No. 773,302. PATENTED OCT. 25, 1904.

W. F. TORREY.

INDEPENDENT VALVE GEAR.

APPLICATION FILED MAR. 6, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

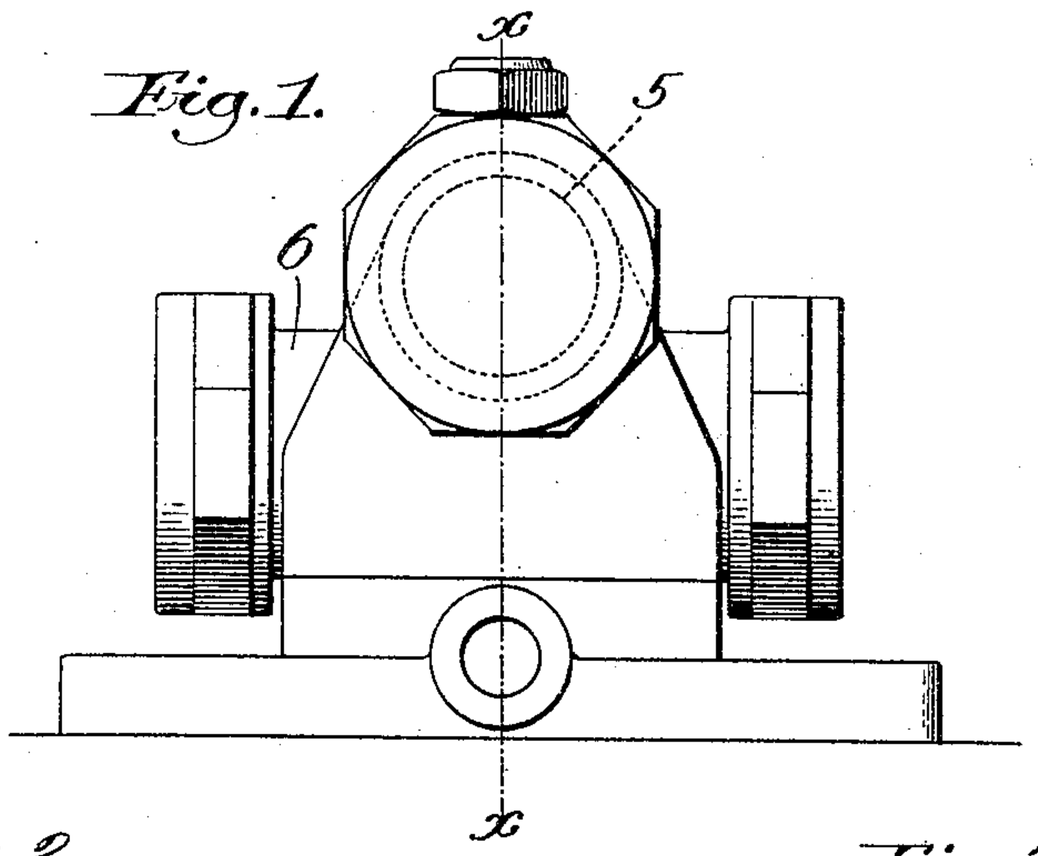


Fig. 2.

