J. McGEORGE.

PUMP.

APPLICATION FILED MAR. 28, 1906.

1,027,139.

Patented May 21, 1912.

2 SHEETS—SHEET 1.

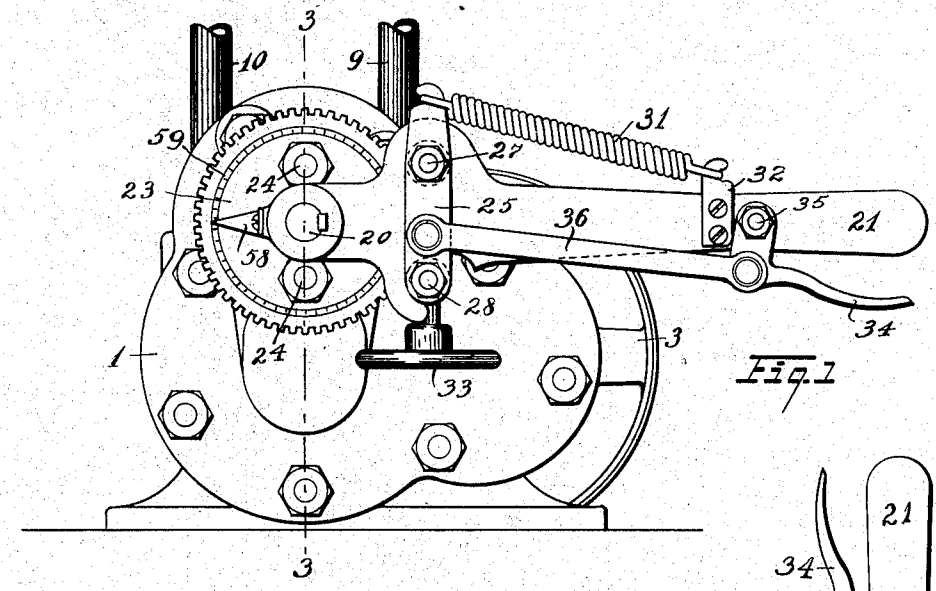

Fig. 1

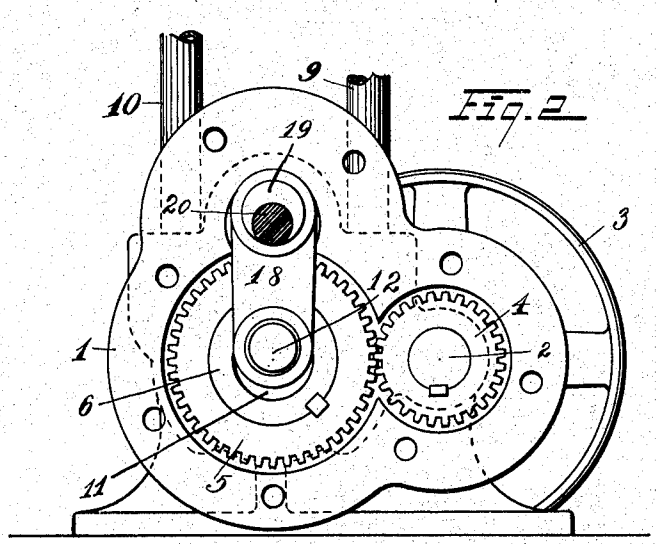

Fig. 2

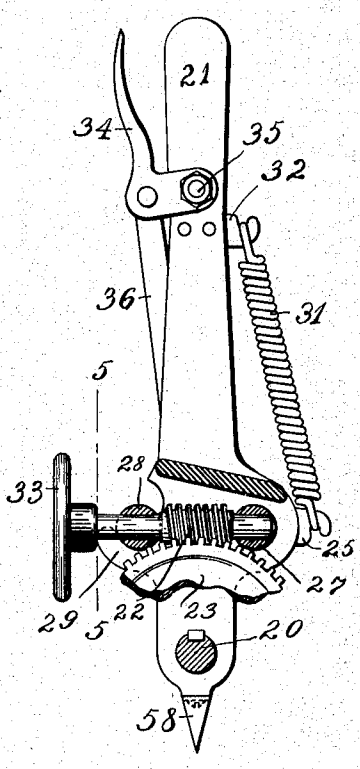

Fig. 6

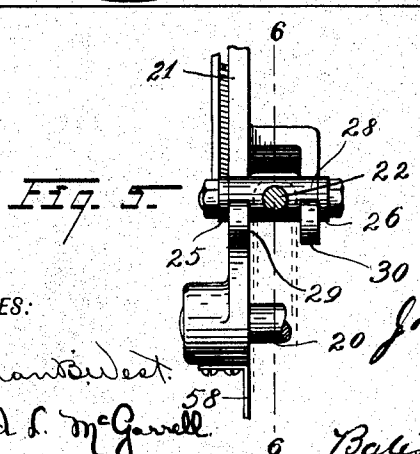

Fig. 5

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2 SHEETS—SHEET 2.

