(No Model.) 3 Sheets—Sheet 1.

C. L. WILKINS.

WATER MOTOR.

No. 535,431. Patented Mar. 12, 1895.

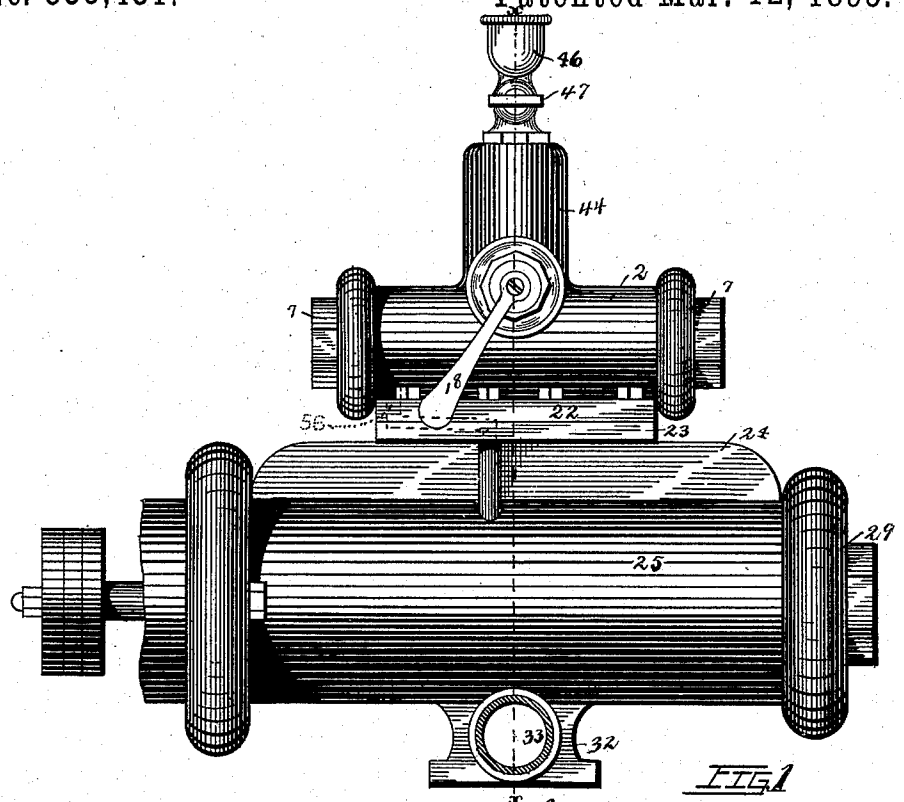

FIG 1

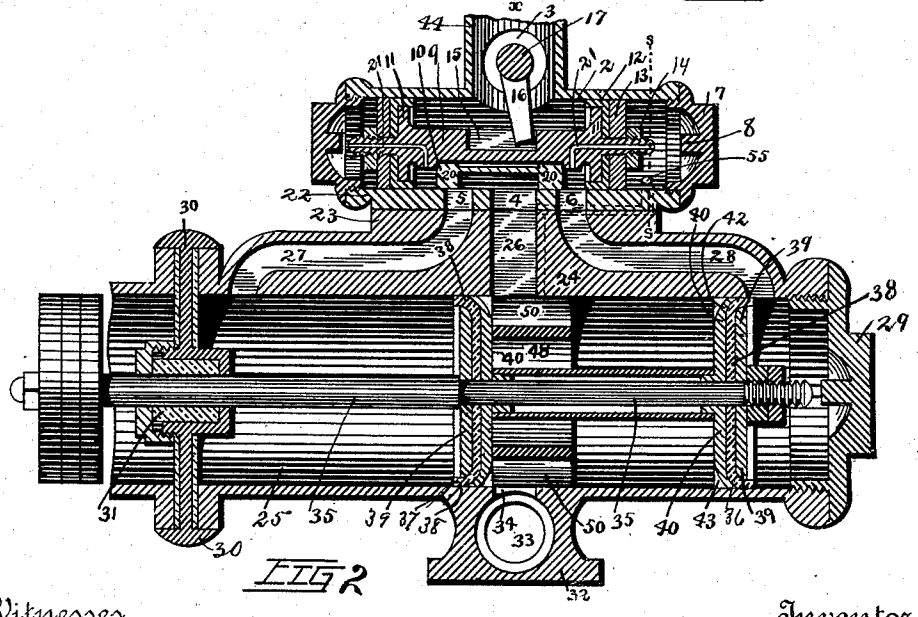

FIG 2

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

(No Model.) 3 Sheets—Sheet 2.

