No. 816,021.

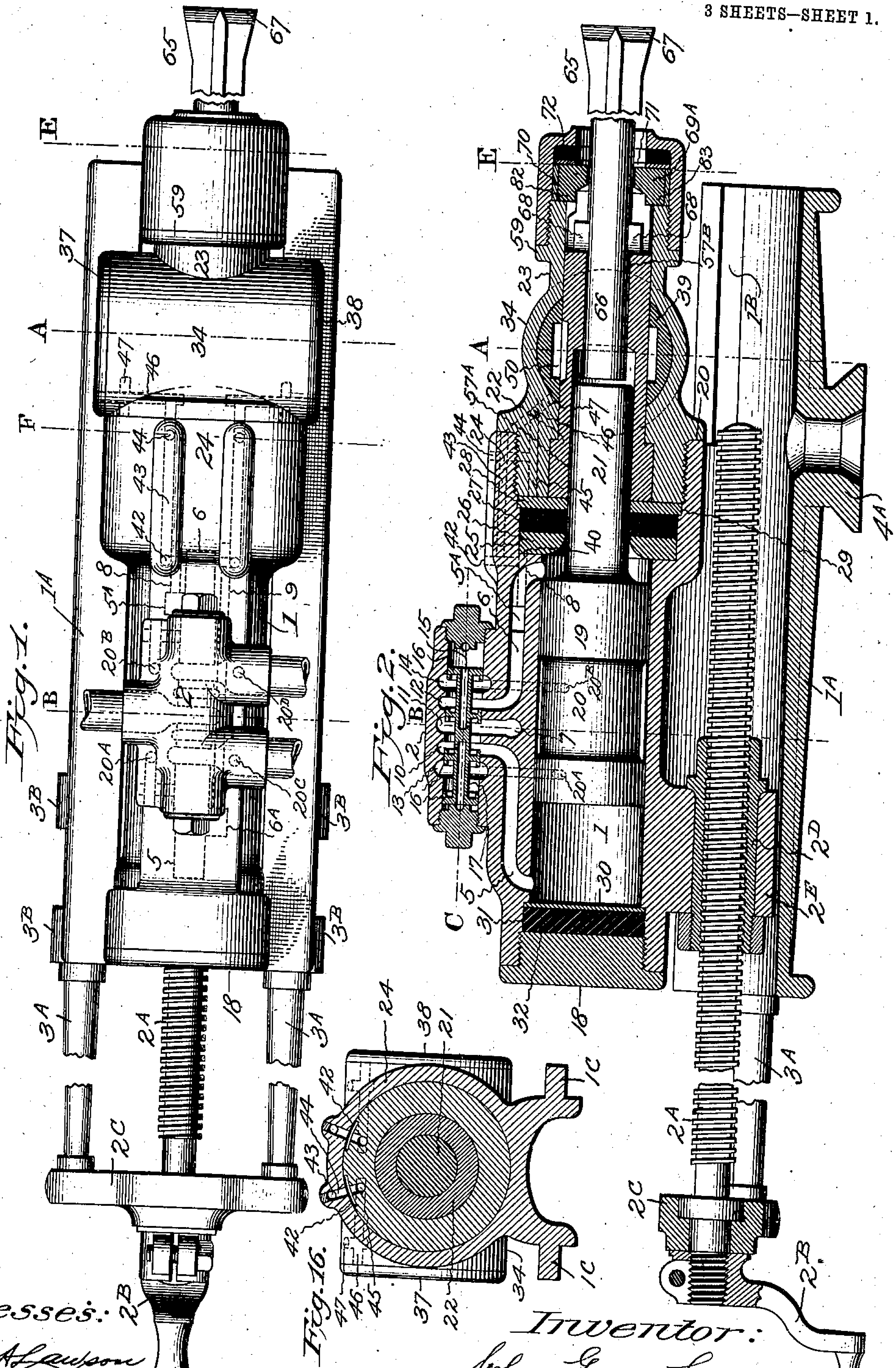
PATENTED MAR. 27, 1906.

J. G. LEYNER.

DRILL BIT ROTATING MECHANISM FOR ROCK DRILLING ENGINES.

