No. 623,816. Patented Apr. 25, 1899.

M. H. OLSEN.

ENGINE FOR HAND DRILLS.

(Application filed Mar. 5, 1898.)

(No Model.) 3 Sheets—Sheet 1.

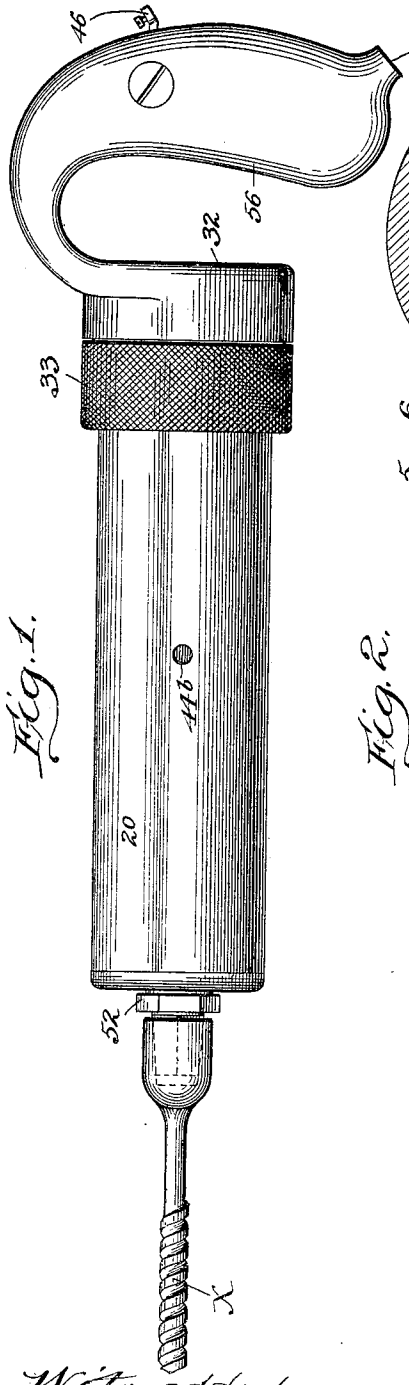


Fig. 1.

