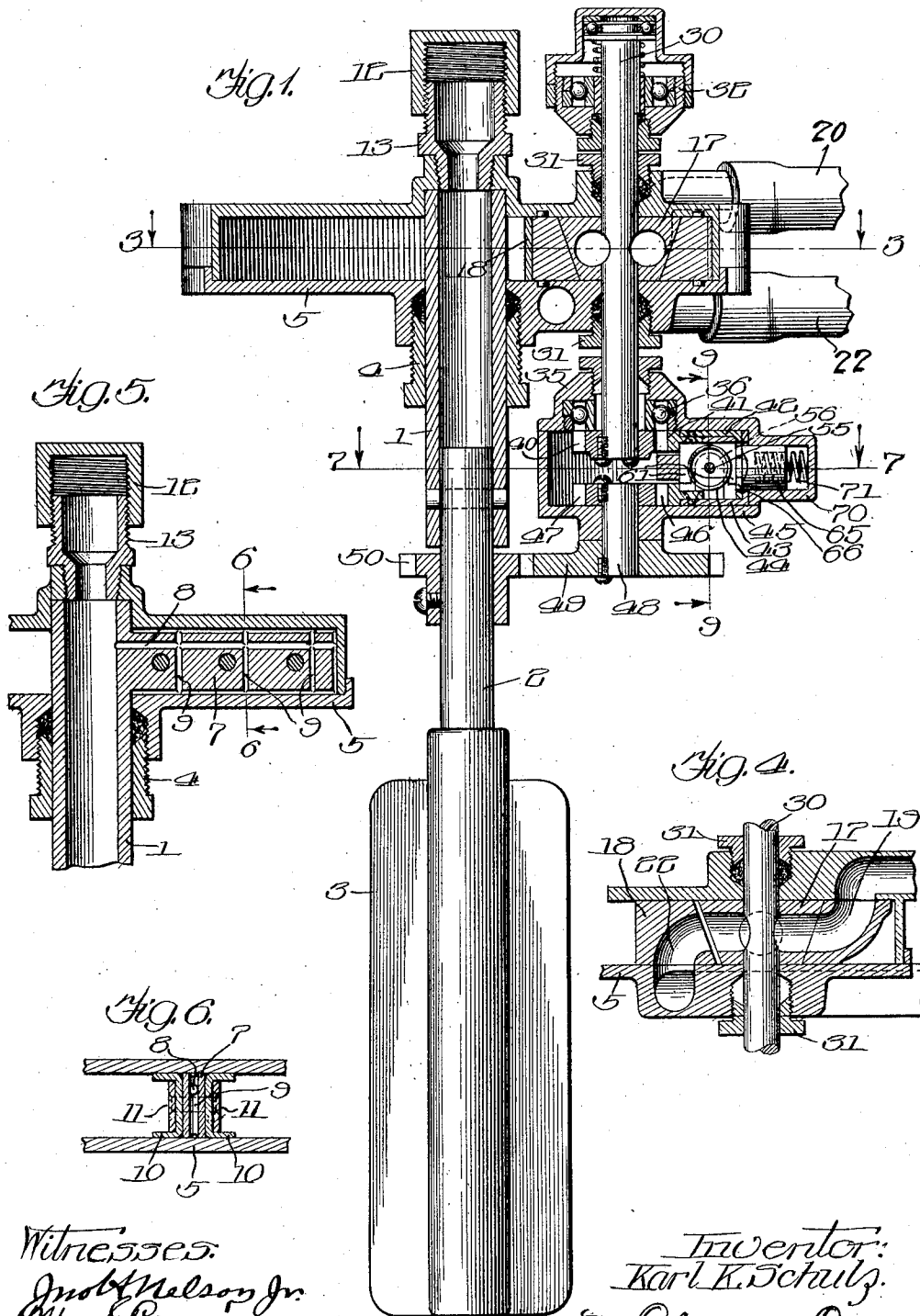


K. K. SCHÜLZ.
WATER MOTOR.
APPLICATION FILED MAY 23, 1912.

1,059,079.

Patented Apr. 15, 1913.