C. L. WILKINS.

WATER MOTOR.

No. 535,431. Patented Mar. 12, 1895.

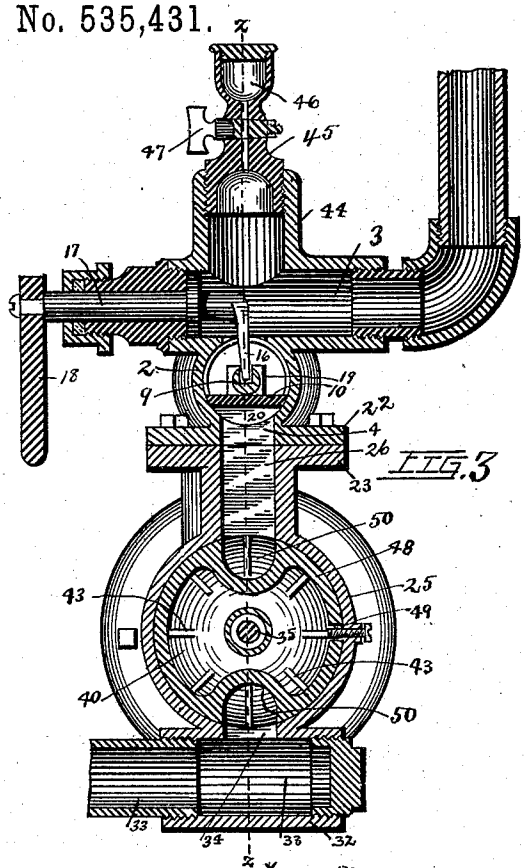

FIG. 3

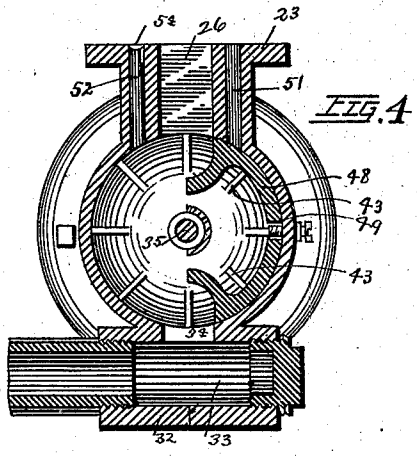

FIG. 4

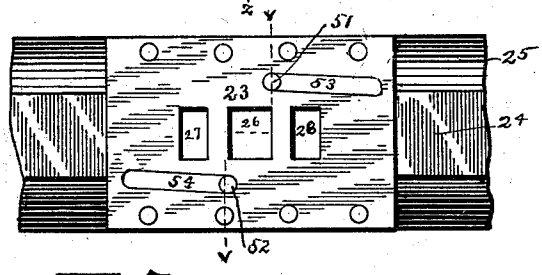

FIG. 5

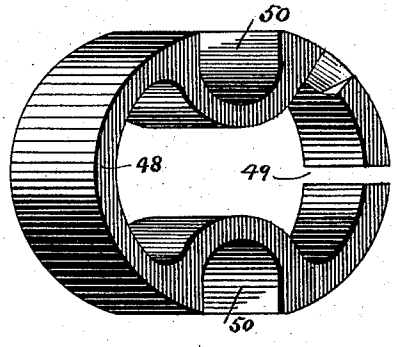

FIG. 6

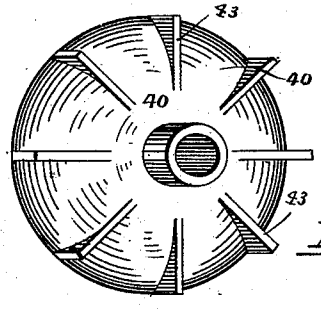

FIG. 7

Witnesses
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(No Model.) 3 Sheets—Sheet 3.

C. L. WILKINS.

WATER MOTOR.

No. 535,431. Patented Mar. 12, 1895.