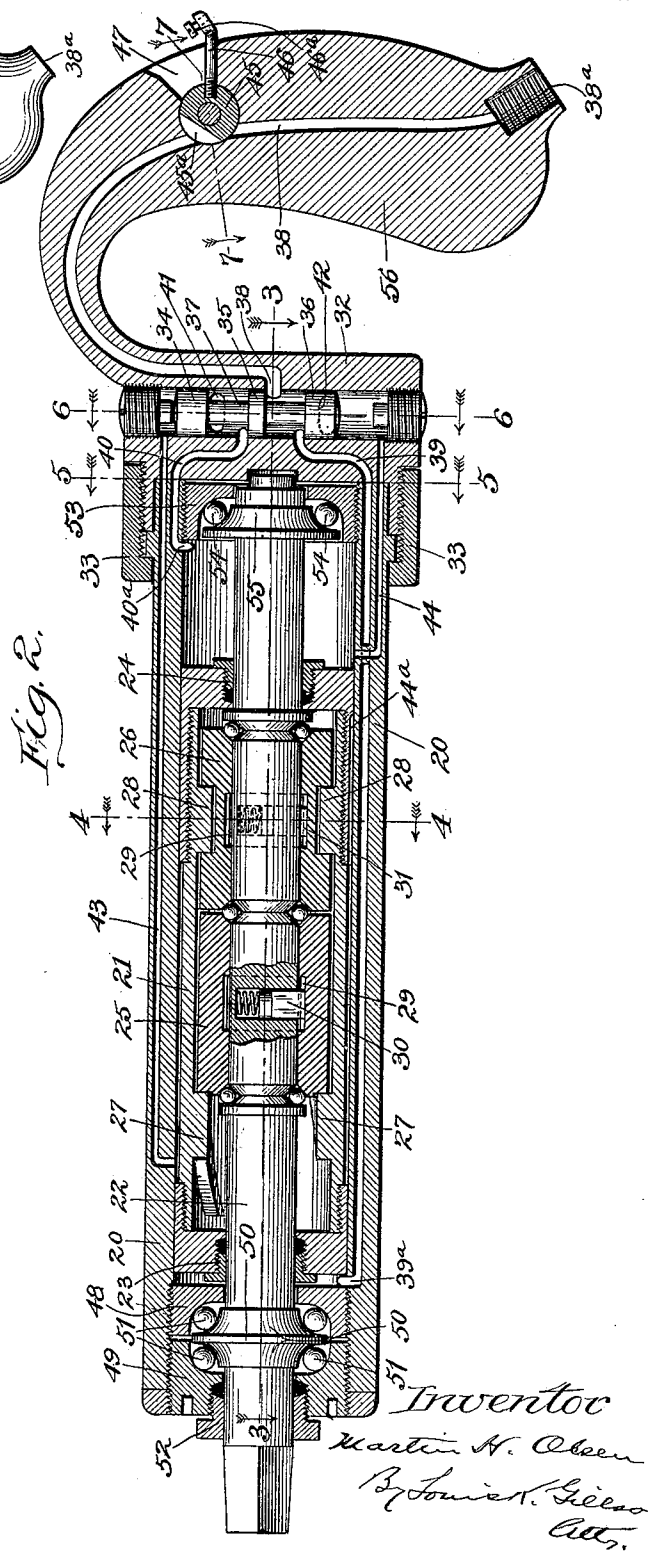


Fig. 2.

Witnesses:
W. C. Coules
Hester B. Baird

Inventor
Martin H. Olsen
By Louis A. Gibson
Atty.

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

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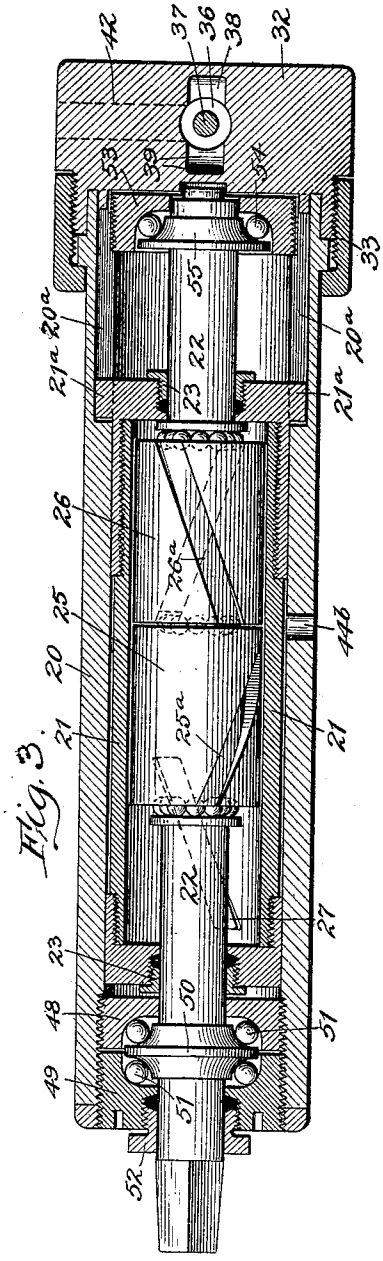


Fig. 3.

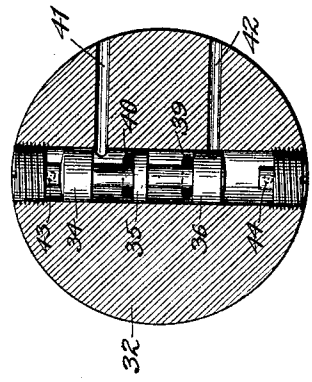


Fig. 6.

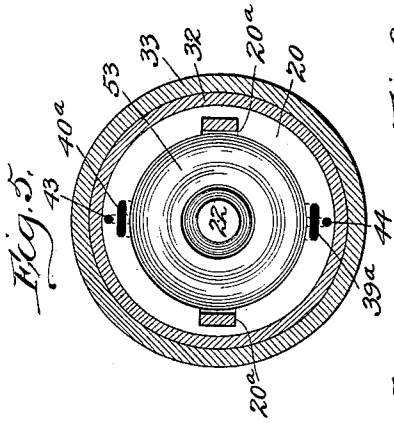


Fig. 5.

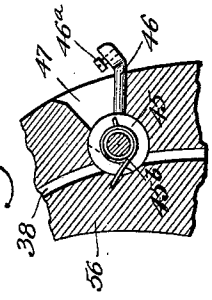


Fig. 8.