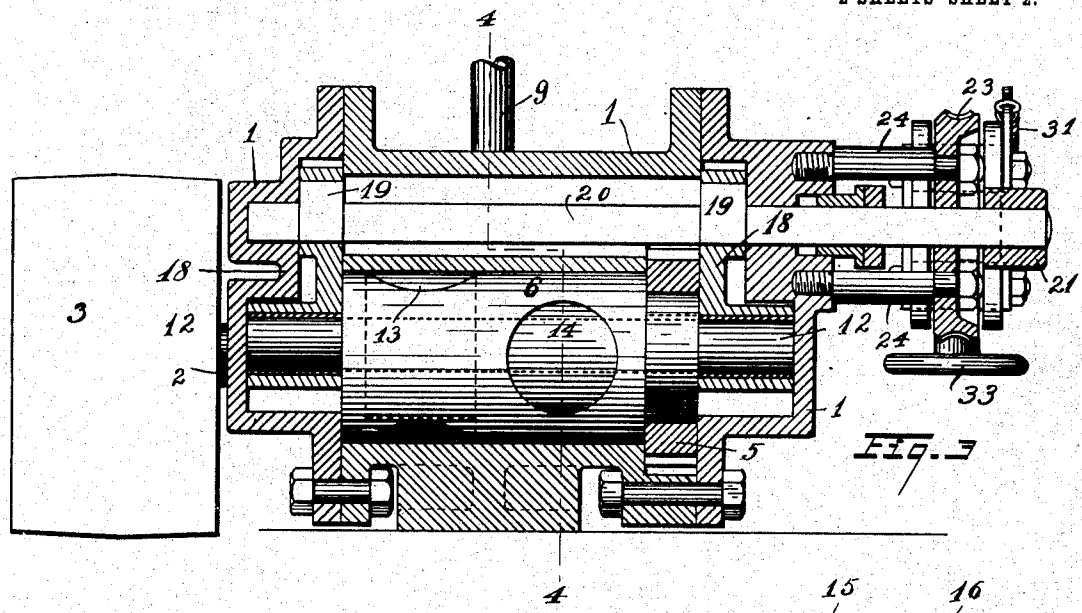

Fig. 3

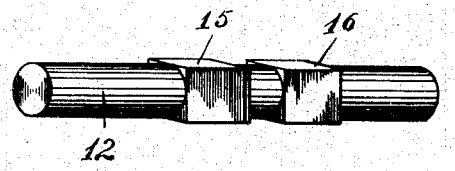

Fig. 7

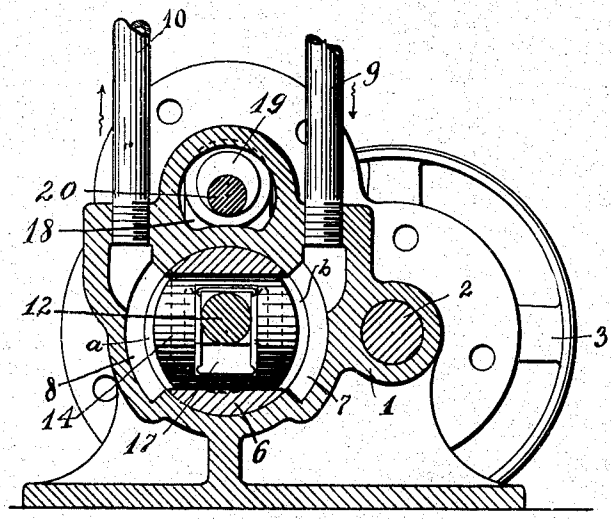

Fig. 4

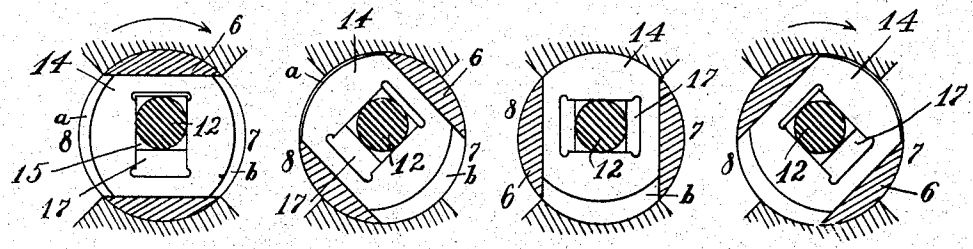

Fig. 8 Fig. 9 Fig. 10 Fig. 11

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UNITED STATES PATENT OFFICE.

JOHN McGEORGE, OF CLEVELAND, OHIO.

PUMP.

1,027,139. Specification of Letters Patent. Patented May 21, 1912.

Application filed March 28, 1906. Serial No. 308,408.

To all whom it may concern:

Be it known that I, JOHN McGEORGE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates in general to variable speed devices, and has particular reference to a pump that is so constructed that the throw of the piston therein may be varied at will, and the course of the propelling fluid through the pump will contain no sharp angles whereby the efficiency would be reduced. The pump is adapted to be combined with a motor which is then driven by the fluid furnished by means of said pump.

The object of the invention is to furnish means for driving the motor at variable speeds, and to so construct the parts that the device will be under perfect control, and, at the same time be simple in construction and efficient and positive in operation.