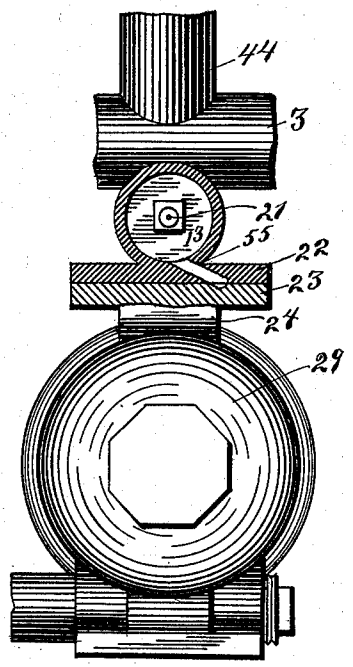

Fig. 8.

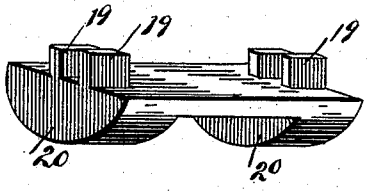

Fig. 9.

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UNITED STATES PATENT OFFICE.

CHARLES L. WILKINS, OF COLUMBUS, OHIO.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 535,431, dated March 12, 1895.

Application filed April 2, 1892. Serial No. 427,450. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. WILKINS, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Water-Motors, of which the following is a specification.

My invention relates to the improvement of water motors, and has particular relation to the improvement and mechanism shown in my former application for patent, dated February 18, 1892, Serial No. 429,964.

The objects of my invention are, to simplify the construction and operation of a motor of this class; to provide improved means and mechanism for supplying water motive power for operating the valve mechanism; to obviate the necessity of employing live water passages which connect through the valve ring; to so construct and arrange the parts of my improved motor as to provide substantially a noiseless operation thereof; to provide a valve ring for the power cylinder of improved construction and arrangement; to provide the piston of said power cylinder with improved forms of heads or valves adapted to co-operate with said valve ring and to produce other improvements which will be more specifically pointed out hereinafter. These objects I accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my improved motor. Fig. 2 is a central longitudinal section of the same, taken on line *z z* of Fig. 3. Fig. 3 is a sectional view on line *x x* of Fig. 1. Fig. 4 is a transverse section taken on two planes as indicated by lines *v v* of Fig. 5. Fig. 5 is a plan view of the motor body showing the upper or operating cylinder removed. Fig. 6 is a view in perspective of my improved valve ring. Fig. 7 is a view of one of the piston head plates which I employ in the power cylinder. Fig. 8 is a transverse section of the upper valve cylinder taken on line *s s* and showing in connection therewith an end elevation of the lower cylinder, and Fig. 9 is a view in perspective of the lower section of the operating valve.

Similar figures refer to similar parts throughout the several views.

As in said former application above mentioned, I employ in the construction of my improved motor an upper valve or operating cylinder as indicated at 2, which is provided with a central supply-pipe 3. 4 represents a central exhaust port in the bottom of said cylinder 2 and 5 and 6 represent respectively, water-ports which are arranged near and on opposite sides of the exhaust port 4. The cylinder 2 has its ends closed by detachable caps 7 which have their concave inner surfaces provided with central inwardly projecting stop lugs 8. The body of the operating valve or piston thereof, is as described in said former application, preferably formed of two sections 9 and 10. The section 9 is as shown in the drawings, in the form of a shaft or rod of less length than the interior of the cylinder 2, said shaft being provided near each end with an enlarged head or shoulder 11 from the center of which projects a screw-threaded extension upon which is mounted a valve or cup-leather 12, the latter being clamped as shown, between the heads 11 and the outer plates 13 by nuts 14, thus forming the valve-heads which fit snugly within the valve cylinder.

As in said former application, the valve portion 9 is provided with an elongated socket 15 in its upper side, within which projects the lower end portion of a starting arm 16, which depends from the inner portion of a key-pin 17, the latter entering the outlet pipe 3 at right-angles therewith and being provided on the outer side of said pipe 3 with a handle-piece 18.

The section 10 of the valve body consists as shown, of a valve plate, the upper side of which is adjacent to the under side of the central portion of the valve portion 9 and the ends of which abut against the shoulders formed in the under side of said portion 9. This valve plate or portion 10 is provided adjoining each of its ends with upwardly projecting lugs 19, which embrace opposite sides of the valve portion 9. Said portion 10 is also provided at each end with a downwardly projecting semi-circular lug indicated at 20, said lugs being adapted to alternately open and cut off communication between the cylinder 2 and ports 5 and 6 as hereinafter described. Formed in the shaft or rod portion 9 of the

valve, near the shoulders or heads 11 thereof, are angular water passages 21 which extending through the screw-threaded stem of the valve, form a communication between those portions of the cylinder 2 which are on opposite sides of the valve-head.