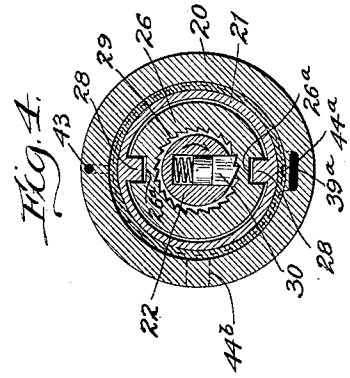


Fig. 4.

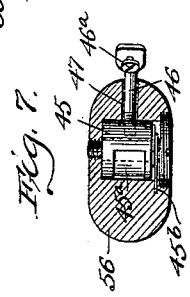


Fig. 7.

Witnesses
W. C. Corlies
Hester B. Baird

Inventor
Martin H. Olsen
By Louis K. Gibson
Atty

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

No. 623,816. Patented Apr. 25, 1899.

M. H. OLSEN.

ENGINE FOR HAND DRILLS.

(Application filed Mar. 5, 1898.)

(No Model.) 3 Sheets—Sheet 3.

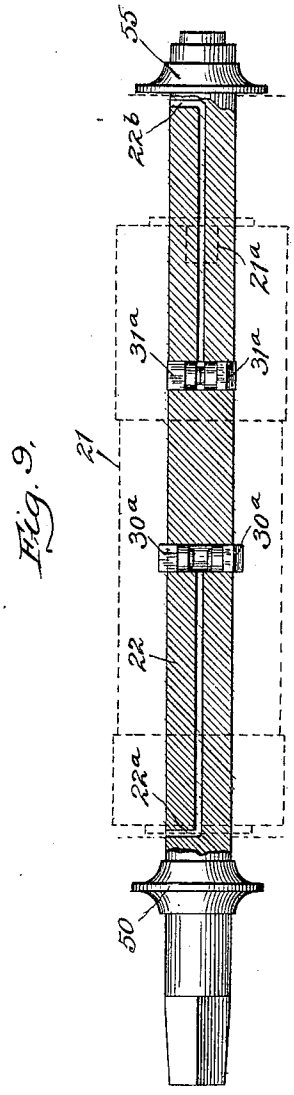


Fig. 9.

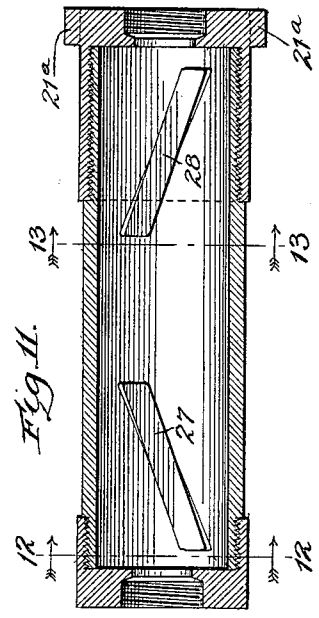


Fig. 11.

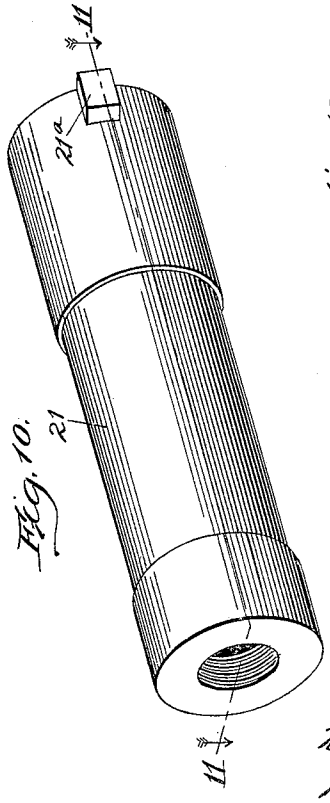


Fig. 10.

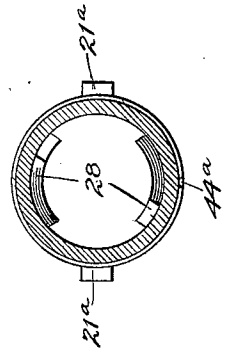


Fig. 13.

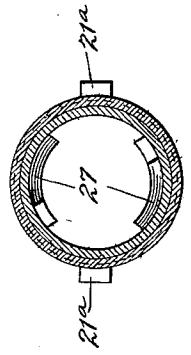


Fig. 12.

Witnesses
W. C. Curtis
Lester B. Baird

Inventor
Marten H. Olsen
By Louis A. Gibson
Atty.

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

UNITED STATES PATENT OFFICE.