In the drawings forming a part of this application, Figure 1 is an end elevation of the pump showing the pipes for conducting the propelling fluid to and from the motor; Fig. 2 is an elevation of the right hand end of the parts shown in Fig. 3, the casing at said end being removed, and the eccentric shaft being in section. Fig. 3 is a longitudinal sectional view taken on the line 3—3 of Fig. 1 and looking to the right. Fig. 4 shows a transverse section taken on the line 4—4 of Fig. 3 and looking toward the left. Fig. 5 is a view of a portion of the shifting lever shown in Fig. 1, said view being taken on the line 5—5 of Fig. 6. Fig. 6 is a view taken on the line 6—6 of Fig. 5. Fig. 7 is a perspective view of the shaft for operating the pistons. Figs. 8, 9, 10 and 11 are sectional views showing the various positions of the piston at different periods in the rotation of the cylinder.

Referring now to the drawings, in which like reference characters designate like parts throughout the several views, 1 represents the casing of the pump in which is journaled the main drive shaft 2, which shaft is provided with a pulley 3, or any other suitable form of driving mechanism. Keyed to the shaft 2 within the casing is a pinion 4, (Fig. 2), which meshes with a gear 5 that is keyed to one end of the rotating cylinder 6. This cylinder is mounted for rotation within the casing 1, said casing being bored to receive the cylinder which snugly fits the bore, except at diametrically opposite points where the casing is provided with ports 7 and 8. These ports may be alternately inlet or outlet ports, depending upon the adjustment of the motor, as will be hereinafter described.

