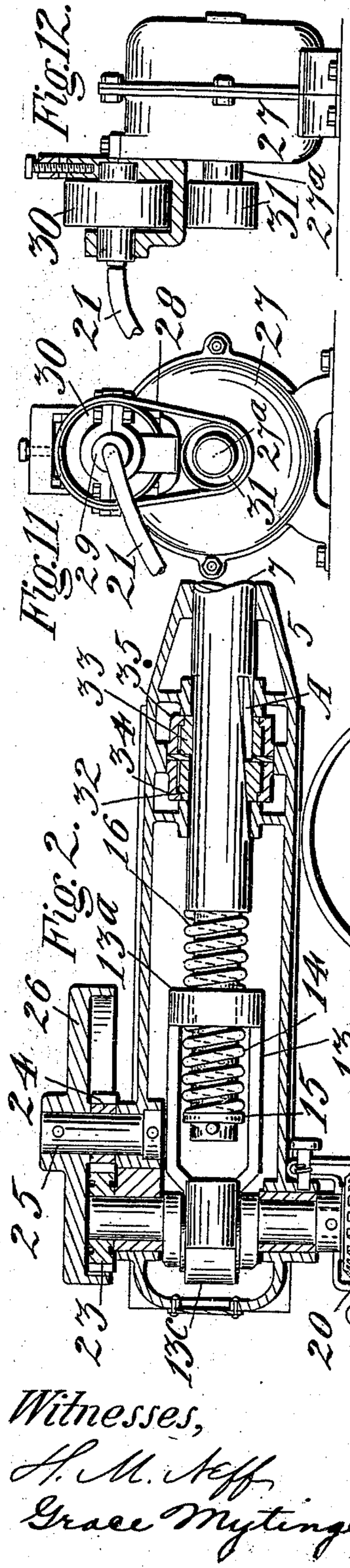
No. 683,404. Patented Sept. 24, 1901.

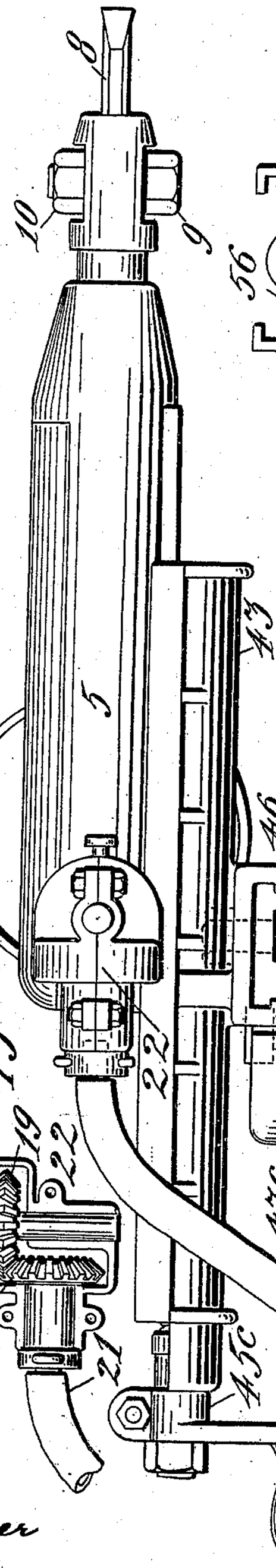
M. C. JACKSON.