At the center of the length of the cylinder 2, I provide an upwardly extending tube 44 with which is connected the stem or tubular end portion 45 of an oil supply cup 46, the flow of oil through the cylinder into the cup being regulated by a suitable key-valve 47.

As shown in the drawings, the bottom portion of the cylinder 2 is extended to form a base-plate 22. This base-plate rests and is secured upon a correspondingly shaped top plate 23, of an upper side extension 24 of a lower or power cylinder 25. This cylinder 25 has its central portion communicating with the port 4 of the upper cylinder by an exhaust-port or passage 26, while the ports 5 and 6 of the upper cylinder communicate by ports or passages 27, 28, with the cylinder 25 near opposite ends thereof.

As shown in the drawings the cylinder 25 is provided with a detachable head or cap 29 while the opposite end of said cylinder is closed by a suitable disk indicated at 30, the center of which is provided with a water-tight journal bearing 31.

The lower side of the cylinder 25 is provided with an extension or central base-block 32, the central or outlet channel 33 of which communicates through an opening 34 with the interior of the cylinder 25.

Within the cylinder 25 is located a piston rod 35 which bears within the journal bearing 31 and carries upon its inner end portion a piston-head 36. A similar piston head 37 is carried near the center of the length of the piston rod as shown. In forming each of these piston-heads, I employ as shown, a cup-leather indicated at 38 which is clamped between plates 39 and 40. The inner plate or disk 40 as shown, is provided with a central hub through which passes the shaft 35.

The outer portion of each of the plates 40 is bent outward as shown in the drawings at 42, to follow the curve of the corresponding portion of the cup-leather. The depressed or rounded outer portion of each of the plates 40 thus produced, has formed therewith radial lugs or blades 43 which are of substantially a triangular form and which serve to form at regular intervals a continuation of the horizontal plane of the central portion of the plate to the periphery thereof.

48 represents my improved valve-ring which is split or separated as shown at 49. This valve-ring 48 fits and is adapted to slide as hereinafter described within the cylinder 25 between the piston heads 37 and 36, and is so supported within said cylinder as to retain its grooves 50 hereinafter mentioned in communication respectively with the exhaust passage 26 and outlet passage 34. This ring has its body bent inward at opposite points to form oppositely located grooves or ways as indicated at 50.

51 and 52 represent respectively, water passages which extend through the top-plate 23 and extension 24 of the lower cylinder on opposite sides of the exhaust passage 4—26, said passages being as shown, arranged diagonally opposite each other. The upper ends of these passages 51, 52 communicate respectively with the inner ends of grooves or channels 53, 54, said grooves extending in opposite directions to points adjacent to the ends of the top-plate 23. The outer end of the groove or way 53 communicates with an upwardly directed passage 55 which is formed through the bottom plate 22 of the cylinder 2 and the upper end of which communicates with said cylinder adjoining the end thereof, as shown in Fig. 8. The groove or way 54 has its outer end communicating with the interior of the opposite end of the cylinder 2 through a passage 56 which corresponds in form with the passage 55 and which is shown in dotted lines in Fig. 1 of the drawings.

In order to illustrate the operation of my device, we will suppose that the parts are substantially in the positions shown in Fig. 2 of the drawings, *i. e.*, the port 6—28 open or partially so, the valve of the cylinder 2 in such position that the passage 56 is closed by one of said valve heads; that the piston head 36 is within the rear end portion of the cylinder 25; that the valve ring has been forced by contact with the piston head 37, to such position that the passage 52 is in communication with one of the spaces between the lugs or blades 43 of said piston head plate. The parts being in these positions, the water which is supplied from the pipe 3 and which passes therefrom into the cylinder 2 partially escapes from said cylinder through the port 6—28 to the space in rear of the piston head 36. The pressure thus imparted to the piston head results in driving the latter forward. A portion of the water entering the cylinder 2 is forced through the valve passage 21 and thus fills the space in front of the valve head, through which said passage is formed. The forward movement hereinbefore mentioned of the piston head 36 results in the contact of said piston head and the end of the ring 48 and in said ring being thus driven forward in the cylinder 25 until the mouth of the passage 51 is unclosed and the mouth of the passage 52 is covered by the periphery of the ring. This opening of the passage 51 results in a discharge of the water contained in that end of the cylinder from which leads the passage 55. This cylinder end being thus relieved from pressure, the pressure of the water contained in the opposite end of said cylinder affords the desired power to drive the valve of the operating cylinder toward the exhausting end of said cylinder, until the outlet passage 55 is closed by the valve head.