3 SHEETS—SHEET 1.



Witnesses:
J. M. Nelson Jr.
M. S. Rosenzweig

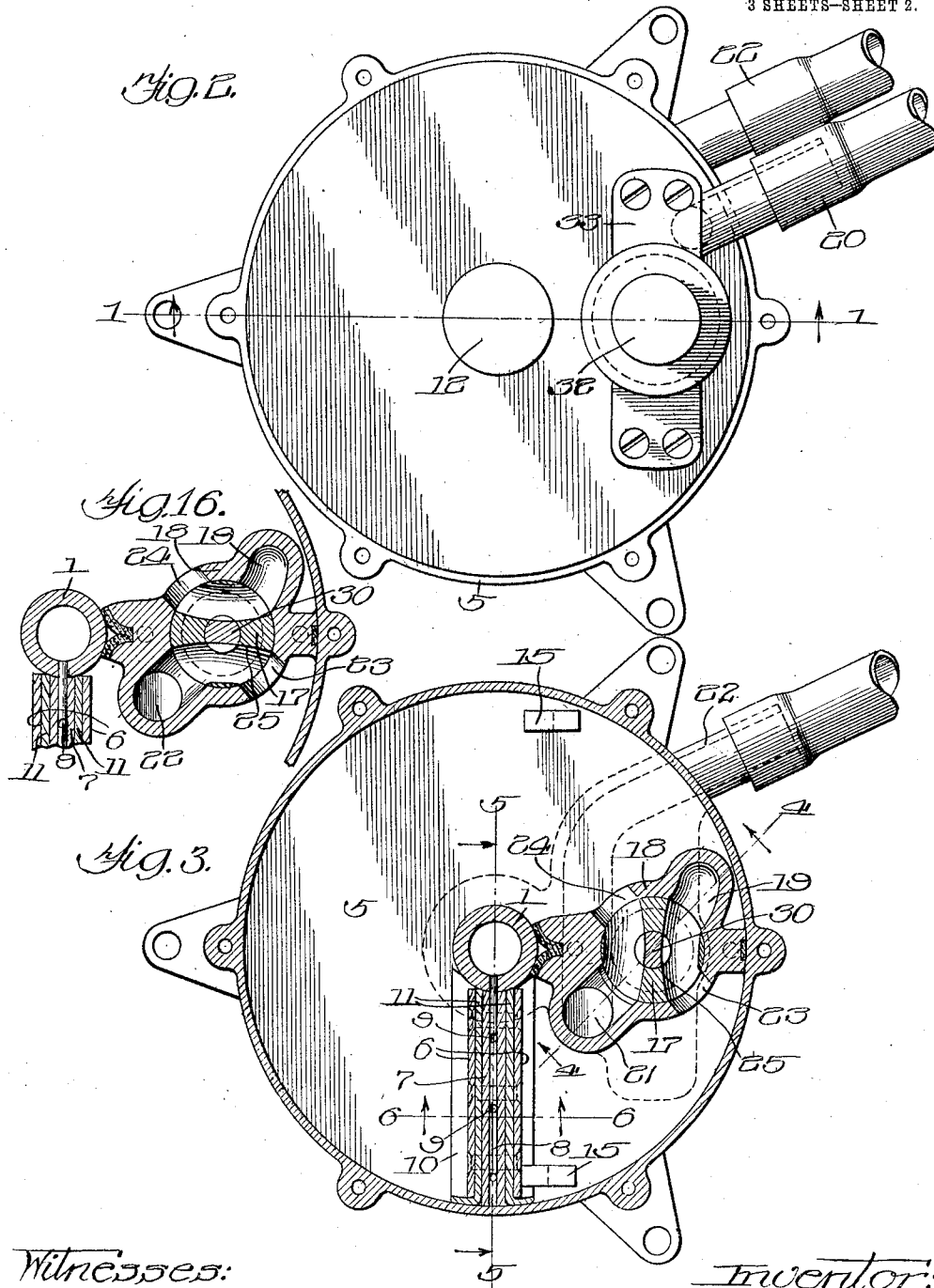
Inventor:
Karl K. Schulz.
By Cheever & Cox
attys.