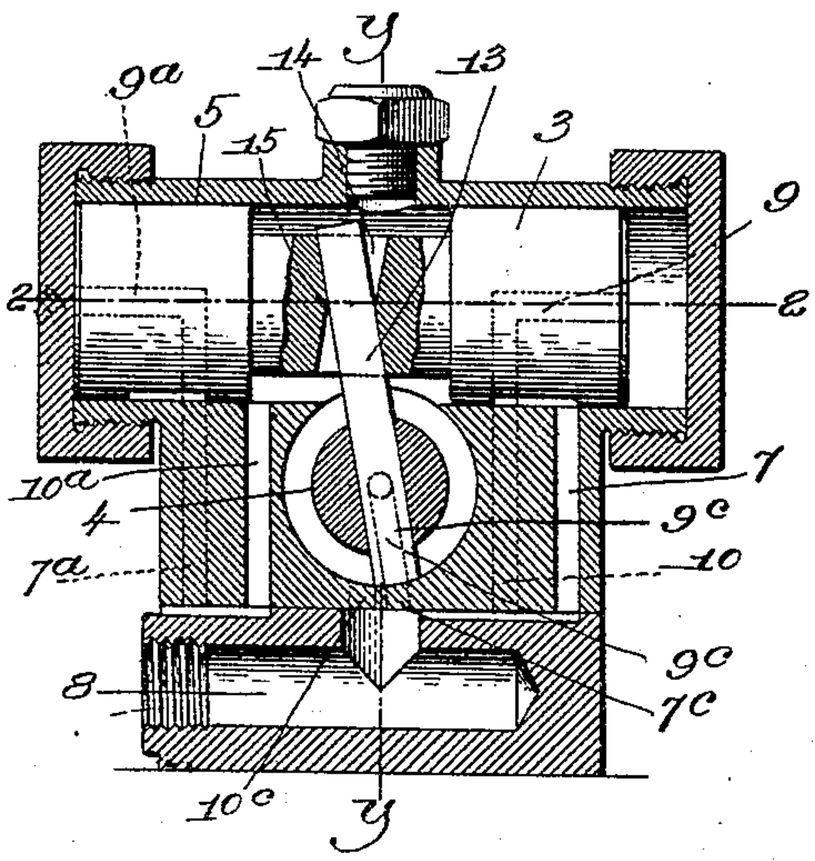


Fig. 3.

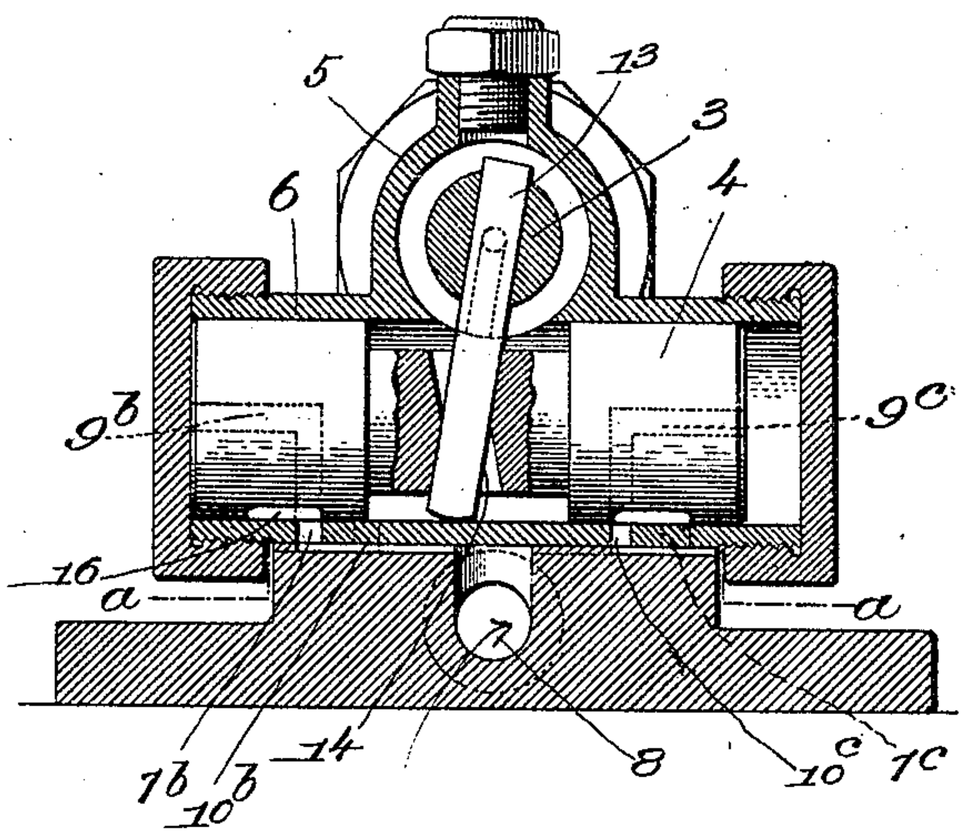


Fig. 4.