MARTIN H. OLSEN, OF CHICAGO, ILLINOIS.

ENGINE FOR HAND-DRILLS.

SPECIFICATION forming part of Letters Patent No. 623,816, dated April 25, 1899.

Application filed March 5, 1898. Serial No. 672,766. (No model.)

To all whom it may concern:

Be it known that I, MARTIN H. OLSEN, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Engines for Hand-Drills, of which the following is a specification, and which are fully illustrated in the accompanying drawings, forming a part of this specification.

In the drawings, Figure 1 is a side elevation of the device. Fig. 2 is a longitudinal central section. Fig. 3 is a longitudinal central section on the line 3 3 of Fig. 2, being on a plane perpendicular to the plane of the view shown in Fig. 2. Figs. 4, 5, 6, and 7 are central views on the lines 4 4, 5 5, 6 6, and 7 7, respectively, of Fig. 2. Fig. 8 is a sectional view on the line 8 8 of Fig. 7. Fig. 9 is a detail longitudinal central section of the drill-carrying shaft, looking in the same direction as in Fig. 2. Fig. 10 is a perspective of the piston of the motor. Fig. 11 is a sectional view on the line 11 11 of Fig. 10; and Figs. 12 and 13 are sectional views on the lines 12 12 and 13 13, respectively, of Fig. 11.

The objects of the invention are to provide a hand-drill which contains a fluid-actuated motor for rotating a drill and to provide a simple and positive automatic motor for devices of this kind. These objects are attained in the device hereinafter fully described and which is illustrated in the accompanying drawings.

The drill X is of any desired form and is carried by a rotative shaft 22, journaled upon the longitudinal axis of a cylinder 20 and driven by means of a reciprocating piston 21 within the cylinder and mounted upon the shaft 22 and in both sliding and rotative engagement therewith. This piston is prevented from rotating by means of splines 21^a 21^a near one of its ends and engaging channels 20^a 20^a in the cylinder-walls. The piston 21 is chambered for the purpose hereinafter described, and in order to prevent the entrance of the driving fluid into this chamber its ends are provided with stuffing-boxes 23 24, as shown. A pair of cylindrical sleeves 25 26 are mounted upon the shaft 22 within the chamber of the piston 21 in such manner that they are in rotative relation to the shaft, but are locked against longitudinal movement thereupon. In the peripheral faces of the sleeves 25 26 are formed channels 25^a 26^a. The general direction of these channels is longitudinal as to the sleeves, but they are oblique to the axis of the shaft 22, the inclination of the grooves of one sleeve being in the opposite direction to that of the grooves of the other sleeve. Oblique ribs 27 28 are formed upon the walls of the chamber of the piston 21 and are adapted to engage the channels 25^a 26^a, respectively, so that as the piston 21 is reciprocated within the cylinder 20 the sleeves 25 26 are caused to oscillate in opposite directions.

Within the bore of the sleeves 25 26 are formed circumferential ratchets 29, their teeth facing in the same circumferential direction. Located within suitable transverse apertures within the shaft 22 are pawls 30 31 for coöperating with the ratchets 29. These pawls may be spring-projected, as shown in Fig. 2, or I may mount within each of the apertures of the shaft a pair of pawls, as 30^a 31^a, the members of each pair projecting in opposite directions and being forced outwardly by fluid-pressure conveyed to the chamber within which they are located by means of ducts 22^a 22^b formed within the shaft 22 and opening laterally to the chamber of the cylinder, one at each of its ends, so that when fluid-pressure is applied to drive the piston it throws out the pawls adjacent to the end of the piston to which the pressure is applied, while the other pair of pawls are relieved from pressure and are free to slide upon the ratchets with which they coöperate with substantially no friction.

The disposition of the grooves in the surfaces of the sleeves 25 26, of the splines engaging these grooves, and of the ratchets and their coöperating pawls is such that the shaft 22 is continuously rotated to the right, being driven by the sleeves alternately.

