. Magruder

Inventor

Liborio Purpura

By Gould & Gould

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LIBORIO PURPURA, OF WHEELING, WEST VIRGINIA.

HYDRAULIC MOTOR.

1,274,588. Specification of Letters Patent. **Patented Aug. 6, 1918.**

Application filed May 22, 1914. Serial No. 840,243.

To all whom it may concern:

Be it known that I, LIBORIO PURPURA, citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Hydraulic Motors, of which the following is a specification.

The invention relates generally to an improvement in hydraulic motors, designed primarily for use as a washing machine motor, and being particularly directed to a motor of the reciprocating type, utilizing water at ordinary house-service pressure as a motive power, whereby to permit the connection of the motor to the usual house-service connections when the motor is desired for use.

The main object of the invention is the production of a motor including a cylinder casing and a reciprocating piston therein, the piston being automatically reciprocated by the water pressure through a valve control, which is in turn governed by the water flow, the piston stems acting as service and exhaust channels, and the exhaust channel stem being formed to convert the reciprocating movement into a rotary movement.

The invention in the preferred form of details will be described in the following specification, reference being had particularly to the accompanying drawings, in which:—

Figure 1 is a perspective view of the motor complete.

Fig. 2 is a longitudinal sectional view through the motor proper, the valves being shown in the initial position.

Fig. 3 is a broken longitudinal sectional view, showing the valves in the intermediate position.

Fig. 4 is a view similar to Fig. 3, showing the valves in the final position.

Fig. 5 is an elevation of one of the cylinder heads or caps.

Fig. 6 is a section on line 6—6 of Fig. 2.

Fig. 7 is an end elevation of the piston.

The improved motor, in its essential details, comprises a base 1, preferably of the form shown, on which at one end is mounted the motor proper, the driving mechanism for the washing machine, or other operated device, being located at the opposite end

The motor proper comprises a cylinder 2, the open ends of which are designed to be closed by removable heads 3 of identical strucure. The heads are of cap formation, having comparatively deep annular flanges 4 to snugly fit the outer surface of the cylinder wall. The flanges 4 are provided with bosses 5 to receive tie rods 6, whereby the respective heads are removably secured in a water-tight manner to the cylinder ends. The flanges 4 are also provided with feet 7, of convenient form and adapted to be removably secured to the base 1, to support the cylinder above and in spaced relation to the base.

The cylinder 2 adjacent each end is formed on the upper side with an approximately triangular projection 8, of hollow construction, open toward the adjacent end of the cylinder through a cylindrical opening 9, a flange 10 being formed at the inner end of the opening. The projection is closed in the opposite direction, and is interiorly in communication with the cylinder 2 through a series of openings 11 formed in the cylinder wall, as more particularly shown in Fig. 6. Each head 3 is formed with an outer enlargement 12, extending upwardly from the center of the head and projecting lengthwise the flange 4. The enlargement is formed with a bore 13, extending therethrough, said bore communicating with the interior of the cylinder 2 through an opening 14 in the head.

The flange extending portion of the enlargement 12 extends in alinement with the projection 8, and when the parts are connected, a short tube like member 15 is arranged between said enlargement and projection, the ends of said member bearing against the flange 10, and against a shoulder 16 formed by enlarging the bore 13 on the part 12, suitable packing rendering the connection water-tight. A water channel, hereinafter termed the valve control channel, is thus formed at each end of the cylinder, said channel opening into the cylinder at remote points and arranged wholly beyond the cylinder.

A piston 17 is arranged for reciprocation within the cylinder, said piston comprising a cylindrical body suitably packed at 18 to prevent leakage around the same. The piston is provided with oppositely projecting stems 19 and 20, both hollow, the former constituting as the service or inlet, and the latter as the exhaust channels for the motive fluid. The respective stems are passed through suitable packed openings 21 in the heads, the inlet stem being guided in its reciprocation in a sleeve extension 22, preferably forming part of the packing gland for

this end of the cylinder. The outlet stem is guided beyond the cylinder, as will later appear. Both stems are guided interiorly of the cylinder by limiting members 23 secured in flanges encircling the openings 21, these limiting members having other functions to later appear. The stems are preferably integral with the piston and their bores lead to the center of the piston, being there divided by a partition 24, the inlet channel 25 extending upwardly and the exhaust channel 26 extending downwardly, as shown.