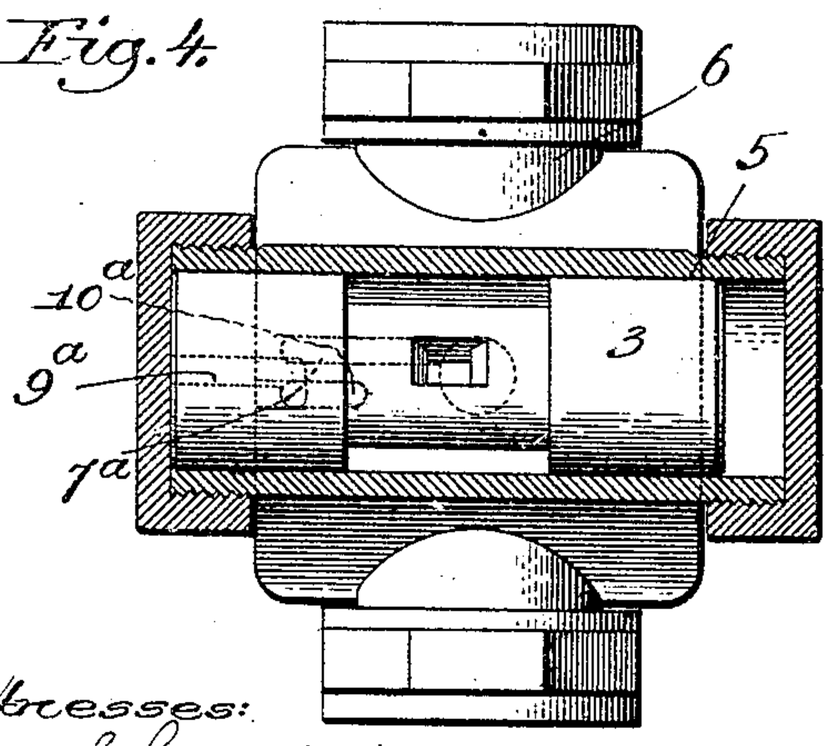
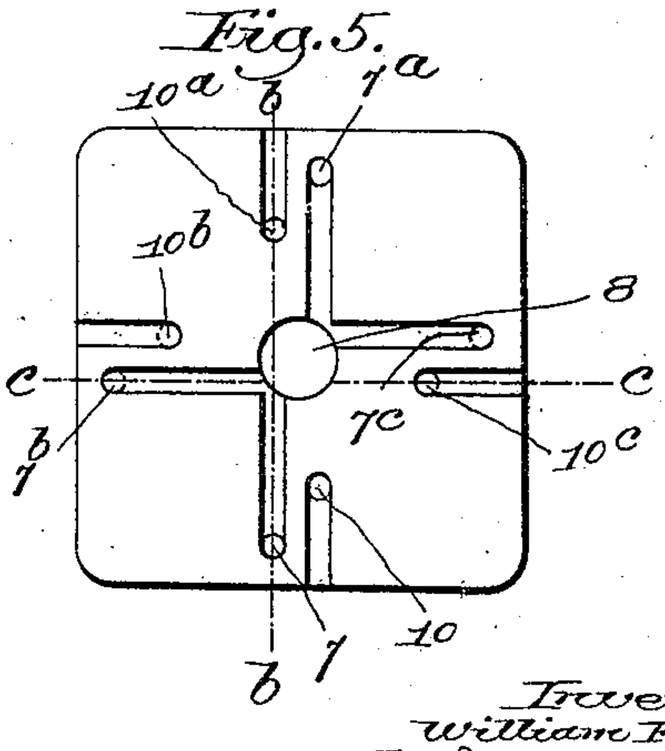


Fig. 5.



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NO MODEL. 2 SHEETS—SHEET 2.