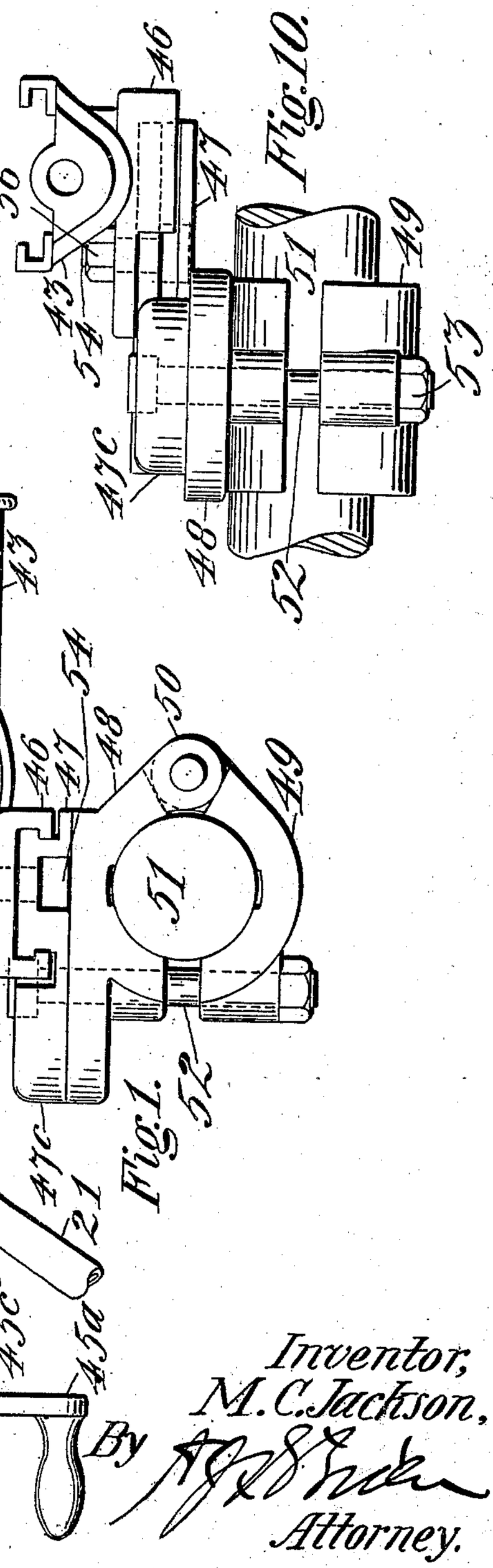
ROCK DRILLING MACHINE.

(Application filed Dec. 20, 1899.)

(No Model.) 2 Sheets—Sheet 1.







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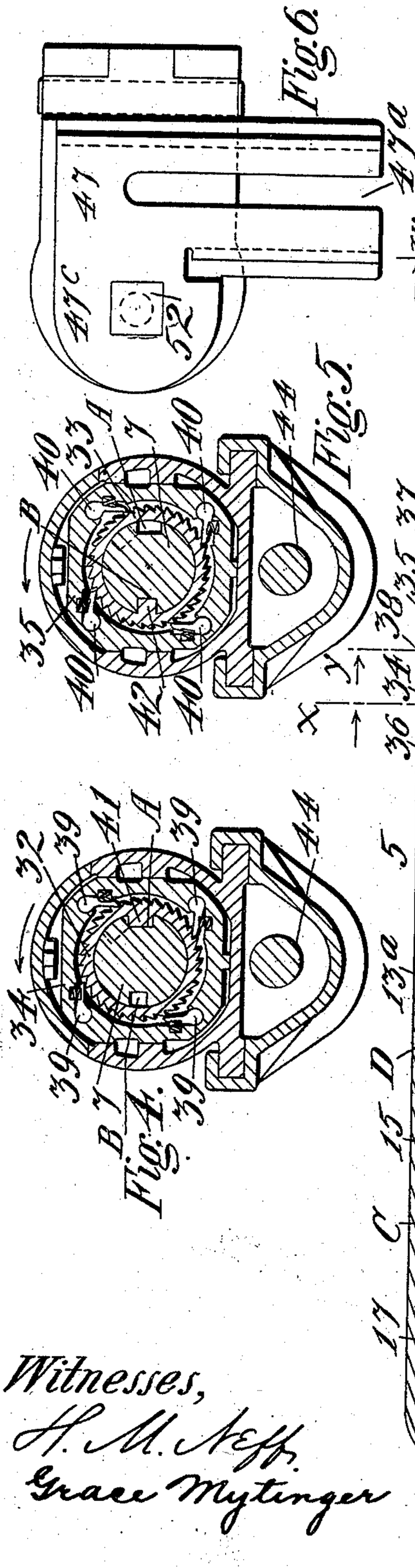

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UNITED STATES PATENT OFFICE.

MANETHO CORTES JACKSON, OF DENVER, COLORADO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE GARDNER ELECTRIC DRILL AND MACHINERY COMPANY, OF SAME PLACE.

ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 683,404, dated September 24, 1901.

Application filed December 20, 1899. Serial No. 741,031. (No model.)

To all whom it may concern:

Be it known that I, MANETHO CORTES JACKSON, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Rock-Drilling Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in rock-drilling machines adapted to be operated through the instrumentality of a flexible shaft and electric motor or other suitable power, my object being to provide a machine of great efficiency, but which shall be operated at a minimum cost. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my improved machine. Fig. 2 is a fragmentary horizontal section taken through the same. Fig. 3 is a vertical section taken through the drill mechanism. Figs. 4 and 5 are cross-sections taken on the lines X X and Y Y, respectively, Fig. 3, looking in the direction of the arrows. Fig. 6 is a top view of the clamp and the slotted plate mounted thereon and forming a support for the guide-shell. Fig. 7 is a fragmentary view of the crank-shaft, shown partly in section. Fig. 8 is a cross-section taken on the line W W, Fig. 3. Fig. 9 is a cross-section taken on the line Z Z, Fig. 8. Fig. 10 illustrates the supporting-bar, the clamp, and the guide-shell viewed at right angles to Fig. 1. Figs. 11 and 12 illustrate an electric motor and the manner of connecting it with the flexible shaft.

Similar reference characters indicating corresponding parts in the views, let the numeral 5 designate the casing of the machine, inclosing the reciprocating shaft 7, carrying the drill-bit 8, which is secured to the shaft by a bolt 9, passing through the shaft and having an opening through which the shank of the bit passes. The shaft extremity is provided with a socket 5^a, in which the bit is inserted, and an opening 5^c, through which the bolt passes. (See Fig. 9.) The bolt 9 is employed to lock the bit in place. This is done by tightening the nut 10. The head of the bolt 9 is made of sufficient weight to perfectly balance the shaft, whereby there is no tendency of the latter to turn when in any position except as it is actuated by the automatic devices hereinafter explained. The rear portion of the reciprocating shaft is connected with the crank-shaft 12 by a yoke 13, whose front and rear extremities 13^a and 13^c engage the top and bottom of the casing, which is fashioned to accurately guide the same. The front part of the yoke is provided with an opening through which the reduced portion 7^a of the drill-shaft passes. The yoke is open, as shown, to receive the shaft extremity. A space is left between the rear extremity of the drill-shaft and the rear extremity of the yoke to allow the said parts a limited independent movement. The portion of the drill-shaft located within the yoke is surrounded by a coil-spring 14, one extremity of which engages a collar 15 on the shaft, while the other extremity bears against the front part 13 of the yoke. The part of the drill-shaft immediately forward of the yoke is also surrounded by a coil-spring 16, which is located between the shoulder 7^c of the shaft and the forward extremity of the yoke. These springs 14 and 16 serve as buffers, forming a yielding connection between the yoke and the drill-shaft and permitting the yoke to move in either direction independently of the shaft. This is an important feature. In case the drill-bit gets stuck or fast in the hole the yoke can move backward in response to the crank-shaft without breaking or injuring the mechanism. Again, if the drill-shaft is moved too close to the rock the yoke actuated by the crank-shaft may move forward after the drill-bit ceases to move. The rear extremity 13^c of the yoke is provided with a cam-slot 13^d, which is engaged by the crank 17 of the shaft. This crank is composed of the arms 17^a, provided with short sleeves 17^d, which project toward and engage each other. The said arms are connected by a pin 17^c, which is

made fast to the arms in any suitable manner. The sleeve parts 17^d of the crank are surrounded by a loose bushing 18, which directly engages the walls of the cam-slot 13^d and forms an antifrictional bearing between the crank and the yoke. By the peculiar shape of the slot 13^d, being an epicycloidal curve, superior thrust or striking power is obtained. It is so formed that when the crank first engages the upper or front portion of the slot the entire forward thrust is made while the crank is making one-fourth of a revolution, thus imparting about double the striking force ordinarily obtained by cam or eccentric mechanism. By reason of this feature great striking force may be obtained even when the crank is rotated at a moderate speed. Moreover, the curve of this slot is such as to permit a rebound of the drill-shaft after striking the rock without subjecting the parts of the mechanism to the severe jar or concussion incident to the use of a straight slot. The peculiar curve of the slot also gives the advantage of requiring a full one-half revolution to the crank in withdrawing the drill-shaft, giving additional power to withdraw the bit and lessening the momentum during the backward stroke. It must be understood, however, that while I prefer the peculiar shape of slot shown in the drawings and heretofore described the invention is not limited to any special construction of slot.

