April 3, 1934. V. M. EVERETT 1,953,534

FLUID MOTOR DEVICE

Filed July 1, 1933 2 Sheets-Sheet 1

Fig. 1.

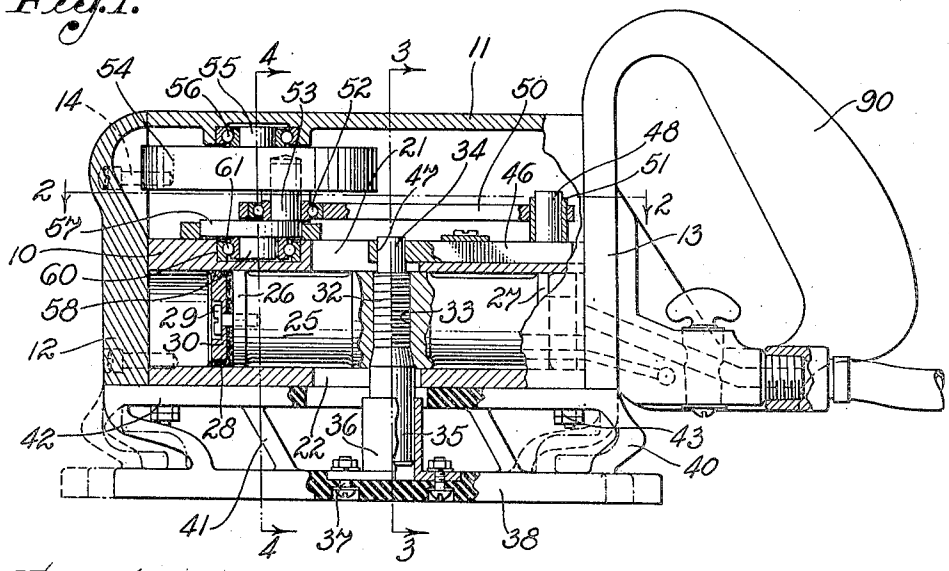



Fig. 5.

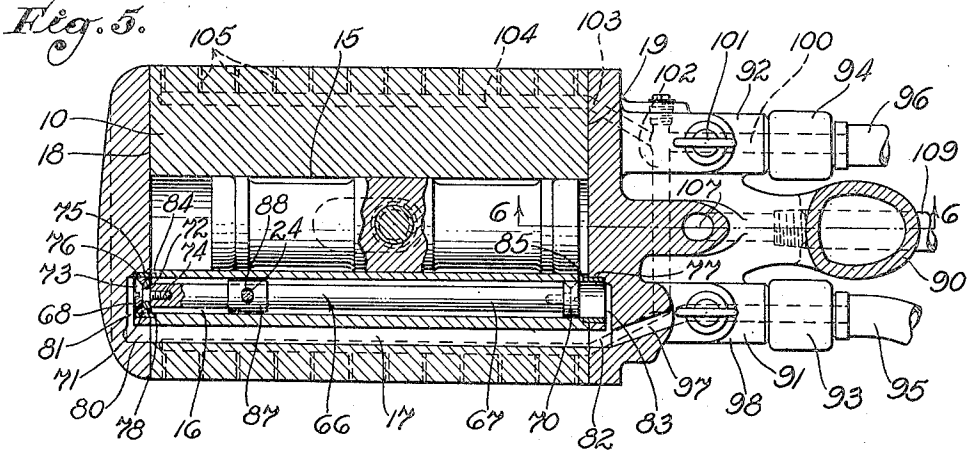
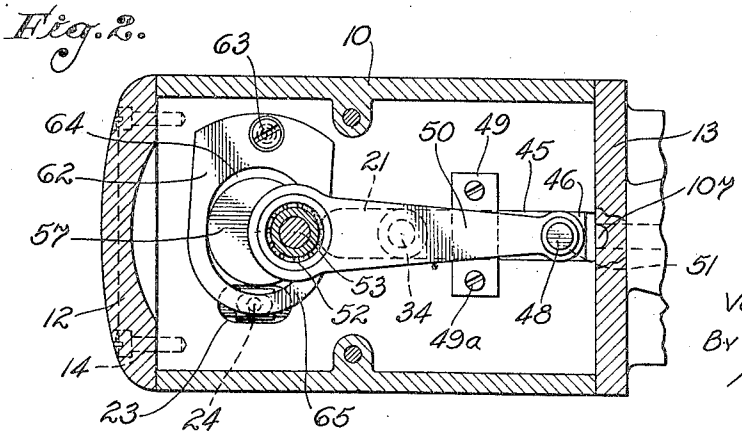



Fig. 2.