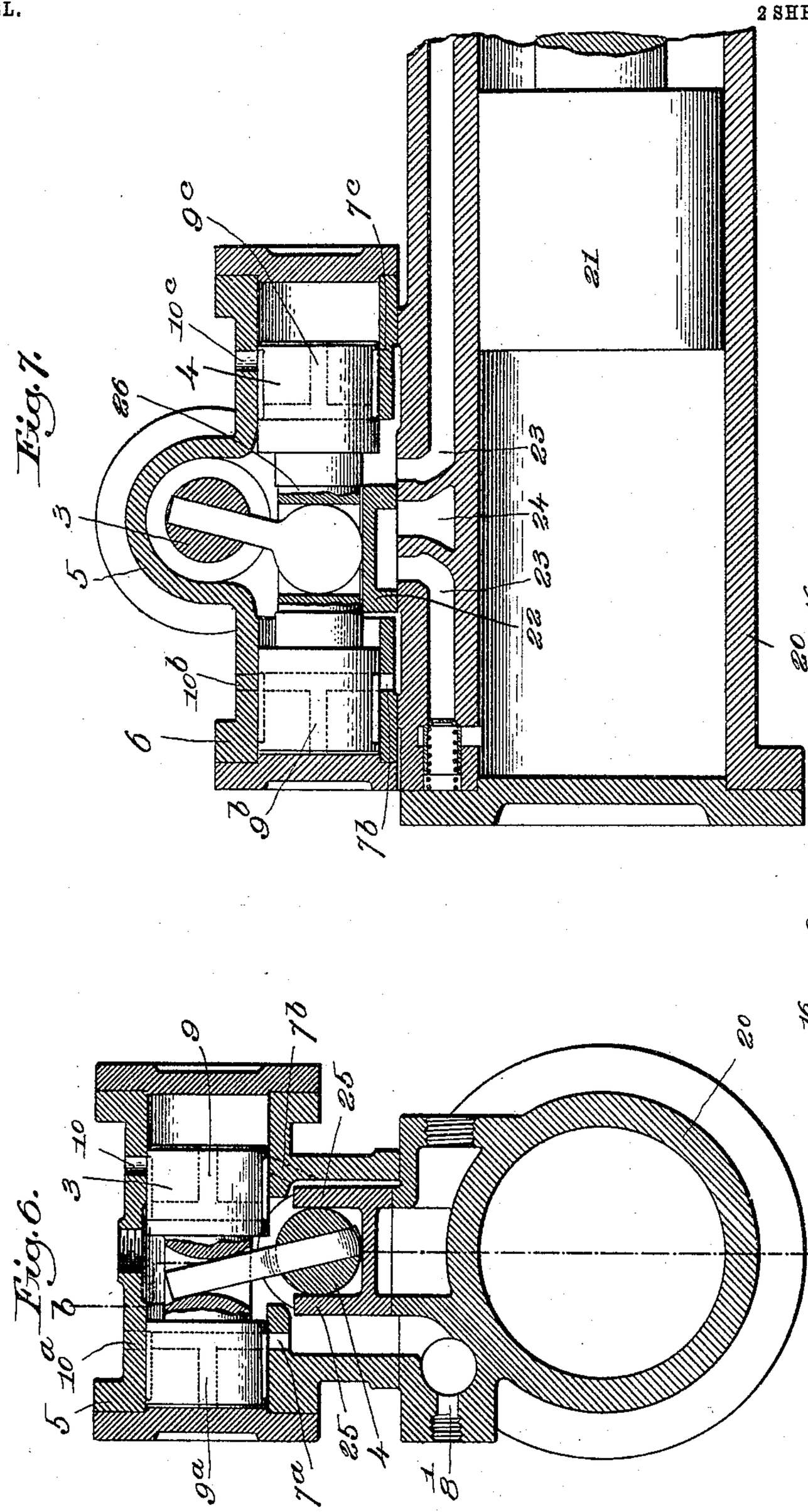

Fig. 7.

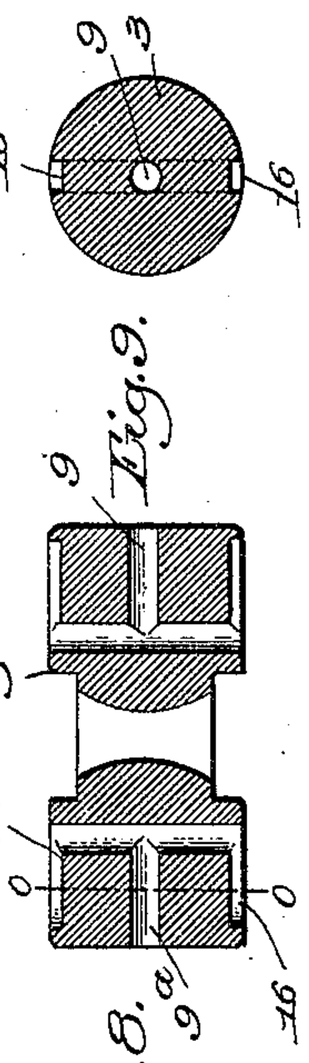

Fig. 9. Fig. 8.