The piston proper is formed adjacent each end with an annular channel, these channels coöperating with the valve control channels at the respective ends of the cylinder. As the piston receives an impulse from each end of the cylinder, the necessity for the duplication of the parts is obvious, and is to be borne in mind for the following description. The annular channels, hereinafter referred to as 27 and 28 for convenience are identical, being of irregular formation in that they are of least depth at the extreme upper portion of the piston and of maximum depth at the diametrically opposite point, the increase of depth being gradual and in both circumferential directions from the upper portions.

Intermediate the channels 27 and 28 the piston body is formed with an interior chamber 29 communicating at the lower end with the inlet channel 25 and opening at the upper end through the surface of the piston, as at 30. At the inner end the chamber aproximates the size of the channel 25 and at the outer end the size of the maximum transverse dimension of the projection 8.

The piston is formed in its upper portion with a valve bore 31 and in its lower portion with a valve bore 32, both extending longitudinally of the piston and opening through the ends thereof. A valve member 33 is, hereinafter termed the inlet valve, slidably mounted in the upper bore, said member comprising a centrally arranged solid valve disk 34 and end sections 35 and 36 projecting in opposite directions from the disk. The sections are of cruciform shape in section to form water channels lengthwise the same. The sections terminate slightly spaced from the disk 34, leaving a reduced stem section 37 on each side of the disk, as shown. The valve bore 31 is enlarged throughout its central portion to snugly receive the disk 34, the ends being reduced to slidably receive the sections 35 and 36, the reduced portion at one end being preferably a removable nipple 38 to permit convenient removal of the valve member when necessary. The valve member is of greater length than the piston, so that one end or the other projects beyond the piston to permit the necessary operation, to be later described.

The valve bore 31 is closed to the chamber 29, except through an annular series of openings 39 formed in the bore wall in line with the chamber 29, as clearly shown in Fig. 6. The lower valve bore 32 communicates directly with the exhaust channel 26 and extends through and is at all times in open communication with the lower portions of the channels 27 and 28, as shown in Fig. 2. A valve member 40 hereinafter termed the exhaust valve, is slidably mounted in the bore 32, said valve being of cruciform in cross section, and of greater length than the bore. The ends of the valve member are provided with a valve disk 41, adapted when in proper position to close one end or the other of the bore 32 against the entrance of water.

At each end of the cylinder and slidably mounted on the limiting members 23 are valve operating members 42. These members are identical and a detailed description of one will suffice for both. Each member 42 is in the form of a disk 43 having a forwardly or outwardly projecting annular edge flange 44 bearing against the wall of the cylinder 2 and packed to prevent leakage. The disk 43 has also a central sleeve extension 45 slidably embracing the limiting member 23, and the latter has a stop flange 46 at the inner end to limit movement of the member 42 in that direction. The members 42 thus present hollow bodies opening toward the cylinder heads, and registering with the openings 14 of the valve control channels.

Beyond the exhaust end of the motor proper, the base 1 is provided with a bracket housing 47 supporting a shaft 48 of the washing machine, on which with the housing is arranged a gear 49. The exhaust channel stem 20 of the motor passes through and is guided in a hollow bearing 50 of the bracket 47, the stem having a lateral discharge pipe 51 to deliver the exhaust flow from the motor. The stem 20 continues beyond the pipe 51 in solid form, and is constructed to provide a gear rack 52, meshing with and reciprocatingly rotating the gear 49 in the operation of the motor.

The detail of the washing machine mechanism is not important to the present invention and the illustration is merely conventional, being intended to include any type of mechanism capable of operation by the motor.