K. K. SCHULZ.
WATER MOTOR.
APPLICATION FILED MAY 23, 1912.

1,059,079.

Patented Apr. 15, 1913.

3 SHEETS-SHEET 2.



Witnesses:

Jno. H. Nelson, Jr.
Max S. Rosenzweig

Inventor:
Karl K. Schulz.
By Cheever & Cox
attys

K. K. SCHULZ.

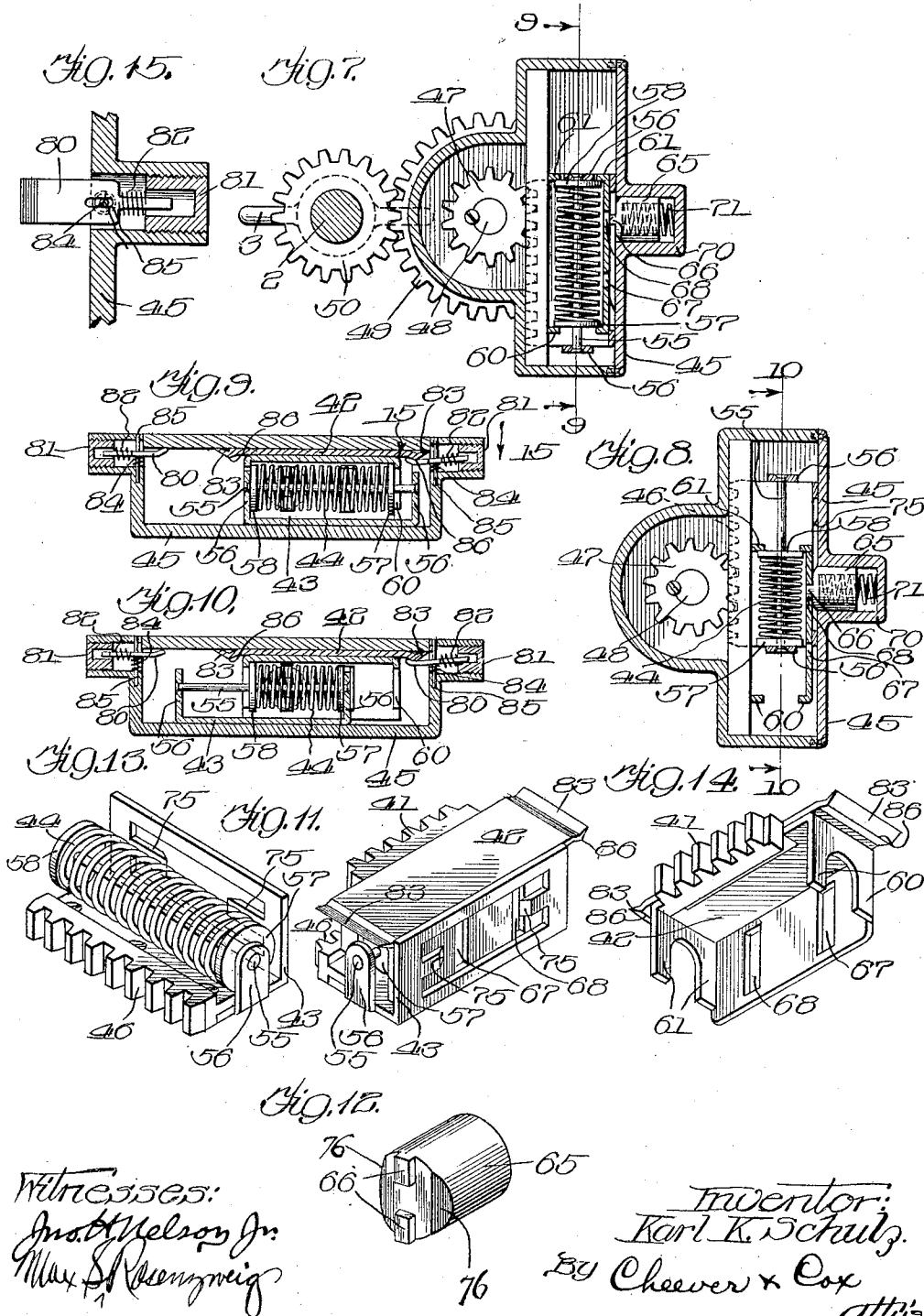
WATER MOTOR.