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FLUID MOTOR DEVICE

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Fig. 3.

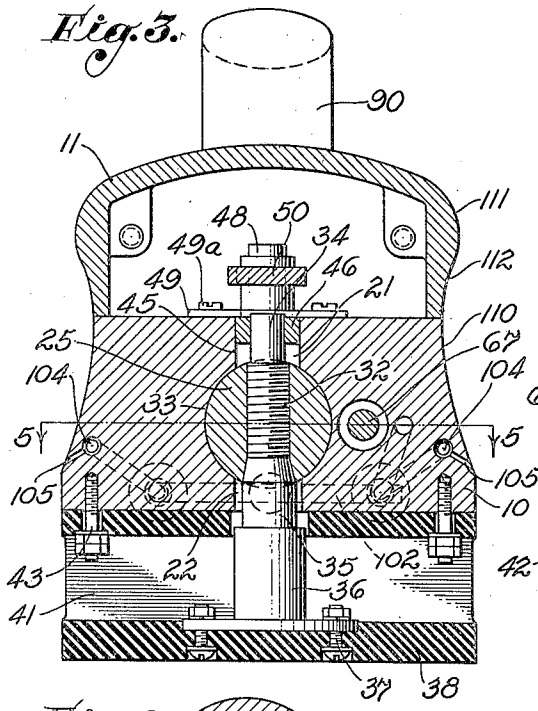



Fig. 4.

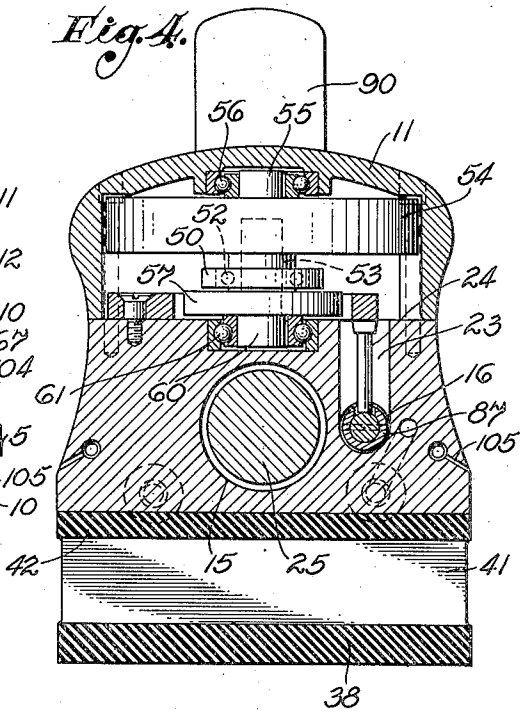



Fig. 6.

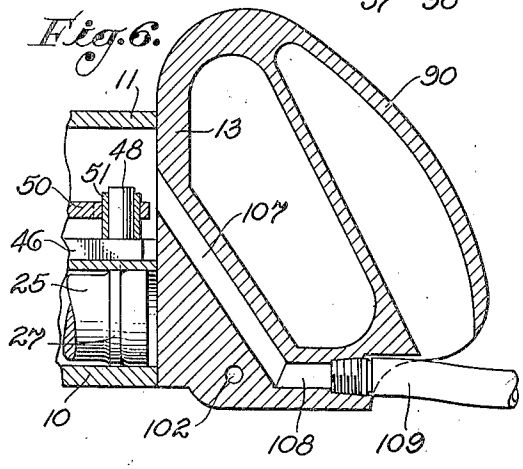
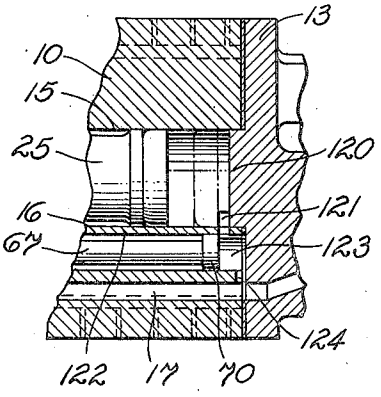



Fig. 7.