A valve-casing 32 is applied to the rearward end of the cylinder 20 and secured thereto by means of a union-coupling 33. Within the chamber of the valve-casing 32, which is transverse to the cylinder 20, is mounted a reciprocating valve comprising disks 34 35 36, fixed upon a stem 37. A duct 38, leading from a source of pressure, enters

the valve-chamber substantially midway of its length, and ducts 39 40 lead from the valve-chamber, being located one upon each side of the port of the duct 38, through the walls of the cylinder 20 to the chamber of the latter, the duct 39 entering the chamber of the cylinder at its outer end, as shown at 39^a, and the duct 40 at its inner end, as shown at 40^a. Exhaust-ports 41 42 lead from the chamber of the valve-casing 32, being located beyond the ducts 39 40—that is to say, nearer the ends of the chamber. The width of the middle disk 35 of the valve is such that it may be located between either of the ducts 39 40 and the duct 38 without covering any of these passages. The width of the outer disks 34 36 of the valve is sufficient to cover the exhaust-ports 41 42, and the length of the valve-stem 37 is such that when one of the exhaust-ports is covered the central disk 35 is at the opposite side of the duct 38, and the other exhaust-port, as well as the adjacent duct leading from the valve-chamber to the cylinder, is between the central disk 35 and the farther end disk, the service-duct 38 being in communication with the other cylinder-duct.

In order to automatically throw the valve by fluid-pressure, ducts 43 44 are formed within the walls of the cylinder 20 and within the valve-casing 32, opening, respectively, to opposite ends both of the cylinder and of the valve-chamber. These ducts open to the cylinder-chamber at such distance from its ends that they are uncovered only at the end of the stroke of the piston. As shown in Fig. 2, the piston has just reached the end of its outstroke and uncovered the duct 44, admitting pressure to the valve-chamber, so that the valve has been thrown to cut off pressure from that end of the cylinder and bring it into communication with the exhaust-port 41, pressure being opened to the outer end of the cylinder.

The diameter of the piston 21 is reduced intermediate of its ends, so as to form an annular chamber with the cylinder-walls, which chamber is brought alternately into communication with the ducts 43 44 as the piston reaches the ends of its stroke. An exhaust-port 44^b is formed in the wall of the cylinder 20, so as to be at all times in communication with the annular chamber surrounding the body of the piston, so that as the ducts 43 44 are brought into communication with this annular chamber the pressure upon the corresponding end of the motor-valve is relieved.

The maximum diameter of the piston at that end which carries the splines 21^a is of such length that the channels 20^a are at no time opened to the annular chamber surrounding the piston, and in order to bring the duct through which pressure is communicated to shift the valve into communication with this annular chamber a channel, as 44^a, is formed in the surface of the piston.

To adapt the tool for hand use, a handle 56, of any desired form, is secured to it and preferably is integral with the valve-chest 32, as shown, the pressure service-duct 38 leading through this handle, which is provided with means, as shown at 38^a, for the attachment of a suitable nipple. Within this handle 56 there is placed a rock-valve 45 for controlling the duct 38, and this valve being provided with a transverse by-pass 45^a, through which the duct may be opened. A spring 45^b is wound upon the arbor of the valve 45 for the purpose of normally holding the valve in such position as to close the duct. A valve-stem 46 projects outwardly beyond the surface of the handle 56 and oscillates within a segmental recess 47, being provided with an adjustable stop 46^a, whereby the throw of the valve may be regulated.

The outer end of the cylinder 20 is closed by means of screw-plugs 48, apertured therethrough for the passage of the shaft 22 and having their adjacent faces concave, so as to form a chamber within which is located a double cone 50 and within which run bearing-balls 51. The outer plug 49 is provided with a stuffing-box 52. A screw-plug 53 is located within the inner end of the cylinder 20 and forms a casing for the bearing-balls 54, which coöperate with a cone 55, mounted upon the shaft 22. The sleeves 25 26 are preferably provided with ball-bearings, as shown.

The operation of the tool is as follows: Assuming the parts to be in the position shown in Fig. 2, the fluid-pressure (preferably compressed air) is admitted by opening the valve 45 to the outer end of the cylinder through the duct 39, and the piston is driven inwardly, thereby causing a pressure rotation to the right of the sleeve 25 and to the left of the sleeve 26. The sleeve 25, being in engagement by means of the ratchet and pawl with the shaft 22, carries the latter with it, the ratchet and pawl of the sleeve 26 being out of engagement. As the piston passes the port of the duct 43 the fluid-pressure passes therethrough to the valve-chamber and shifts the valve so as to bring the duct 40 into communication with the duct 38, the duct 39 being opened to the exhaust-port 42. The shifting of the valve is facilitated by reason of the communication of the duct 44 with the exhaust-port 44^b through the channel 44^a and the annular chamber surrounding the body of the piston. The piston being now driven in the opposite direction, the ratchet and pawl of the sleeve 26 come into engagement, and this sleeve being now partially rotated to the right the rotation of the shaft already set up is continued. As the piston reaches the end of its outstroke the duct 44 is opened to pressure and the duct 43 is opened to the relief-port 44^b, so that the valve is again shifted.