Communicating with the ports 7 and 8 respectively, are pipes 9 and 10, said pipes extending from the pump to the motor, and conveying propelling fluid. Extending axially through the cylinder 6 is a circular opening 11, (Fig. 2), and through said opening extends the shaft 12 for operating the pump pistons 13 and 14. This shaft is shown in perspective view in Fig. 7, from which view it will be seen that it is provided with squared portions 15 and 16, said squared portions fitting into rectangular openings 17 in the pistons. The shaft 12 has bearings at its ends in hanging links 18, said links being suspended from eccentrics 19 on an eccentric rod or shaft 20 that is mounted in the casing above the shaft 12 and has its bearings in the end-pieces of the frame 1. By turning the shaft 20 into different positions, the links 18 are raised and lowered, said movement also carrying the shaft 12 up and down in the rectangular openings 17 of the pistons. When the shaft 20 is turned so as to bring the axis of the shaft 12 into coincidence with the axis of the cylinder, the rotation of the cylinder will produce no lateral movement of the pistons 13 and 14. When, however, the shaft 20 is turned so as to lift the shaft 12 above the axial center of the cylinder, and the latter is then rotated, the pistons will be caused to move back and forth through the cylinder, the extent of such movement being dependent upon the distance between the axial centers of the shaft 12 and the cylinder. Figs. 8 to 11, inclusive, show the shaft 12 raised above the axis of the cylinder, and the various positions the piston assumes during a partial rotation of the cylinder. Thus in Fig. 8, the cylinder is turned so that the rectangular opening 17 is vertical. As the squared portion of the shaft 12 fits the side walls of the opening, it is evident that the piston 14 will occupy a central position within the cylinder. Fig. 10 shows the cylinder in such position that the rectangular opening lies in a horizontal position, so that

the squared portion of the shaft 12 lifts the piston 13 vertically, said piston then being in its maximum outer position. Figs. 9 and 11 show the openings 17 in midway positions.

For ease in construction, and in order to secure a more uniform pumping action, I prefer to make the pistons cylindrical in cross section, as appears from the piston 14 in Fig. 3, and to arrange said pistons at angles one with the other. As shown in Fig. 3, the pistons 13 and 14 are arranged 90° apart; and if a greater number of pistons were used in the same cylinder, they should be so arranged as to receive and discharge the propelling fluid at regular intervals.

The pistons fit the bores in the cylinder made therefor snugly so that there can be no leakage of the propelling fluid from one side of the cylinder to the other, and the same may be said of the fit of the cylinder 6 within the bore in the casing. The propelling fluid in the port 7 can pass into the port 8, therefore only as a result of the pumping action of the pistons. When the piston is in its said position, as shown in Figs. 4 and 8, there are pockets *a* and *b* formed by the ends of the piston and the adjacent parts of the cylinder, said pockets then being of equal capacities. As the cylinder rotates to the right, the pocket *a* gradually closes, thereby pushing the propelling fluid it formerly contained into the port 8, and thence into the pipe 10 which conveys the fluid to the motor. As the pocket *a* closes, the pocket *b* opens; and when the cylinder reaches the position shown in Fig. 10, the pocket *a* has completely closed or has ceased momentarily to exist, while the pocket *b* has reached its maximum capacity, both pockets at that instant being out of communication with the ports 7 and 8. As the cylinder continues to rotate, the pocket *b* opens into the port 8, and the piston begins its movement in a direction to close said pocket, thus forcing the liquid therein into the port 8. Simultaneously with the closure of the pocket *b* comes the opening of the pocket *a*, which pocket is then in communication with the port 7. From this description, it will be understood that these pockets receive their propelling fluid from one port, and discharge the same into the other port. The propelling fluid is thus forced into the port 8 and pipe 10, an impulse being given to the liquid in such port and pipe with each reciprocation of the piston. If but a single or a few pistons be employed in the same cylinder, the flow of the fluid through the port 8 will pulsate; but if a sufficient number of pistons be employed and they are arranged at the proper relative angles, the flow will become practically continuous.