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1,953,534

# UNITED STATES PATENT OFFICE

1,953,534

## FLUID MOTOR DEVICE

Vernon M. Everett, Fullerton, Calif.

Application July 1, 1933, Serial No. 678,590

14 Claims. (Cl. 121—3)

My invention relates to a fluid motor, and relates in particular to the construction of small fluid motors of portable character adapted for reciprocation of a tool or working member movably secured to the portable motor structure.

It is found that there are certain mechanical operations which can be performed only by reciprocating motion of a tool or working part. For example, the filing of dies requires the use of a file in reciprocating motion. Until lately work of this character has been done manually, but now filing machines are employed, in which the file is reciprocated through a hole in a table, and the die to be filed is moved on this table relative to the file, which operates in a fixed position. My invention provides a relatively light fluid motor to which a tool, such as a file, may be secured, this motor being of such compact size and light weight that it may be moved by a workman relative to the object to be filed, thereby greatly expediting the filing operation. As a further example, it is found that polishing, rubbing, and sanding operations are best performed with a reciprocating motion, rather than with a circular motion, and in the absence of suitable mechanical devices adapted to be moved relative to the surface of the work to be polished, a great deal of such work is now done by hand. My present invention is especially adapted for use as a mechanical polishing or rubbing device, adapted to hold a suitable rubbing pad, sheet of abrasive material, etc., and adapted to be manually moved across the surface of the work. As a polishing device, my invention is of especial value for the reason that it efficiently produces a high frequency reciprocation of a polishing or rubbing pad, thereby minimizing the time and the human effort required for a given job.

It is an object of my invention to provide a simple form of fluid motor having a reciprocating piston of double-end character adapted to operate in a cylinder bore, the device having a simple valve means for controlling the flow of fluid under pressure to the ends of the piston member, and for transmitting reciprocating motion from the piston to the working member of the device.

It is an object of the invention to provide a device of the above character in which the piston bore, valve bore, and fluid passages are formed from end to end of a body by simple boring and reaming operations, and having end plates which are fitted upon the end of the body so as to close these passages.

It is a further object of the invention to provide a device of the above character having a simple and rugged construction, in which connection to the reciprocating piston member is made through openings in the center of the body containing the cylinder bore in which the piston operates, it being a further feature of this invention to provide a simple means for controlling the extremes of movement of the piston member and for producing an essentially harmonic movement of the piston member, whereby a pounding action of the operating parts of the device is reduced to a minimum.

It is a further object of my invention to provide a motivating device of the above character having a fly-wheel therein for minimizing vibration by counterbalancing the movement of the reciprocating parts. An especial feature of this device is that a fly-wheel is employed which operates at sufficiently high speed to provide a stabilizing effect through use of gyroscopic action of the fly-wheel so that a smooth manipulation of the device over the surface being treated is attained.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is a side view of a preferred embodiment of my invention, this view being partly sectioned on a central vertical plane.

Fig. 2 is a longitudinal section on a plane represented by the line 2—2 of Fig. 1.

Fig. 3 is a cross section on a plane represented by the line 3—3 of Fig. 1.

Fig. 4 is a cross section on a plane represented by the line 4—4 of Fig. 1.

Fig. 5 is a horizontal section on a plane represented by the line 5—5 of Fig. 3.

Fig. 6 is a fragmentary section taken as indicated by the line 6—6 of Fig. 5.

Fig. 7 is a fragmentary horizontally sectioned view showing an alternative manner of forming the valve ports at the ends of the cylinder bore of the device.

As shown in Figs. 1, 3, 4, and 5 of the drawings, the invention employs a body 10 of essentially rectangular prismoidal form, an arched cover member 11 which is of the same length as the body 10 and is placed so as to cover the upper face thereof, and end plates 12 and 13 of such size as to extend over the ends of the body 10 and the cover member 11, the end plates being secured to such members by the means of screws 14. As best shown in Fig. 5, a cylinder bore 15, a valve bore 16, and a fluid delivery passage 17 may be formed longitudinally through the body 10 from the front end face 18

thereof to the rear end face 19 thereof. Extending upwardly from an intermediate part of the cylinder bore 15 is a first opening 21, and extending downwardly from the bore 15 in alignment with the opening 21 is a second opening 22. As shown in Fig. 4, a longitudinally elongated opening 23 extends upwardly from a point near the forward end of the valve bore 16, this opening 23 providing a space in which a valve operating pin 24 may move and also a discharge passage leading outwardly from an intermediate part of the valve bore 16. It is to be noted that since the bores 15 and 16 extend from end to end of the body 10, they may be readily formed and reamed.