The crank-shaft 12 is suitably journaled in the casing 5. (See Fig. 2.) To one of the projecting extremities of this shaft is made fast a bevel-gear 19, which meshes with a similar gear 20, to which one extremity of the flexible shaft 21 is secured. The two gears are inclosed by a dust-proof gear-case 22. To the opposite protruding extremity of the crank-shaft 12 is made fast a gear 23, which meshes with a small gear or pinion 24, fast on a short shaft 25, journaled on the casing 5 and having a fly-wheel 26 made fast to its outer extremity. By this construction and arrangement the speed of the fly-wheel becomes greater than that of the crank-shaft, enabling me to obtain the desired steadying results and uniformity of motion by the use of a much smaller fly-wheel than could otherwise be employed. This is an important feature in a machine of this class, since the space in which the machine must be operated is nearly always limited, and a large fly-wheel, if not prohibitive, becomes a source of great annoyance. As shown in the drawings, the fly-wheel is provided with an interior flange which conceals its operating-gear and pinion. The extremity of the flexible shaft 21 remote from the gear 20 is connected with an electric motor 27 by a belt 28, engaging pulleys 30 and 31, respectively, mounted on the motor-shaft 27^a and a short shaft 29, with which the extremity of the flexible shaft is directly connected. The pulley 30 is readily detachable, whereby the uniformity of the drill-shaft stroke may be preserved regardless of the revolution or speed of the motor or the voltage of the current with which the motor is connected. This is an important feature, since when working in different localities currents of different voltage must necessarily be utilized, but by using pulleys of various sizes the uniform rapidity of stroke may be maintained. This belt connection is sufficiently positive for all practical purposes and at the same time prevents breaking or injury to the mechanism in case the movement of the crank-shaft should be suddenly arrested. It must be understood, however, that any other suitable connection between the motor and flexible shaft may be employed, also that any desired power other than an electric motor may be utilized for operating the machine.

The mechanism for imparting the rotary movement to the drill-shaft will now be described. This shaft is provided with a spiral or inclined groove A and a straight groove B, the one being indicated by full lines and the other by dotted lines in Fig. 3. The drill-shaft is surrounded by two ratchet-wheels 32 and 33, inclosed by keepers 34 and 35, located within the casing 5 and locked against rotation therein. These two keepers are located between rings 36 and 37, surrounding the drill-shaft and formed integral with the casing. These rings lock the keepers and their ratchet-wheels against longitudinal movement in the casing. The keepers and their respective ratchets are separated by a washer 38. The ratchet 32 is locked against rotation in the direction indicated by the arrow in Fig. 4 by spring-held dogs 39, pivotally mounted on the keeper 34. The ratchet 33 is locked against rotation in the same direction by similar dogs 40. The ratchet 32 is provided with a lug 41, which engages the spiral groove A of the drill-shaft. The ratchet 33 is provided with a similar lug 42, engaging the straight groove B of the drill-shaft. Hence as the said shaft is moved forward in the performance of its function it moves in a direct line, since the dogs 40 and the ratchet 33 lock it against rotation in the direction indicated by the arrow in Fig. 5 by virtue of the engagement of the lug 42 with the straight groove of the shaft. Again, during the backward stroke the drill-shaft turns in the direction opposite that indicated by the arrows in Figs. 4 and 5, since the dogs 39 lock the ratchet 32 against movement in the direction of the arrows and the shaft turns by virtue of the engagement of the lug 41 with its spiral groove.

The drill-casing 5 is slidingly mounted on a guide-shell 43, in which is journaled the feed-screw 44, engaging a depending nut 45, formed integral with the casing. The turning of the feed-screw by means of a hand-crank 45^a causes the casing 5 and its attachments to move back and forth on the shell, as desired.