In operation, with the parts in the positions illustrated in Fig. 2, which is the initial or starting position, the water from any suitable source, as a faucet, is admitted through a flexible hose connection to the inlet channel, the hose being connected to the stem 19, as shown in Fig. 1. The water entering the inlet channel finds its way through the chamber 29, and through openings 39 (the valve disk 34 being in advance of said openings 39) to the valve control channel,

and so through the opening 14 at the inlet end of the cylinder. The pressure acting against the valve operating member 42 moves the latter toward the piston 17, moving the valve member 33, but not yet operating the valve member 40. The valve member is moved until the disk 34 closes the openings 39, but the water will continue to reach the valve operating member through the chamber 29. The member 42 continues its movement forcing the valve members 33 and 40 to fully operative position, moving the disk 34 beyond the openings 39 and closing the end of the valve bore 32 by the head 41 of the exhaust valve. The water now flows past the section 35 of the valve member 33 (owing to the cruciform shape of such section) and between the piston and operating member 42. Owing to the pressure behind it through valve control channel 13, the member 42 is temporarily a fixed member and the piston moves toward the exhaust end of the cylinder. As the piston moves it alines the channel 27 with the openings 11, and the pressure against the member 42 moves the latter to normal position, the expressed water flowing through the channel 27 past the cruciform exhaust valve 40 and out the exhaust channel 26. All water on the exhausting side of the piston finds its way through the proximate end of the valve bore 32, the disk 41 of the exhaust valve being removed from its seat. The movement of the piston continues until reaching the exhaust end of the cylinder when the valve member section strikes the operating member 42 at this end of the cylinder which forces the valve member to its position described as initial or starting position, and the exact operation just described is repeated.

A continual reciprocation of the piston is thus secured, the entire operation being automatic and completely and fully actuated by the water pressure, no springs or other motive accessories being used or needed.

By the specific arrangement described, all interior parts are readily accessible and removable for renewal or repair, this having a highly desirable advantage in devices of this class.

What is claimed as new is:

1. A hydraulic motor including a casing, a piston therein, valves controlling the admission of motive fluid to operate the piston, fluid operated means to actuate the valves, said piston being formed with a chamber and a series of ports to admit the fluid to said fluid operated means, one of the valves controlling said ports.

2. A hydraulic motor including a casing, a piston mounted for reciprocation therein, hollow stems carried by the piston and constituting a motive fluid inlet and exhaust channels, the piston being formed with spaced annular channels at all times in open communication with the exhaust channel, and means carried by the piston to control the direction of the fluid from the inlet in one direction or other between the piston and casing, valves constructed and arranged to coöperate with said channels.

3. A hydraulic motor including a cylinder, a piston therein, motive-fluid control valves operable in the piston, and a valve operating member arranged in the cylinder and operated by the motive fluid.

4. A hydraulic motor including a cylinder, a piston therein, motive-fluid control valves operable in the piston, and a valve operating member arranged in the cylinder and operated by the motive fluid, one of said valves operating to partly check the flow of the fluid to said member.

5. A hydraulic motor including a cylinder, a piston therein, motive-fluid control valves operable in the piston, and a valve operating member arranged in the cylinder and operated by the motive fluid, one of said valves operating to partly check the flow of the fluid to said member, the other of said valves directing the exhaust from said member.

6. A hydraulic motor, a cylinder, a reciprocating piston therein, valves movable in the piston, valve operating members at each end of the cylinder, means for delivering the motive fluid interiorly of the piston, the cylinder being formed with a valve control channel at each end, one of said valves in one position operating to partly check the flow of the fluid from the interior of the piston to said control channel.

7. A hydraulic motor including a cylinder, a piston therein, hollow stems carried by the piston and constituting inlet and exhaust channels, an inlet valve movably mounted in the piston and controlling the direction of fluid from the inlet to opposite sides of the piston, and an exhaust valve movably mounted in the piston, said piston being formed with an exhaust channel arranged in the outer surface thereof and in open communication with the exhaust channel of the stem, said piston channel being closed against the bore of the inlet valve and in open communication with the bore of the exhaust valve, said exhaust valve being constructed and arranged to control communication between the exhaust valve bore and the cylinder.