Within the bore 15 is a piston member 25 having cylindrical ends 26 and 27 to which sealing means are secured, such sealing means being shown as cup washers 28 held in place by screws 29 and filler washers 30. After placing the piston 25 in the cylinder bore 15, a pin or bar 32 is threaded through an opening 33 formed preferably centrally in the piston 25, the upper end of the bar 32 providing a pin or projection 34 and its lower end 35 constituting a movement of power transmitting means projecting downwardly through the opening 22 so as to engage a bushing 36 which is secured by means of screws 37 to the lower plate portion 38 of a flexible rubbing pad or working member 40 which has rubber walls 41 extending upwardly from the lower wall 38 and connecting to a horizontal upper wall 42, preferably of rubber, which is adapted to be secured to the lower face of the body 10 by means of studs 43, as shown in Fig. 3.

Extending rightwardly from the upper opening 21, a slot or channel 45 is formed in the upper face of the body 10, this channel 45 receiving a slide bar 46 which is held in the channel 45 by means of a plate 49 and screws 49a, and the leftward end of which slide bar 45 extends into the upper part of the opening 21 and has an opening 47 therein for receiving the upwardly extending pin portion 34 by which the reciprocating movement of the piston 25 is transmitted to the bar 46. A pin 48 extends upwardly from the rightward end of the bar 46, this pin 48 constituting a wrist pin to which a connecting rod 50 is attached. The connecting rod 50 has a bushing 51 mounted in its rightward end, such bushing 51 fitting down over the pin 48 and resting against the upper face of the bar 46, thereby holding the connecting rod 50 in raised position relative to the bar 46. The leftward end of the connecting rod 50 has a ball bearing 52 mounted therein for engagement with a crank pin 53 connected to a fly-wheel 54. The upper face of the fly-wheel 54 is provided with a trunnion 55 adapted to engage a ball bearing 56 mounted in the upper wall of the cover member 11. The crank pin 53 extends downwardly from the fly-wheel 54 and has an eccentric 57 mounted on its lower end, this eccentric in turn having a downwardly projecting trunnion 58 which is concentric with the trunnion 55 of the fly-wheel 54. The leftward portion of the upper face of the body 10 is counterbored at 60 to receive a ball bearing 61 for carrying the trunnion 58 in alignment with the trunnion 55. The diameter of the circle on which the crank pin 53 rotates determines the distance through which the bar 50 and the piston 25 may move; accordingly, the extremes of movement of the piston 25 are determined by the fly-wheel structure, and the movement of the piston 25 is likewise given a harmonic character. As will be noted in Fig. 1, the eccentric 57 is mounted close to the upper face of the body 10, and on the upper face of the body 10, as shown also in Figs. 2 and 4, a yoke member 62 is pivotally secured by means of a screw 63. The yoke member 62 has a laterally elongated opening 64 which receives the eccentric 57, and the swinging end 65 of the yoke 62 carries the valve operating pin 24 described hereinabove relative to Fig. 4. As the fly-wheel 54 and the eccentric 57 rotate, the yoke member 62 is swung back and forth so as to move the pin 24 longitudinally in the elongated opening 23 which extends upwardly from an intermediate portion of the valve bore 16.

Mounted in the valve bore 16 is a valve member 66 consisting of a stem or bar 67 of smaller diameter than the valve bore 16 and having cylindrical valve heads 68 and 70 secured to the ends thereof. The valve heads 68 and 70 are of essentially the same diameter as the valve bore 16, and may each consist of a ring 71 of triangular cross section held on an end of the stem 67 between a washer 72 and the head 73 of a screw 74.