The bottom of the guide-shell is provided

with a depending projection 46, grooved to receive and retain a plate 47, which rests on a clamp member 48, coöperating with a clamp member 49. The two clamp members are hinged at 50 and embrace the supporting-bar 51. They are locked on the shaft by a bolt 52, fastened by a nut 53. This bolt also passes through a projection 47^c of the plate 47. This plate is provided with a slot 47^a, through which passes a bolt 54, whose head engages a groove in the bottom of the plate and is larger than the width of the slot. The depending part 46 of the guide-shell is connected with this plate by a bolt 54, passing through an opening in the part 46 and the slot of the plate 47. By loosening the nut 56 on this bolt the guide-shell and the drill mechanism may be shifted laterally, the bolt traveling in the slot 47^a for the purpose of inserting a drill-bit, after which the machine may be returned to its normal position in proper alinement with the drill-hole. All this may be accomplished without loosening the clamp embracing the bar 51 and without getting the machine out of alinement. If it is desired to adjust the machine to drill in a different direction, the nut 53 is loosened.

In the operation of the machine the crank-shaft is rotated from the motor 27 through the instrumentality of the flexible shaft and the connections heretofore described. The operation of the crank-shaft imparts a reciprocating movement to the drill-shaft by virtue of the engagement of the crank 17 with the slot 13^d of the yoke, the drill-shaft being automatically rotated in the manner set forth. The drill-casing is moved back and forth on the guide-shell by the operation of the feed-screw. The shoulder 45^c of the crank 45^a engages the end of the guide-shell and prevents the screw from traveling longitudinally when turned to carry the casing forward, and the collar 44^a of the screw prevents the backward movement of the latter when the casing is traveling rearwardly. The yoke 13 is locked against rotation by tongues C and D, formed on the casing and engaging counterpart grooves formed, respectively, in the top and bottom of the yoke.

Having thus described my invention, what I claim is—

1. In a drill, the combination with a casing and a turning-drill and drill-shaft, of a yoke in axial alinement with the shaft, means for reciprocating the yoke, a sliding connection between the shaft and yoke, means for preventing the rotation of said yoke, stops on said shaft to the front and the rear of said sliding connection and a spring interposed between each stop and said connection, substantially as described.

2. In a rock-drilling machine, the combination with a guide-shell and suitable drilling mechanism mounted thereon, of a supporting-bar, a clamp embracing the bar, a plate bolted to the clamp and provided with a slot extending parallel with the bar, the guide-shell being provided with a depending part having an opening registering with the slot in the plate, and a bolt passing through the said opening and the said slot, the bolt being secured by a nut so that by loosening the nut the guide-shell and the machine supported thereon, may be shifted in a direction parallel with and independently of the supporting-bar without loosening the clamp on said bar.

3. In a rock-drilling machine, the combination with a guide-shell and a suitable drilling mechanism mounted thereon, of a supporting-bar, a clamp embracing the bar, a plate bolted to the clamp and provided with a slot extending parallel with the bar, and a groove extending parallel with but larger than the slot, a part mounted on the guide-shell and coöperating with the plate, the said part having an opening registering with the slot of the plate, and a bolt passing through the slot and the opening in the coöperating part of the guide-shell, the head of the bolt engaging the groove in the plate, whereby as the nut is loosened the guide-shell may be shifted in a line parallel with the supporting-bar without loosening the clamp on the bar or moving the latter.

4. The combination with a guide-shell and drill mechanism mounted thereon, the guide-shell having an integral apertured depending part, a supporting-bar, a clamp attached to the bar, a plate attached to the clamp and having a slot extending parallel with the bar, the depending part of the shell being fashioned to interlock with said plate and slide thereon, the aperture in the shell part registering with the slot in the plate.

5. In a percussive drill, the combination of an inclosing shell, a drill-shaft guided therein, a sliding yoke having a resilient connection with the drill-shaft, and a crank-shaft mounted in the shell and connected to said yoke by means of a slot therein, said slot being curved as described to permit the crank to impart a quick forward movement and a relatively slow retractile movement to the yoke and drill-shaft as the crank rotates through the forward and backward strokes, respectively.

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

MANETHO CORTES JACKSON.

Witnesses:
A. J. O'BRIEN,
GRACE MYTINGER.