This movement of the valve of the operating cylinder results in forming a communication between the port 6—28 and the exhaust port 4—26 and in opening the port 5—27 to communication with the valve cylinder 2.

From the action above described, it will readily be seen that the motive power is imparted to the upper cylinder or valve or piston through the pressure of the water which enters the cylinder ends through the passage 21 and that the reciprocating motion of the piston of the lower cylinder imparts such movement to the valve ring, as to alternately close and unclose the exhaust passages 51 and 52 which lead respectively from the ends of the upper cylinder. It will also be seen the connections of the passages 55 and 56 within the cylinder 2 are at such points in said cylinder as to result in said passages being closed by the operating valve heads before the latter reach the ends of the cylinder, thus leaving a sufficient volume of water in the cylinder end to cushion the same against the contact of the valve head. In this manner, all undesirable noise or jar which might result through the operation of the motor is obviated.

From the construction of my improved valve ring, it is evident that the grooves 50 will at all times be in communication with the exhaust port 4—26, and that the water from said port will be carried through said grooves and cylinder 25 into the outlet pipe 33. It will also be seen that the construction of the plates 40 which form parts of the piston heads 36 and 37 is such as to admit of a direct contact and pressure against the valve ring and at the same time allow the water from the passages 51 and 52 to escape into the lower cylinder.

From the construction herein shown and described, it will be seen that a simple and reliable form of water motor may be produced at a reasonable cost of manufacture; that its action is positive and that the parts are so arranged and constructed as to greatly decrease the liability of the same getting out of working order.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a water motor, the combination, with a working cylinder, of a valve cylinder connected therewith, said cylinders being provided with passages to form communications between each end of the valve cylinder and with the working cylinder on each side of its center, said cylinders being also provided with an exhaust passage and with inlet passages extending from each side of the exhaust to the end of the working cylinder, a double headed piston within the working cylinder, a ring valve between the two heads, provided with recesses upon diametrically opposite sides thereof, said ring valve having an intermittent reciprocatory motion, whereby it is adapted to alternately open and close the passages leading from the center of the cylinder to the ends of the valve cylinder, and a reciprocatory valve in the valve cylinder, the heads of which are adapted to alternately open and close the passages at the ends of said cylinders, substantially as set forth.

2. In a water motor, the combination with the power cylinder 25 and driving piston having two piston heads therein, valve ring 48 fitting and sliding in said power cylinder, oppositely located grooves or suitable ways 50 in said ring and outlet 34 in said cylinder, of upper cylinder 2, a water inlet therefor and ports 55—56 near the cylinder ends which communicate with the cylinder 25, a reciprocating valve in said upper cylinder and passages 21 through the heads thereof, ports 4—26, 6—28, and 5—27 connecting cylinders 2 and 25 as described and passages 51—53 and 52—54 connecting said cylinders and adapted to be closed or opened by the movement of the valve ring, substantially as and for the purpose specified.

3. In a water motor, the combination with the cylinders 2 and 25, ports 6—28, 4—26 and 5—27 connecting said cylinders as described, exhaust ports near the ends of said cylinder 2 which connect with said cylinder 25, a reciprocating piston in said cylinder 25 having heads 36, 37 as described, a face plate 40 on each of said valve heads, said face plate having inturned edge portions from which rise as described, lugs 43, a valve ring between said piston heads and grooves or openings 50 therein, said valve ring adapted by contact with said valve heads to close or open communication between the two cylinders through the ports 55—56, substantially as and for the purpose specified.

4. In a water motor the combination with the cylinder 25, a ring valve therein having an intermediate sliding motion, and a waste passage 33 as described, of a valve cylinder, a reciprocating valve therein, passages connecting said cylinder 25 with the power chambers of said valve cylinder, said passages opened and closed by the movement of said ring, valve and passages establishing as described, communication between said waste pipe 33 and the two ends of the valve cylinder 2 alternately through said ring valve substantially as and for the purpose specified.

CHARLES L. WILKINS.

In presence of—
C. C. SHEPHERD,
BARTON GRIFFITH.