In alignment with the ends of the valve bore 16, counterbores or openings 75 are formed in the end plates 12 and 13, these counterbores 75 having cylindrical bushings 76 and 77 mounted therein so as to project slightly from the faces of the end plates 12 and 13. The bushings 76 and 77 have the same internal diameter as the valve bore 16, and the ends thereof project into shallow counterbores 78 formed at the ends of the valve bore 16 in such a manner that the bushings 76 and 77 will be concentrically aligned with the valve bore 16 and will form extensions of the valve bore beyond the ends of the cylinder bore 15. A blind opening 80 is formed in the end plate 12 in alignment with the fluid delivery passage 17, and by means of an undercutting drilling tool a passage 81 may be formed connecting the blind end of the opening 80 with the extreme end of the valve bore 16 identified by the bushing 76. In a similar manner, an opening 82 is formed in the end plate 13, and this opening 82 is connected with the interior of the bushing 77 by means of a passage 83. Fluid ports 84 and 85 connect the ends of the cylinder bore 15 with the valve bore 16 at the inner ends of the bushings 76 and 77. The valve member 66 is of such length that when the valve head 68 is within the bushing 76, the valve head 70 will be withdrawn from the bushing 77 and will be disposed to the left of the valve port 85. In the position of the valve member 66 shown in Fig. 5, the rightward end of the cylinder bore 15 will connect through the port 85 and the interior of the bushing 77 with the passage 83 connecting with the fluid delivery passage 17, and the leftward end of the cylinder bore 15 will connect through the port 84 directly with the intermediate portion of the valve bore 16 and will be shut off from communication with the fluid delivery passage 17 by reason of the fact that the valve head 68 is in a position within the bushings 76 and 77 and lies to the left of the port 84. It will be perceived that the ports 84 and 85 may be conveniently formed by cutting grooves in the ends of the body 10 in positions to connect between the end portions of the bores 15 and 16, this constituting one of the many structural simplifications which my present invention provides.

In alignment with the opening 23, the valve stem 67 may have a sleeve or bushing 87 mounted thereon, the upper part of this member 87 having an opening 88 adapted to receive the lower end of the valve operating pin 24. Accordingly, as the rotation of the eccentric 57 produces oscil-

lation of the yoke 62, engagement of the lower end of the pin 24 with the opening 88 will cause a corresponding movement of the valve member 66 so that the valve heads 68 and 70 will be moved in timed relation to the operation of the piston, whereby to control the flow of fluid to and from the respective ends of the cylinder bore 15. One of the end plates, such as the end plate 13, may have a handle 90 formed thereon, and adjacent the lower portion of the handle 90 metal bodies 91 and 92 may be formed, the outer ends of these bodies 91 and 92 having means 93 and 94 thereon for the connection thereto of hose members 95 and 96. The body 91 is provided with a fluid passage 97 having a valve device 98 for the control thereof, and the body 92 is provided with a passage 100 which has a valve device 101 and connects with a cross passage 102, through which passage 102 water may be conducted to passages 103 which extend to the face of the end plate 13 in position to communicate with water delivery passages 104 formed within and along the sides of the body 10. Accordingly, the hose 96 may be employed to deliver water to the device when it is being used for wet sanding or wet rubbing of a surface to be finished, this water being delivered to the surface which is being operated on through small jet openings 105 which lead outwardly from the passages 104 in the body 10.

The form of the invention shown in the drawings is especially adapted for use of compressed air as a motivating fluid, which air is delivered to the device through the hose 95. When the cooperating parts of the device are in the positions shown in Figs. 1, 2, and 3, the rightward end of the cylinder bore 15 will be connected with the fluid passage 17, and the leftward end of the cylinder bore 15 will be connected through the port 84 with the discharge passage formed by a portion of the intermediate part of the valve bore 16, the opening 23, the interior of the cover member 11, and a passage 107 which leads rightwardly and downwardly through the central portion of the handle structure. If desired, the outer end 108 of the discharge passage may be connected with a discharge hose 109, this, however, being a matter of preference of the user of the device. When the piston 25 is moved leftwardly to the other end of the bore 15, the valve member 66 will be moved rightwardly so that the valve head 70 will lie within the bushing 77, and the valve head 68 will be disposed to the right of the valve port 84. Therefore, the delivery to and discharge from the cylinder bore 15 will be reversed so that the leftward end of the bore 15 will be connected with the fluid delivery passage 17, and the rightward end of the bore 15 will be connected with the discharge passage formed through the intermediate portion of the valve bore 16, as previously described.