8. A hydraulic motor including a cylinder, a piston therein, hollow stems carried by the piston and constituting inlet and exhaust channels, an inlet valve movably mounted in the piston, and an exhaust valve movably mounted in the piston, each of said valves being in part of cruciform shape in section and directing the fluid from the inlet to opposite sides of the piston, said piston being formed with an exhaust channel arranged in the outer surface thereof and in open com-

munication with the exhaust channel of the stem, said piston channel being closed against the bore of the inlet valve and in open communication with the bore of the exhaust valve, said exhaust valve being constructed and arranged to control communication between the exhaust valve bore and the cylinder.

9. A hydraulic motor including a cylinder, a piston therein, said cylinder being exteriorly formed to provide a valve-control channel, the piston being formed with a chamber arranged to register with the inlet end of said channel, means for admitting motive fluid to the chamber, an inlet valve member movably mounted in the piston, the valve bore passing through the chamber and having its wall formed with openings to establish communication between the bore and chamber, a valve disk carried by said valve member to control said openings, and valve operating means actuated by the fluid passing through the control channel.

10. A hydraulic motor including a cylinder, a piston therein, said cylinder being exteriorly formed to provide a valve-control channel, the piston being formed with a chamber arranged to register with the inlet end of said channel, means for admitting motive fluid to the chamber, an inlet valve member movably mounted in the piston, the valve bore passing through the chamber and having its wall formed with openings to establish communication between the bore and chamber and a valve disk carried by said valve member to control said openings, and a valve operating member to receive the motive fluid from the outlet end of said channels.

11. A hydraulic motor including a cylinder, a piston therein, said cylinder being exteriorly formed to provide a valve-control channel, the piston being formed with a chamber arranged to register with the inlet end of said channel, means for admitting motive fluid to the chamber, an inlet valve member movably mounted in the piston, the valve bore passing through the chamber and having its wall formed with openings to establish communication between the bore and chamber and a valve disk carried by said valve member to control said openings, and a valve operating member to receive the motive fluid from the outlet end of said channels, said valve member being of cruciform shape beyond the disk to permit flow of the motive fluid longitudinally of the valve bore.

12. A hydraulic motor including a cylinder, a piston therein, said cylinder being exteriorly formed to provide a valve-control channel, the piston being formed with a chamber arranged to register with the inlet end of said channel, means for admitting motive fluid to the chamber, an inlet valve member movably mounted in the piston, the valve bore passing through the chamber and having its wall formed with openings to establish communication between the bore and chamber and a valve disk carried by said valve member to control said openings, and a valve operating member to receive the motive fluid from the outlet end of said channels, and means for guiding and limiting movement of said member toward the piston.

13. A hydraulic motor including a cylinder, a piston therein, said cylinder being exteriorly formed to provide a valve-control channel, the piston being formed with a chamber arranged to register with the inlet end of said channel, means for admitting motive fluid to the chamber, an inlet valve member movably mounted in the piston, the valve bore passing through the chamber and having its wall formed with openings to establish communication between the bore and chamber and a valve disk carried by said valve member to control said openings, and a valve operating member to receive the motive fluid from the outlet end of said channels, and means for guiding and limiting movement of said member toward the piston, said means serving to limit movement of the piston toward the end of the cylinder.

14. A piston for hydraulic motors including a body, hollow stems projecting in opposite directions therefrom, said piston being formed with an inlet valve bore and with an exhaust valve bore, an inlet valve in its bore, an exhaust valve in its bore, said piston being formed with a circumferential exhaust channel closed against the inlet valve bore and in open communication with the exhaust valve bore, a chamber formed in the piston surrounding the inlet valve bore and in communication with the latter, said inlet valve bore and one of said hollow stems being in communication, and a valve disk carried by the inlet valve to control one of said communications, a channel in communication with said chamber, and valve actuating means to be operated by the fluid passing through said chamber and channel.