The controlling-valve 45 is so located that it is opened by the hand of the operator as he grasps the handle 56. As the grasp of this handle is relinquished the valve closes by the action of the spring 45^b.

The speed of the drill is controlled in part by the extent to which the valve 45 is opened, and this is regulated by means of the set-screw 46^a, and it is controlled in part by the pitch of the channels 25^a 26^a and their coöperating ribs 27 28, as the angular movement of the sleeves 25 26 corresponds with the degree of inclination of these channels and ribs from the axis of the shaft.

When the form of pawls shown in Fig. 9 is used, it will be seen that upon the admission of pressure to the cylinder these pawls are instantly thrown out so as to engage the ratchet, and when this pressure is relieved the pawls are free to recede, and consequently as the sleeve is turned backwardly with reference to the ratchet the latter slides freely upon the pawls and with practically no friction.

I claim as my invention—

1. In a motor, the combination with a rotative shaft, of a pair of sleeves adapted to oscillate upon the shaft as a center, clutch connection between each of said sleeves and the shaft and engaging in the same direction of movement, a piston, adapted to be reciprocated longitudinally upon the shaft, relatively-reversed cam connection between such piston and the oscillating sleeves, whereby the shaft may be continuously rotated by the application of power to cause the reciprocation of the piston.

2. The combination with a cylinder, a chambered non-rotative reciprocating piston within the cylinder, and a rotative shaft journaled upon the axis of the cylinder and piston, of a pair of non-reciprocating cam-sleeves journaled upon the shaft within the chamber of the piston, such sleeves being so engaged with the piston that its reciprocation causes their oscillation and in relatively opposite directions, and ratchet-and-pawl connection between the sleeves and the shaft whereby the shaft is continuously rotated by the oscillation of the sleeves.

3. The combination with a cylinder, a chambered piston adapted to reciprocate within the cylinder, a spline for engaging the piston with the cylinder, and a rotatable shaft journaled upon the axis of the cylinder and piston, a pair of rotatable, non-reciprocating sleeves journaled upon the shaft and within the chamber of the piston, cam-ribs oblique to the axis of the sleeves connecting the sleeves with the piston, the ribs relating to one sleeve being inclined in the opposite direction from those relating to the other sleeve, and clutch connection between the sleeves and the shaft, such clutches acting in the same direction.

4. The combination with a cylinder, a chambered non-rotative reciprocating piston within the cylinder, and a rotative shaft journaled upon the axis of the cylinder and piston, of a pair of non-reciprocating cam-sleeves journaled upon the shaft within the chamber of the piston, such sleeves being so engaged with the piston that its reciprocation causes their oscillation and in relatively opposite directions, a pair of clutch-blocks housed within a transverse aperture in the shaft for engaging each sleeve, and a duct leading through the shaft to the clutch-block aperture whereby fluid-pressure may be applied to eject such blocks.

5. The combination with a cylinder, a chambered piston adapted to reciprocate within the cylinder, a spline for engaging the piston with the cylinder, and a rotatable shaft journaled upon the axis of the cylinder and piston, a pair of rotatable, non-reciprocating sleeves journaled upon the shaft and within the chamber of the piston, cam-ribs oblique to the axis of the sleeves connecting the sleeves with the piston, the ribs relating to one sleeve being inclined in the opposite direction from those relating to the other sleeve, a pair of clutch-blocks housed within a transverse aperture in the shaft for engaging each sleeve, ducts leading through the shaft and opening respectively to each of the block-apertures and to opposite ends of the cylinder.

6. In a fluid-pressure motor, the combination with a cylinder, and a trunk-piston reciprocating therein and having a peripheral recess intermediate of its ends, of a pressure-distributing valve for the motor, ducts for serving pressure to opposite sides of such valve for shifting the same, such ducts leading from the cylinder and opening thereto in such position that in alternation one of them is uncovered to the cylinder-chamber and the other to the peripheral recess of the piston at the end of each stroke of the piston, the cylinder having an exhaust-port in register with such peripheral recess at the end of each stroke of the piston.

MARTIN H. OLSEN.

Witnesses:
LOUIS K. GILLSON,
HESTER B. BAIRD.