The structure herein shown is extremely simple and is very durable. As the piston 25 reciprocates, the movement thereof is transmitted through the member 35 to the lower wall 38 which is flexibly or movably connected through the walls 41 with the wall 42 connected directly to the lower face of the fluid motor device. The movement of the lower wall 38, which may have suitable cloth or other rubbing fabric secured thereto, is accompanied by a flexing of the upright walls 41 between the extreme positions and intermediate positions indicated by full and dotted lines in Fig. 1. The fly-wheel 54 and its associated controlling parts are disposed within the cover member 11 so as to be fully protected. The body 10 and the cover member 11 cooperate to produce a compact housing for the operating parts of the device, which housing is of such shape that it may be readily gripped by the hand of the operator not engaging the handle 90. For example, the side walls of the body 10 are converged upwardly as indicated at 110 in Fig. 3, and the cover member has the side walls thereof rounded at 111 and then curved inwardly at 112 to meet the side walls of the body 10.

The interior faces of the bushings 76 and 77 constitute extensions of the valve bore 16. In the form of the invention disclosed in Figs. 1 to 6, the bushings 76 and 77 are aligned with the valve bore 16 by reason of the fact that they project into shallow counterbores 78 formed at the ends of the bore 16. It will be perceived that these bushings 76 and 77 may be eliminated, but that the elimination thereof would require additional machine operations in aligning the openings formed in the end plates 12 and 13 with the valve bore 16. In Fig. 7 I show a simple means whereby the use of the bushings 76 and 77 may be avoided. In this alternative structure the end plates, such as the end plate 13, are provided with a cylindrical boss 120 which extends within the extremity of the cylinder bore 15 so as to act as a filler for the end of the bore 15 beyond a valve port 121 which is cut by means of a milling tool through the metal wall 122 of the body 10 disposed between the bores 15 and 16. It will be seen, therefore, that the valve bore 16 has an end portion 123 disposed beyond or rightwardly of the port 121, thereby providing a space into which the valve head 70 may move from the position in which it is shown in Fig. 7. For connecting the extreme end of the valve bore 16 with the fluid delivery passage 17, a slot 124 is cut in the end face of the body 10 as shown. When the valve head 70 is in the position shown in Fig. 7, there will be a direct communication between the fluid delivery passage 17 and the rightward end of the cylinder bore 15. When the valve head 70 moves rightwardly into the end space 123 of the valve bore 16, the port 121 will connect with the intermediate portion of the valve bore 16, which intermediate portion forms a part of the discharge passage of the device.

Although I have herein shown and described my invention in simple and practical form, it is recognized that certain parts or elements thereof are representative of other parts, elements, or mechanisms which may be used in substantially the same manner to accomplish substantially the same results; therefore, it is to be understood that the invention is not to be limited to the details disclosed herein but is to be accorded the full scope of the following claims.

I claim as my invention:

1. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being a lateral opening from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each

of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; and actuating means for said valve operating means connecting through said lateral opening with an intermediate portion of said piston.

2. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; actuating means for said valve operating means connecting through the first of said lateral openings with an intermediate portion of said piston; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

3. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; actuating means for said valve operating means connecting through the first of said lateral openings with an intermediate portion of said piston; power transmitting means extending from an intermediate portion of said piston through said second lateral opening; and a working member reciprocably mounted on said body and operatively connected to said power transmitting means.

4. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; a bar longitudinally slidable on said body adjacent the outer end of said first lateral opening; means connecting said bar with said piston through said first lateral opening; actuating means for said valve operating means supported on the exterior of said body and being connected to said bar so as to function in accordance with the back and forth movement of said bar; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

5. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion

of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; a bar longitudinally slidable on said body adjacent the outer end of said first lateral opening; means connecting said bar with said piston through said first lateral opening; actuating means for said valve operating means supported on the exterior of said body and being connected to said bar so as to function in accordance with the back and forth movement of said bar; power transmitting means extending from an intermediate portion of said piston through said second lateral opening; and a working member reciprocably mounted on said body and operatively connected to said power transmitting means.

6. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having a crank; valve operating means connecting said fly-wheel and said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; means connecting said crank of said fly-wheel with said piston, through said first lateral opening; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

7. A device of the character described, including: a body having a longitudinal cylinder bore a valve bore, and a fluid delivery passage, from end to end thereof there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having a crank; valve operating means connecting said fly-wheel and said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; a bar slidable on said body adjacent said first lateral opening; means connecting said bar with said piston through said first lateral opening; connecting rod means connecting said crank of said fly-wheel with said bar, whereby the reciprocation of said bar by said piston will be transmitted to said crank of said fly-wheel; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

8. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having

a crank and a valve operating eccentric; a yoke member reciprocated by said eccentric; means connecting said yoke member with said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; means connecting said crank of said fly-wheel with said piston, through said first lateral opening; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

9. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending in opposite directions from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having a crank and a valve operating eccentric; a yoke member reciprocated by said eccentric; means connecting said yoke member with said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; a bar slidable on said body adjacent said first lateral opening; means connecting said bar with said piston through said first lateral opening; connecting rod means connecting said crank of said fly-wheel with said bar, whereby the reciprocation of said bar by said piston will be transmitted to said crank of said fly-wheel; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

10. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending respectively upwardly and downwardly from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having a crank and a valve operating eccentric; a yoke member reciprocated by said eccentric; means connecting said yoke member with said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; a bar slidable on said body adjacent said first lateral opening; means connecting said bar with said piston through said first lateral opening; connecting rod means connecting said crank of said fly-wheel with said bar, whereby the reciprocation of said bar by said piston will be transmitted to said crank of said fly-wheel; a hollow cover member over the top of said body; end plates extending vertically across the ends of said body and said cover member, one of said end plates having a fluid passage therein connecting with said fluid delivery passage of said body; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

11. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending respectively upwardly and downwardly from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having a crank and a valve operating eccentric; a yoke member reciprocated by said eccentric; means connecting said yoke member with said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; a bar slidable on said body adjacent said first lateral opening; means connecting said bar with said piston through said first lateral opening; connecting rod means connecting said crank of said fly-wheel with said bar, whereby the

reciprocation of said bar by said piston will be transmitted to said crank of said fly-wheel; a hollow cover member over the top of said body; end plates extending vertically across the ends of said body and said cover member, one of said end plates having a handle formed thereon and a fluid passage therein connecting with said fluid delivery passage of said body; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

12. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being first and second lateral openings extending respectively upwardly and downwardly from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; a fly-wheel mounted on said body adjacent the outer end of said first lateral opening, said fly-wheel having a crank and a valve operating eccentric; a yoke member reciprocated by said eccentric; means connecting said yoke member with said valve stem so as to move said valve stem back and forth in accordance with the movement of said piston; a bar slidable on said body adjacent said first lateral opening; means connecting said bar with said piston through said first lateral opening; connecting rod means connecting said crank of said fly-wheel with said bar, whereby the reciprocation of said bar by said piston will be transmitted to said crank of said fly-wheel; a hollow cover member over the top of said body; end plates extending vertically across the ends of said body and said cover member, said end plates closing the ends of said cylinder bore, said valve bore, and said fluid delivery passage, and one of said end plates having a fluid passage therein connecting with said fluid delivery passage of said body; and power transmitting means extending from an intermediate portion of said piston through said second lateral opening.

13. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being a lateral opening from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; actuating means for said valve operating means connecting through said lateral opening with an intermediate portion of said piston; and a pair of end plates secured to the ends of said body so as to overlie the ends of said cylinder bore, said valve bore, and said fluid delivery passage, there being a fluid passage through one of said end plates connecting with said fluid delivery passage of said body.

14. A device of the character described, including: a body having a longitudinal cylinder bore, a valve bore, and a fluid delivery passage, from end to end thereof, there being a lateral opening from an intermediate portion of said cylinder bore to the exterior of said body, there being ports connecting the ends of said cylinder bore with said valve bore at points a short distance within the ends of said valve bore, and there being also a fluid discharge passage extending outwardly from an intermediate portion of said valve bore; a double-ended piston in said cylinder bore, said piston being shorter than said cylinder bore so as to reciprocate therein; a valve stem extending longitudinally within said valve bore; a valve head connected to each end of said valve stem, each of said heads being adapted to be moved between positions beyond and within the said port associated therewith while the other of said heads is moved by said stem between positions within and beyond the said port at the opposite end of said valve bore, so that when one of said heads is in a position to connect an end of said cylinder bore with the corresponding end of said valve bore, the other of said heads will be in a position to connect the opposite end of said cylinder bore through the intermediate portion of said valve bore with said fluid discharge passage; valve operating means connecting with said valve stem so as to move the same back and forth in timed relation to the movement of said piston; actuating means for said valve operating means connecting through said lateral opening with an intermediate portion of said piston; a cover extending from end to end of said body and over said valve operating means; and a pair of end plates secured to the ends of said cover and said body so as to overlie the ends of said cylinder bore, said valve bore, and said fluid delivery passage, there being a fluid passage through one of said end plates connecting with said fluid delivery passage of said body.

VERNON M. EVERETT.