15. A piston for hydraulic motors including a body, hollow stems projecting in opposite directions therefrom, said piston being formed with an inlet valve bore and with an exhaust valve bore, an inlet valve in its bore, an exhaust valve in its bore, said piston being formed with a circumferential exhaust channel closed against the inlet valve bore and in open communication with the exhaust valve bore, a chamber formed in the piston surrounding the inlet valve bore and in communication with the latter, said inlet valve bore and one of said hollow stems being in communication, and a valve disk carried by the inlet valve to control one of said communications, both of said valves being in part of cruciform shape in section, a channel in communication with said cham-

ber, and valve actuating means to be operated by the fluid passing through said chamber and channel.

16. A piston for hydraulic motors including a body, hollow stems projecting in opposite directions therefrom, said piston being formed with an inlet valve bore and with an exhaust valve bore, an inlet valve in its bore, an exhaust valve in its bore, said piston being formed with a circumferential exhaust channel closed against the inlet valve bore and in open communication with the exhaust valve bore, a chamber formed in the piston surrounding the inlet valve bore and in communication with the latter, said inlet valve bore and one of said hollow stems being in communication, and a valve disk carried by the inlet valve to control one of said communications, and disk heads carried by the exhaust valve to alternately close the ends of said exhaust valve bore, a channel in communication with said chamber, and valve actuating means to be operated by the fluid passing through said chamber and channel.

17. A piston for hydraulic motors including a body, hollow stems projecting in opposite directions therefrom, said piston being formed with an inlet valve bore and with an exhaust valve bore, an inlet valve in its bore, an exhaust valve in its bore, said piston being formed with a circumferential exhaust channel closed against the inlet valve bore and in open communication with the exhaust valve bore, a chamber formed in the piston surrounding the inlet valve bore and in communication with the latter, said inlet valve bore and one of said hollow stems being in communication, and a valve disk carried by the inlet valve to control one of said communications, the remaining hollow stem being in open communication with the exhaust valve bore, a channel in communication with said chamber, and valve actuating means to be operated by the fluid passing through said chamber and channel.

18. A hydraulic motor comprising a cylinder, a piston therein, hollow stems extending in opposite directions from the piston and movably mounted in the cylinder ends, a limiting member carried by each end of the cylinder, a valve operating member slidably mounted on each limiting member, an inlet valve member mounted in a bore in the piston, the ends of said member being of cruciform shape and adapted to be engaged by the valve operating members, the piston being formed with a chamber surrounding the valve bore, the wall of said bore formed with openings in line with the chamber, and a disk carried by the valve member to control said openings, said cylinder being formed with a control channel to establish communication between said chamber and valve-operating member in one position of the piston.

19. A hydraulic motor comprising a cylinder, a piston therein, hollow stems extending in opposite directions from the piston and movably mounted in the cylinder ends, a limiting member carried by each end of the cylinder, a valve operating member slidably mounted on each limiting member, an inlet valve member mounted in a bore in the piston, the ends of said member being of cruciform shape and adapted to be engaged by the valve operating members, the piston being formed with a chamber surrounding the valve bore, the wall of said bore formed with openings in line with the chamber, and a disk carried by the valve member to control said openings, said cylinder being formed with a control channel to establish communication between said chamber and valve operating member in one position of the piston, an exhaust valve mounted in a bore in the piston and adapted to be operated by the valve operating member.

20. A hydraulic motor comprising a cylinder, a piston therein, hollow stems extending in opposite directions from the piston and movably mounted in the cylinder ends, a limiting member carried by each end of the cylinder, a valve operating member slidably mounted on each limiting member, an inlet valve member mounted in a bore in the piston, the ends of said member being of cruciform shape and adapted to be engaged by the valve operating members, the piston being formed with a chamber surrounding the valve bore, the wall of said bore formed with openings in line with the chamber, and a disk carried by the valve member to control said openings, said cylinder being formed with a control channel to establish communication between said chamber and valve-operating member in one position of the piston, an exhaust valve mounted in a bore in the piston and adapted to be operated by the valve operating member, said piston being formed with a circumferential channel to establish communication between said control channel and the exhaust valve bore in one position of the piston.

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

LIBORIO PURPURA.

Witnesses:
E. M. LENNON,
H. D. WHEATON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."