Fig. 6.

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No. 773,302. Patented October 25, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM F. TORREY, OF BOSTON, MASSACHUSETTS.

INDEPENDENT VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 773,302, dated October 25, 1904.

Application filed March 6, 1903. Serial No. 146,439. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. TORREY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Independent Valve-Gear, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to independent valve-gear—that is, a valve-gear which is operated independently of any moving part of the apparatus to which it is applied—and it can be used for various purposes, one of which is to control the valve of any motor in which it is desired to operate said valve independently of any moving part of the motor.

The embodiment of the invention herein illustrated comprises two piston-like valve members each controlling an inlet and an exhaust port, and means connecting said members whereby each gives the other the movement necessary to open or close the corresponding ports. The valve members operate in cylinders, and the connection between them is such that the longitudinal movement of one member operates to rock or give an angular movement to the other member. The ports are so arranged that the angular or oscillating movement of each member reverses the latter.

In the operation of the device the motive fluid is admitted to one end of one cylinder and operates to drive one of the members forward longitudinally. This movement, through the connection between the members, rocks or oscillates the other member, and thereby opens the inlet and exhaust ports to the cylinder in which said latter member operates, so that said member is driven forward. This longitudinal movement of the second member rocks or oscillates the first member, thereby reversing the latter, whereby it is given a backward longitudinal movement. This movement in turn rocks the second member and reverses it, so that it is given a backward longitudinal movement.

With this construction it will be seen that each member acts reciprocally on the other and that the longitudinal movement of one operates to reverse the other. By connecting up the main valve of any motor to one of the members its longitudinal movement back and forth may be utilized for operating said main valve.

In the drawings, Figure 1 is an elevation of one form of my improved valve-gear. Fig. 2 is a section substantially on the line *x x*, Fig. 1, the lower portion of the figure being taken on the line *b b*, Fig. 5, looking to the right. Fig. 3 is a section on the line *y y*, Fig. 2, the lower portion of said figure being taken on the line *c c*, Fig. 5. Fig. 4 is a section on the line 2 2, Fig. 2. Fig. 5 is a section on the line *a a*, Fig. 3, looking down and showing in dotted lines the arrangement of ports. Fig. 6 is a view similar to Fig. 2, showing my invention as it may be applied in operating the main valve of a motor; and Fig. 7 is a section on the line *b b*, Fig. 6. Fig. 8 is a longitudinal view through one of the piston-like valve members. Fig. 9 is a section on the line *o o*, Fig. 8.

3 and 4 designate, respectively, the two piston-like valve members, and 5 and 6 the cylinders in which they operate. Each member is impelled forward and backward in its cylinder by some suitable motive fluid which is admitted at the proper times to the ends of the cylinders and acts as a valve to control admission of the motive fluid to the cylinder in which it operates. For this purpose I have illustrated in this form of my invention each member as having a port at each end, and each port is adapted to register with an inlet and an exhaust port alternately. The function of each of said ports is to connect the corresponding end of the cylinder with the inlet and exhaust ports to the cylinder alternately, and the device is so constructed that the movement of each member necessary to bring the ports in said member into register with either the inlet or exhaust ports is derived from the movement of the other member.

9, 9^a, 9^b, and 9^c indicate the ports in the piston-like members, 9 9^a being the ports in the member 3 and 9^b 9^c the ports in the member 4.

7 7^a 7^b 7^c indicate the inlet-ports through

which the motive fluid is admitted to the cylinders, and these ports are all shown as having communication with a common inlet 8, which will be connected to the source of motive-fluid supply by any suitable means. In Fig. 5, which is a section on the line *a a*, Fig. 3, looking downwardly, I have illustrated the position of the inlet-ports by dotted lines. The section in Fig. 2 is taken substantially on the line *b b*, Fig. 5, and that in Fig. 3 on the line *c c*. The port 7 admits motive fluid to the right-hand end of the cylinder 5, Fig. 2, and coöperates with port 9, the port 7^a admits fluid to the left-hand end of said cylinder, Figs. 2 and 4, and coöperates with port 9^a, the port 7^b admits motive fluid to the left-hand end of the cylinder 6, Fig. 3, and coöperates with port 9^b, and the port 7^c admits motive fluid to the right-hand end of said cylinder 6 and coöperates with port 9^c.