APPLICATION FILED MAY 23, 1912.

1,059,079.

Patented Apr. 15, 1913.

3 SHEETS-SHEET 3.



UNITED STATES PATENT OFFICE.

KARL K. SCHULZ, OF CHICAGO, ILLINOIS.

WATER-MOTOR.

1,059,079.

Specification of Letters Patent.

Patented Apr. 15, 1913.

Application filed May 23, 1912. Serial No. 699,221.

To all whom it may concern:

Be it known that I, KARL K. SCHULZ, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Water-Motors, of which the following is a specification.

My invention relates to fluid actuated motors and in the form here selected for illustration, is particularly adapted for oscillatory water motors, designed to operate washing machines.

The objects of my invention are first, to provide full stroke mechanism for insuring full and proper action of the controlling valve; second, to provide means for absorbing the shock which might be otherwise incident to the movement of the valve; third, to provide means for lubricating the motor piston, and fourth, to provide various details of construction whereby the manufacture may be simplified and the motor rendered efficient and durable.

I obtain my objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a sectional assembly view taken on a plane passing through the axes of the main shaft and valve shaft as indicated by the line 1—1, Fig. 2. Fig. 2 is a plan view of the parts shown in Fig. 1. Fig. 3 is a plan section taken on the line 3—3, Fig. 1. Fig. 4 is a vertical section of the valve and valve casing on the line 4—4, Fig. 3. Fig. 5 is a vertical section on the line 5—5, Fig. 3. Fig. 6 is a vertical section on the line 6—6, Figs. 3 and 5. Fig. 7 is a plan section of the valve operating mechanism, taken on the line 7—7, Fig. 1. Fig. 8 is similar to Fig. 7, but shows the parts in changed position. Fig. 9 is a vertical section of the full stroke mechanism for operating the controlling valve. The plane of section is on the line 9—9, Figs. 1 and 7. Fig. 10 is similar to Fig. 9, but shows the parts in changed position. The plane of section is indicated by the line 10—10, Fig. 8. Fig. 11 is a perspective view of the cage which comprises the chief elements of the full stroke mechanism. Fig. 12 is a perspective view of the detent which is one of the parts of the full stroke mechanism. Figs. 13 and 14 are perspective views of parts of the full stroke mechanism. Fig. 15 is a sectional detail on the line 15—15, Fig. 9, and shows the shock absorber and the ar-

rester for the cage parts. Fig. 16 is a plan section showing the valve changed from the position shown in Fig. 3. The plane of section is indicated by the line 3—3, Fig. 1.

Similar numerals refer to similar parts throughout the several views.

According to the present design, the main shaft 1 is hollow and has a post 2, 3 secured thereto, said post being adopted for the usual dolly. (Not shown.) Shaft 1 passes through a gland 4, into the piston chamber 5 which is circular and contains the oscillatory piston 6. The construction of this piston forms one of the important features of my mechanism, and is best shown in Figs. 3, 5 and 6.

The center core of the piston consists of an arm 7 which extends radially from shaft 1 and has a longitudinal duct 8 communicating with vertical ducts 9, as best shown in Fig. 5. Two washers 10, back up to said arm, as best shown in Fig. 6, the upper and lower edges bending over to form flanges which contact the top and bottom of the piston chamber. The washers are preferably formed of leather and are held in position by plates 11 which are riveted or otherwise fastened to arm 7. It will be obvious that by forcing grease into the hollow shaft it will enter the ducts 8 and 9 and pass to the edges of the piston and prevent the water from leaking past it. The grease is contained in the shaft and in a cup 13 screwing into the top of the piston chamber and closed by a screw cap 12. After the cavities are filled, a turn or two on cap 12 will inject enough grease into ducts 8 and 9 to keep them filled.