The above description applies when the shaft 12 is lifted above the axial center of the cylinder, and when the cylinder is turning to the right, as seen in Figs. 8 to 11, inclusive. If, however, the shaft were lowered below the axial center of the cylinder and the cylinder continued to rotate in the same direction, the direction of motion of the fluid would be reversed; for, as will be seen from Fig. 10, the pocket *b* would then be closed, while the pocket *a* at the opposite end of the piston would be opened and full of the fluid which would then be ready to be discharged into port 7 and through the tube 9. It will thus be apparent that by simply changing the position of the shaft 12, the pump will not operate at all, or will pump with a variable length of stroke, and in such direction as is desired.

The shaft 20 is extended at the end of the casing opposite the drive pulley 3, and it is rocked to vary the eccentricity of the shaft 12 with respect to the cylinder by means of a hand lever 21, said lever being keyed or otherwise suitably connected with the said shaft 20. The lever is held in any adjusted position by means of a worm 22, see Fig. 6, that meshes with a stationary worm gear 23, said worm gear being secured to the casing of the motor by means of bolts 24. The worm 22 is mounted in a frame consisting of side pieces 25 and 26, said frame being carried by the lever 21. The pieces 25 and 26 of the frame are jointed by cross rods 27 and 28, the rod 27 forming a pivot for the frame upon which it is adapted to rock upon the lever. The rod 28 normally rests against stop projections 29 and 30 on the lever, the latter projection being in the form of a bracket that extends from the side of the lever and projects into proper position to support the rod, as seen in Fig. 5. This rod is normally held in engagement with the projections 29 and 30 by means of a coiled spring 31 that engages a hook on one end of the frame piece 25, the other end of said spring hooking over a projection 32 on the arm 21. The frame piece 26 is a duplicate of the frame piece 25, except for the hook on the latter, which is not present on part 26. The rod 27 is journaled in the hand-lever 21 and in the bracket projection 30, the latter extending about in a right-angled formation and being of sufficient length to serve as such bearing. The worm 22 is journaled in the cross rods 27 and 28 and it carries on the end opposite the pivot rod 27 a hand wheel 33 by which the worm may be turned so as to vary the adjustment of the lever. The worm may be thrown entirely out of mesh with the wheel 23 by means of a grip lever 34 that is pivoted at 35 to the hand lever 21, said grip lever being connected through a link 36 with the side piece 25. When the grip lever is drawn toward the hand lever, the frame is turned about the rod 27 and the worm is entirely disengaged

from the wheel, so that the hand lever may be turned to any desired extent. By simply releasing the grip lever, the worm is drawn into engagement with the stationary worm wheel, which will hold the lever in the position into which it has been moved. If, however, the adjustment is not exactly as desired, a simple rotation of the hand wheel 33 will rotate the worm and thus move the hand lever about the worm wheel to the desired position.

Any kind of self starting, positive acting, reversible motor can be used with this pump. I prefer to use a piston motor having more than two cylinders acting at different angles upon the same crank shaft, since with a piston motor there is no "slip" between the impelling fluid and the motor parts which would diminish the efficiency of the system. The use of any number of cylinders above two renders the device self starting, and a piston motor made in this manner will run equally well in either direction and hence may be reversed by merely changing the direction of fluid supply thereto. With any such arrangement it will be clear that the rapidity of rotation of the shaft of the motor depends upon the length of the stroke given to the pistons in the pump. By simply moving the hand lever 21, the rapidity of rotation of the motor can be varied at will, within limits, or said motor can be reversed at will. In this way, the power which can be furnished or the speed attained by the motor can be easily controlled. As the degree by which the power is multiplied or the speed of the motor depends upon the position of the hand lever 21, the amount of such multiplication or the speed of the driven shaft may be indicated by an index pointer 58 on the hand lever, said pointer moving over an index scale 59 on the worm gear.

While I have necessarily illustrated and described specific mechanism for carrying out the principles of my invention, I desire it to be understood that the following claims are not to be limited to such specific mechanism any further than is rendered necessary by the terms therein employed or by the prior state of the art.

Having thus described my invention, I claim:

1. In a device of the character described, a casing, an inlet and an outlet port in said casing, a cylinder mounted within the casing between said ports, means for turning said cylinder, a piston mounted in said cylinder, a shaft passing through said cylinder and having a bearing portion upon which the piston is adapted to reciprocate, and means for varying the position of the shaft with respect to the axis of the cylinder whereby the extent of the throw of the piston into the cylinder is regulated.