10 10^a 10^b 10^c indicate the exhaust-ports from the ends of the cylinders, the position of the said ports being shown by dotted lines in Fig. 5.

It will be noticed that the exhaust and inlet ports at any end of either cylinder are out of alinement with each other circumferentially, so that each member 3 or 4 must be turned axially or angularly to shift any port therein from communication with the inlet to the exhaust port, or vice versa. Each member is given this necessary turning or angular motion by means of the longitudinal movement of the other member. For this purpose I have arranged the two cylinders transverse or at right angles to each other and connect said pistons by means of a rocking member 13, which extends transversely through apertures 14 in each of them. The walls of the apertures which extend longitudinally of the members are parallel, while the walls which extend transversely are rounding or crowning, so as to make fulcrum-points 15, against which the member 13 fulcrums during the longitudinal movement of each member. With this construction it will readily be seen that the longitudinal movement of the member 3 will rock the member 4 and the longitudinal movement of the member 4 will rock the member 3.

With the parts as described above and in the position shown in Fig. 3 it will be observed that the port 9^c communicates with the exaust-port 10^c, while the port 9^b registers with the inlet-port 7^b. Motive fluid is therefore admitted to the left-hand end of the cylinder 6 in Fig. 3, and the member 4 is driven to the right. This movement of said member rocks or turns the member 3 angularly, and thereby carries the port 9^a out of register circumferentially with the exhaust-port 10^a and into register with the inlet-port 7^a and also carries the port 9 out of register circumferentially with the inlet-port 7 and into register with the exhaust-port 10. Motive fluid is now admitted to the left-hand end of cylinder 5, Fig. 2, and the member 3 is driven to the right. This longitudinal movement of the member 3 rocks the member 4, as will be obvious, and reverses the latter by carrying the port 9^c out of register with the exhaust-port 10^c and into register with the inlet-port 7^c and the port 9^b out of register with the inlet-port 7^b and into register with the exhaust-port 10^b. The member 4 is now driven to the left, Fig. 3, and this movement rocks the member 3 into the position shown in Fig. 3, thereby reversing the latter. The member 3 then is moved to the left, Fig. 2, and in so doing reverses member 3, this operation being repeated as long as motive fluid is supplied. The members thus act reciprocally on each other, each member by its movement giving to the other member the necessary movement to reverse the latter.

It is to be noted that the construction of my improved apparatus is such that the longitudinal and turning movements of each member are separate in point of time—that is, during one interval of time one member is moving longitudinally and during the next interval it is turning about its axis; but the turning and longitudinal movements do not occur at the same time; also, that the two members do not both have at any one interval of time a simultaneous longitudinal movement, but that the entire longitudinal movement of one occurs while the other is at rest from longitudinal movement.

In order that any of the ports 9 9^a 9^b 9^c may not be carried out of register with the corresponding inlet or exhaust ports by the longitudinal movement of the corresponding member, I provide the members 3 and 4 with suitable grooves 16, which communicate with said ports 9 9^a 9^b 9^c, whereby any of said ports will not be carried out of register with the corresponding inlet or exhaust port by the longitudinal movement of the members 3 or 4. By making the grooves 16 shorter than the length of the stroke of the exhaust or inlet may cut off at some point during the stroke, depending on the length of the grooves. With this construction it will be understood that there is no dead-center for the apparatus and that by merely admitting the motive fluid to the main inlet 8 the valve will at once start up and will continue in operation so long as the motive fluid is supplied.

My improved device may be applied to a variety of uses. When constructed as in Figs. 1 to 5, it can be used simply as a vibrator—that is, can be attached to or mounted on any article or mechanism to which it is desired to give a jarring or pounding movement. The device may also be used as an engine by simply connecting one of the piston-like members to the device to which it is to be operated. In this latter capacity the de-

vice may be used as a valve-operating mechanism.