The shaft is rotated by the piston, which in the present instance swings through an arc of about 180 degrees, being limited by the two stationary stops 15, shown in Fig. 3. The piston is actuated by introducing the actuating fluid first on one side of the piston and then on the other. The admission and exhaust of the fluid is controlled by a valve 17 mounted in valve casing 18. Said casing has an inlet port 19, supplied through the duct 20, and an outlet 21 drained by duct 22. Valve casing 18 is also provided with two ports 23 and 24. The valve has a central partition 25 and the parts are so constructed and arranged that when the valve occupies one position, for example as shown in Fig. 3, water will be introduced on one side of the piston and be permitted to escape

from the opposite side thereof; and when the valve is rotated 90 degrees to the position shown in Fig. 16, the flow of water will be reversed and cause the piston to travel in the opposite direction.

The controlling valve is operated by a valve shaft 30, which passes through glands 31 screwing into the top and bottom of the casing as best shown in Figs. 1 and 4. The upper end is journaled in a suitable bearing 32, carried by a bracket 33 supported on top of the piston chamber. The lower end of the valve shaft is also furnished with a bearing which consists chiefly of the casing 35, secured to the bottom of the piston chamber and provided with a ball bearing 36, as best shown in Fig. 1.

I will now describe the full stroke mechanism and the apparatus whereby the valve shaft 30 is operated. At the lower end of the valve shaft is fastened a pinion 40 which meshes with a rack 41 formed at the edge of a part 42, as best shown in Fig. 14. This element 42 and its companion 43, shown in perspective in Fig. 13, and assembled in Fig. 11, form two of the chief elements of the full stroke mechanism and when assembled somewhat resemble a cage in which a helical compression spring 44 is inclosed. This cage fits within the housing 45 secured to the casing 35, as best shown in Fig. 1. Both the elements 42 and 43 are independently slidable in the housing and element 43 has a rack 46 which meshes with a pinion 47. Pinion 47 is fastened to a jack shaft 48 journaled in the housing 45. A spur gear 49 is fastened to shaft 48 outside of the housing and meshes with a pinion 50 fastened to the post 2. It will be clear that when said post and the pinion 50 rotates back and forth they will impart corresponding rotary movement to shaft 48 and cause a rectilinear reciprocatory movement of the cage element 43. The movement of part 43 is transmitted to part 42 through the agency of the spring 44 in the following manner: A rod 55 passes longitudinally through the center of the spring and is supported at the ends by two lugs 56 which project up from the part 43 and are preferably formed integral therewith. Loosely mounted upon the rod at the ends of the spring are two end plates 57, 58. Thus the end plates are free to slide along the rod 55, but are normally held in contact with the lugs 56. The upper cage part 42 which fits over the lower part 43 is provided at the ends with fingers 60 and 61 which are located far enough apart to loosely straddle the lugs 56 without engaging them. The fingers 60 engage the outer surface of the plate 57 and the fingers 61 engage the outer surface of the plate 58. Hence the two cage parts are capable of sliding independently of each other in a direction parallel

to the rod 55 and the upper part 42 is normally held by spring 44 in central position with the plates 57 and 58 in contact with the lugs 56. In this position the ends of the cage parts substantially register with each other. Thus relative movement of the two cage parts is possible, but is opposed by the force of the spring.

The reciprocatory movement of the lower cage part is approximately uniform and corresponds with the movement of shaft 1. The movement of the upper cage part, however, is intermittent, being temporarily detained at each end of its stroke by a detent 65, shown in perspective in Fig. 12, and also in Figs. 7 and 8. Said detent is provided with lugs 66 adapted to enter the slots 67 and 68 in the back of part 42. Said detent fits slidably within the guide socket 70, formed in the back of housing 45. It is constantly urged forward by a spring 71; and by reference to Figs. 1, 7 and 8, it will be apparent that when the detent is forward, in acting position, as shown in the drawings, it will hold the upper cage part against movement. Said detent is automatically repressed, that is, forced backward to non-acting position, by cams 75 formed on the back of the lower cage part. As one of these cams comes along it engages the nearest bevel 76 on the detent and forces the latter back, thus releasing the upper cage part and permitting the spring 44 to quickly move the said upper cage part forward to the end of its stroke where the lugs 66 of the detent will again enter one of the slots in the back of said upper cage part. This forward movement of the upper cage part and rack 41 drives the pinion 40 and causes the latter to reverse the position of the controlling valve and hence reverse the travel of the main piston. The action of the controlling valve is thus intermittent as it should be, and retains one position until it should be reversed whereupon it quickly reverses its position, and in each instance makes a full movement, that is, a full quarter turn.