2. In a device of the character described, a casing, an inlet and an outlet port in said casing, a cylinder mounted within the casing between said ports, means for turning said cylinder, a plurality of pistons mounted in said cylinder, a shaft passing through said cylinder and having a bearing portion upon which the pistons are adapted to reciprocate, and means for varying the position of the shaft with respect to the axis of the cylinder, whereby the throw of the pistons in the cylinder is regulated, said pistons being so arranged as to discharge successively and at regular intervals.

3. In a device of the character described, a casing, an inlet and an outlet port within the casing, a cylinder mounted within the casing between the ports, means for rotating the cylinder, a piston mounted to rotate with the cylinder and adapted to reciprocate therein, a shaft passing through the cylinder and the piston, said piston having a bearing upon the shaft, and means for moving the said shaft bodily to vary the position of the shaft with respect to the piston, whereby the throw of the latter is regulated.

4. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a piston mounted to reciprocate in said cylinder, a shaft passing through said cylinder and engaging the piston whereby the latter is caused to reciprocate as the cylinder rotates, and means for moving said shaft bodily so that it may occupy different positions relative to the axial line of said cylinder, whereby the piston may transfer fluid from one port to the other in variable quantities or may reverse the direction of the motion of said fluid.

5. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a piston mounted to reciprocate in said cylinder, a shaft passing through said cylinder and engaging the piston whereby the latter is caused to reciprocate as the cylinder rotates, a rod having eccentrics, means for rotating said rod, and means connecting said rod with the shaft for moving said shaft so that it may occupy different positions relative to the axial line of said cylinder, whereby the piston may transfer fluid from one port to the other in variable quantities or may reverse the direction of the motion of said fluid.

6. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a plurality of pistons mounted to reciprocate in said cylinder, said pistons being shorter than the diameter of the cylinder, whereby pockets are formed at the ends of the pistons, a shaft passing through said

cylinder and engaging the pistons whereby the latter are caused to reciprocate as the cylinder rotates, and means for moving said shaft so that it may occupy different positions relative to the axial line of said cylinder, whereby the pockets at the ends of the pistons may receive fluid from one port and transfer it to the other port in variable quantities, or whereby the direction of the motion of said fluid may be reversed.

7. In a device of the character described, a casing, a pair of ports in said casing, a cylinder rotating between said ports, a shaft passing through the cylinder, a piston mounted in the cylinder, said piston having an elongated opening through which the shaft passes, a squared portion on said shaft engaging with the elongated opening in the piston, and means whereby the shaft may be moved to opposite sides of the central axis of the cylinder, whereby as the cylinder rotates, the piston will be reciprocated a variable distance on the squared portion of the shaft or its direction of motion reversed.

8. In a device of the character described, a casing, a pair of ports in said casing, a cylinder rotating between said ports, a shaft passing through the cylinder, a piston mounted in the cylinder, said piston having an elongated opening through which the shaft passes, a squared portion on said shaft engaging with the elongated opening in the piston, a rod having eccentrics, means for turning said rod, and connections between said rod and shaft, whereby the shaft may be moved to opposite sides of the central axis of the cylinder, so that as the cylinder rotates, the piston will be reciprocated a variable distance or its direction of motion reversed.

9. In a device of the character described, a casing, a pair of ports in said casing, a member mounted to rotate between said ports, a piston reciprocated by said member, said piston having an elongated opening, a shaft passing through the member and through the opening in the piston, a squared portion upon said shaft upon which the piston is adapted to reciprocate, a rod having eccentrics, connections between said rod and the shaft, a lever for turning said rod to vary the position of the shaft with respect to the axial line of the cylinder, whereby the strokes of the piston may be varied or its direction of action reversed, and means for holding the lever in any position to which it may be moved.

10. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a piston reciprocating in said cylinder, said piston having an elongated opening, a shaft passing through the cylinder and through the opening in the piston, a squared portion upon said shaft upon which the piston is adapted to reciprocate as the cylinder rotates, a rod having eccentrics, links connecting said rod and the shaft, a lever for turning said rod to vary the position of the shaft with respect to the axial line of the cylinder, whereby the stroke of the piston may be varied or its direction of action reversed, and means for holding the lever in any position to which it may be moved.

11. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a plurality of pistons reciprocating in said cylinder, said pistons having elongated openings, a shaft passing through the cylinder and through the openings in the piston, said shaft having squared portions upon which the pistons are adapted to reciprocate, said pistons being so arranged as to discharge successively and at regular intervals, a rod having eccentrics, connections between said rod and the shaft, a lever for turning said rod to vary the position of the shaft with respect to the axial line of the cylinder, whereby the stroke of the piston may be varied or its direction of action reversed, and means for holding the lever in any position to which it may be moved.

12. In a device of the character described, a rod having eccentrics, a lever attached to said rod by means of which the latter may be turned, a worm wheel stationarily mounted and co-axial with said rod, a frame carried by said lever, a worm journaled in said frame, a spring engaging the lever and the frame and normally holding the worm in engagement with the worm wheel, a grip lever carried by the first mentioned lever, connections between the grip lever and the frame for throwing the worm out of engagement with the worm wheel so that the rod may be rotated, a rotating cylinder, a plurality of pistons mounted in and turning with said cylinder, a shaft passing through the cylinder and through said pistons, and connections between said shaft and said rod, whereby the said shaft may be moved toward or from the axis of the cylinder for varying the stroke of the pistons or for reversing the action of the pistons, the pistons being so arranged that they will discharge a fluid successively and at regular intervals.

13. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a piston carried by said cylinder and rotating therewith, said piston being provided with an elongated opening, a shaft passing through the cylinder and piston and having a squared portion engaging with the opening in the piston, a rod having eccentrics, connections between said rod and shaft whereby when the rod is turned the shaft

will be moved with respect to the axial line of the cylinder so as to vary the throw of the piston or to reverse its direction of action, a lever connected to the rod, a worm wheel stationarily mounted on the casing and co-axial with the said rod, a worm pivoted to said lever and normally engaging the worm wheel so as to hold the lever in any of its adjusted positions, means for removing the worm from engagement with the wheel so that the lever may be moved, and an index pointer carried by said lever.

14. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a piston carried by said cylinder and rotating therewith, said piston being provided with an elongated opening, a shaft passing through the cylinder and piston and having a squared portion engaging with the opening in the piston, a rod having eccentrics, connections between said rod and shaft whereby when the rod is turned the shaft will be moved with respect to the axial line of the cylinder so as to vary the throw of the piston or to reverse its direction of action, a lever connected with said rod, a frame pivoted to said lever, a worm wheel stationarily mounted on the casing and co-axial with the said rod, a worm journaled in the frame on said lever and normally engaging the worm wheel so as to hold the lever in any of its adjusted positions, means for removing the worm from engagement with the wheel so that the lever may be moved, and an index pointer carried by said lever.

15. In a device of the character described, a casing, a pair of ports in said casing, a cylinder mounted to rotate between said ports, a plurality of pistons carried by said cylinder and rotating therewith, said pistons being provided with elongated openings, a shaft passing through the cylinder and pistons and having squared portions engaging with the openings in the pistons, a rod having eccentrics, connections between said rod and shaft whereby when the rod is turned the shaft will be moved with respect to the axial line of the cylinder so as to vary the throw of the pistons or to reverse their direction of action, a lever connected to said rod, a worm wheel stationarily mounted on the casing and co-axial with the said rod, a worm pivoted to said lever and normally engaging the worm wheel so as to hold the lever in any of its adjusted positions, means for removing the worm from engagement with the wheel so that the lever may be moved, and an index pointer carried by said lever, the pistons being so arranged as to discharge successively and at regular intervals.

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

JOHN McGEORGE.

Witnesses:
HAROLD McGEORGE,
M. M. GAUDERN.