In employing the apparatus for operating the main valve to a motor I will connect the valve to one of the members 3 or 4 and utilize the longitudinal movement thereof to give the main valve its movement. Figs. 6 and 7 show such an application of my invention. 20 designates the power-cylinder and 21 a power-piston operating therein and 22 a slide-valve which controls the inlet and exhaust ports 23 and 24, leading to and from said cylinder. Any suitable form of connection may be employed between one of the members 3 or 4 and the main valve 22. As herein shown, said valve is provided with parallel arms 25, between which the central part of the member 4 is received, said member being reduced at its central portion, so as to form shoulders 26, which engage the arms 25, whereby the reciprocating movement of the member 4 reciprocates the valve 22. This construction permits the member 4 to turn, but locks said member and the valve 22 together for longitudinal movement. The principle of operation of the independent valve mechanism illustrated in these figures is the same as that already described, although I have shown a slightly-different arrangement of ports. The motive fluid is admitted through the main inlet 8′, and therefore fills the space surrounding the slide-valve 22 and the space where the two cylinders communicate with each other. The inlet-ports 7 7^a 7^b 7^c lead from this space to the various cylinders. I have arranged the ports 9 9^a 9^b 9^c slightly different than in the form of invention shown in Figs. 1 to 4, as the exhaust-ports 10 10^a 10^b 10^c are formed in the upper side of the cylinders. In other respects, however, the invention is similar to that already described. Instead of this arrangement of exhaust-ports I may connect the ports to the main exhaust-port 24 by suitable passage-ways, if desired. When applied in this way, the main valve 22 of the motor is operated entirely independent from the piston. A construction of this sort is especially applicable in pneumatic hammers and similar instruments.

Various changes in the construction of the device may be made without departing from the invention expressed in the appended claims.

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

1. In a valve mechanism, two cylinders each having an inlet and an exhaust port, a piston-like valve member operating in each cylinder, and a pin extending transversely through both members whereby the longitudinal movement of one turns the other angularly and thus opens and closes certain of the ports.

2. In a valve mechanism, two cylinders each having an inlet and an exhaust port, a piston-like valve member operating in each cylinder and controlling the ports communicating therewith, and a pin extending transversely through both of said members and connecting them so that the longitudinal movement of one turns the other angularly and thus operates to open or close the ports controlled by the latter member.

3. In a valve mechanism, two cylinders extending transversely to each other and each having an inlet and an exhaust port, a piston-like valve member operating in each cylinder and controlling the ports communicating with said cylinder, and a pin extending transversely through both members and having a rocking engagement with each member whereby the longitudinal movement of one turns the other angularly and thus opens and closes the ports corresponding to the latter member.

4. In a valve mechanism, two piston-like members each moving transversely to the other, means connecting said members whereby the longitudinal movement of one turns the other angularly, inlet and exhaust ports so arranged as to be controlled by the angular movement of the members, a power-cylinder, and a main valve operated by one of said members and controlling the admission and exhaust of motive fluid to said cylinder.

5. In a device of the class described, two piston-like valve members, an inlet and an exhaust port controlled by each member, means connecting said members whereby each gives the other the movement necessary to open and close the ports controlled by said members, a power-cylinder, and a valve operated by one of said members and controlling the admission and exhaust of motive fluid to said power-cylinder.

6. In a device of the class described, two cylinders each having an inlet and an exhaust port, a piston-like valve member in each cylinder, said members being capable of both a longitudinal and an angular movement and each having a port which is brought into communication with the inlet or exhaust port of the corresponding cylinder by an angular movement of said member, and a pin extending transversely through both said members and connecting them so that the longitudinal movement of one causes an angular movement of the other.

7. In a valve mechanism, two cylinders each having an inlet and an exhaust port at each end, a piston-like valve member operating in each cylinder and having a port at each end, and a pin extending transversely through both of said members and having a rocking engagement with each whereby the movement of each reverses the other.

8. In an apparatus of the class described, two cylinders each having an inlet and an exhaust port at each end, a piston-like valve member operating in each cylinder and hav-

ing a port at each end, and means connecting said members whereby the longitudinal movement of each operates to turn the other angularly and thereby reverse the latter, the ports being so placed that the turning and longitudinal movements of each member are separate in point of time.

9. In a device of the class described, two cylinders each having an inlet and an exhaust port at its side near each end, a piston-like valve member operating in each cylinder, each member having a port in its side to register with the ports in the cylinder, and means connecting said members whereby the longitudinal movement of each operates to turn the other angularly and thereby reverses the latter, the ports in the cylinders being so placed that the turning and longitudinal movements of each member are separate in point of time.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM F. TORREY.

Witnesses:
LOUIS C. SMITH,
GEO. W. GREGORY.