I will now describe the shock absorbing and brake mechanism of the full stroke mechanism: As above indicated, the movement of the upper cage part 42 tends to be rapid on account of its sudden release. The shock incident to its arrest is lessened by arresters 80 at each end of the housing 45, as best shown in Figs. 9, 10 and 15. These arresters fit into sockets 81 at the rear end where they are cushioned by small compression springs 82. Cams 83 are formed at each end of part 42 and these slip under the arresters and force the latter back against the pressure of the springs 84. Said springs 84 encircle small guide pins 85 and hold the arresters normally in close contact with the back of the housing. Obviously, the cams 83 striking the arresters will be retarded there-

by and relieve the shock which would otherwise occur. The parts just mentioned perform another function in serving to prevent rebound of the upper cage part. For this purpose the forward ends of the arresters are hook shaped and are adapted to slip over and releasably engage ridges 86 formed on the front of the cams 83. The relation of these parts is best shown in Figs. 9 and 10.

In operation, when the main piston is traveling in a clockwise direction with the valve in the position shown in Fig. 3, a rotary movement will be imparted to the gear wheels 50, 49 and 47 and will cause the lower cage part to move forward until the tripping cams 75 repress the detent 65 and release the upper cage part 42. Thereupon the upper cage part, acting under the influence of the main spring 44, travels forward and reverses the controlling valve 17. This reverses the direction of travel of the main piston, and a similar action takes place at the end of its movement.

It will be understood that the design of the motor may be considerably varied without departing from the spirit of the invention. For example: the shock absorbing mechanism might be entirely dispensed with without rendering the apparatus inoperative. Again, the form of bearing for the valve shaft may be altered to suit conditions. Other changes may suggest themselves to those skilled in the art.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a fluid actuated motor, a piston chamber, a piston therein having an internal duct leading to the contact edge of the piston, a hollow rotary shaft to which said piston is fastened, the duct in the shaft communicating with the duct in the piston, and a stationary lubricant receptacle in communication with the duct in the shaft for supplying lubricant thereto.

2. In a fluid actuated motor, a piston chamber, a piston therein having an internal duct leading to the contact edge of the piston, a hollow rotary shaft to which said piston is fastened, the duct in the shaft communicating with the duct in the piston, and a chambered screw cap for containing lubricant and forcing it as required into said ducts.

3. In a fluid actuated motor, a piston chamber, a rotary hollow shaft, a piston secured to said shaft and working in said piston chamber, said shaft and said piston having an internal duct leading from the end of the shaft to the friction edge of the piston and a screw cap screwing onto said piston chamber in position to communicate with the end of the duct in the shaft.

4. In a fluid actuated motor, in combina-

tion, oscillating motor and valve shafts, a jack shaft geared to the motor shaft and a full stroke mechanism comprising a first part geared to the jack shaft, a second part geared to the valve shaft, a detent for holding said second part at the end of its stroke, a spring interposed between said first and second parts, and means for automatically repressing said detent when the motor shaft has reached the end of its throw.

5. In a fluid actuated motor, the combination with the main and valve shafts having an oscillating motion, of a full stroke mechanism for the valve shaft, said mechanism comprising a first part sliding rectilinearly in synchronism with the main shaft, a spring strained by said first part, a second part of the full stroke mechanism actuated by said spring and adapted to actuate the valve shaft, a detent for temporarily arresting said second part, and means on said first part for releasing the second part from said detent.

6. In a fluid actuated motor, the combination with the main and valve shafts having an oscillating motion, the piston actuating the main shaft and the casing for said piston, of a full stroke mechanism for the valve shaft, said mechanism comprising a first part actuated by the piston, a spring strained by said first part, a second part of the full stroke mechanism actuated by said spring and articulately connected to the valve shaft for operating it, a detent for temporarily arresting said second part, and means on said first part for releasing the second part from said detent.

7. In a fluid actuated motor, the combination with the main and valve shafts having an oscillating motion, the piston actuating the main shaft and the casing for the piston, of a full stroke mechanism for the valve shaft, said mechanism comprising a first part moving in synchronism with the main shaft and separate therefrom and from the piston, a spring strained by said first part, a second part of the full stroke mechanism actuated by said spring and adapted to actuate the valve shaft, a detent for temporarily arresting said second part, and means actuated by said first part for rendering the detent non active.

8. In a fluid actuated motor, the combination with the main and valve shafts having an oscillating motion, of a full stroke mechanism for the valve shaft, said mechanism comprising a first part moving in synchronism with the main shaft, a spring strained by said first part, a second part of the full stroke mechanism actuated by said spring and adapted to actuate the valve shaft, a detent for temporarily arresting said second part, and two oppositely faced cams on said first part adapted to engage and repress said detent for releasing said second part and permitting it to operate the valve shaft

when the motor shaft has completed a movement in either direction.

9. In a fluid actuated motor, the combination of an oscillating piston, a piston chamber, a main shaft fastened to said piston, a valve for controlling the actuating fluid, and connections between said shaft and valve for actuating the latter said connections comprising a first element adapted to reciprocate in a straight line and moved by and in synchronism with the shaft, a spring strained by said first element, a second element actuated by said spring and connected to the valve for operating it, and a detent adapted to temporarily detain said second element and adapted to be repressed by said first element.

10. In a fluid actuated motor, the combination of an oscillating piston, a piston chamber, a main shaft fastened to said piston, a valve for controlling the actuating fluid, and connections between said shaft and valve for actuating the latter, said connections comprising two sliding cage parts inclosing a spring, the first cage part being in positive gear connection with the shaft and the second cage part being in positive gear connection with the valve, and the spring being adapted to be strained by the first and to operate the second of said cage parts, the second cage part having two slots, a spring urged detent adapted to enter first one and then the other of said slots to hold the second cage element temporarily at the end of its stroke, and cams on the first cage part for forcing the detent out of the slots to thereby release the second cage part.

11. In a fluid actuated motor, the combination with the motor shaft of an oscillating valve, a sliding reciprocating element, toothed gears connecting said sliding element with said shaft, a spring adapted to actuate said sliding element, a detent for temporarily holding said sliding element, means actuated by the motor shaft for straining said spring and subsequently repressing said detent whereby said sliding element is suddenly released and shot forward under the action of said spring, and means for gently arresting said sliding element.

12. In a fluid actuated motor, the combi-

nation with the motor shaft, of an oscillating valve, a sliding reciprocating element in gear connection therewith, a spring adapted to actuate said sliding element, a detent for temporarily holding said sliding element, means actuated by the motor shaft for straining said spring and subsequently repressing said detent whereby said sliding element is suddenly released and shot forward under the action of said spring, said sliding element having a cam thereon, a plate in position to be struck by said cam, and a spring for yieldingly holding said plate in position.

13. In a fluid actuated motor, the combination with the motor shaft of an oscillating valve, a sliding reciprocating element in gear connection therewith, a spring adapted to actuate said sliding element, a detent for temporarily holding said sliding element, means actuated by the motor shaft for straining said spring and subsequently repressing said detent whereby said sliding element is suddenly released and shot forward under the action of said spring, said sliding element having a cam thereon, an arresting plate in position to be struck by said cam and transversely arranged springs adapted to yieldingly hold said arresting plate in position.

14. In a fluid actuated motor, an oscillating valve, a sliding element for operating the same, a spring for actuating said sliding element, a reciprocating motor shaft, connections whereby said spring is strained in synchronism with said shaft, a detent for temporarily holding said sliding element, means operated by said connections for repressing said detent to suddenly release said sliding element, said sliding element having a ridge formed thereon, and a spring pressed hook for engaging said ridge at the end of the movement thereof for preventing rebound of said sliding element.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

KARL K. SCHULZ.

Witnesses:

HOWARD M. COX,

MAX S. ROSENZWEIG.