APPLICATION FILED JUNE 22, 1903.

3 SHEETS—SHEET 1.



Witnesses:

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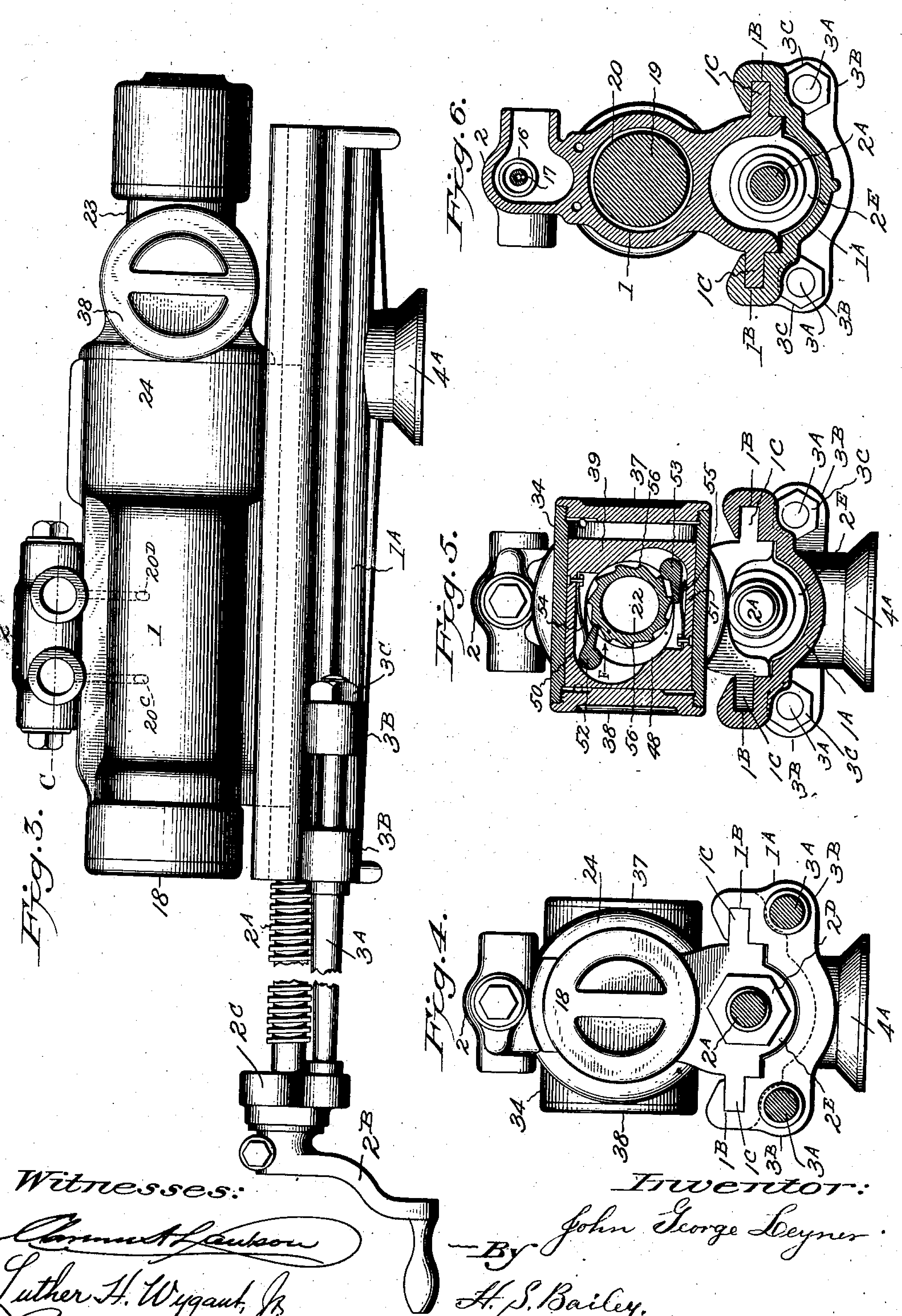

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3 SHEETS—SHEET 3.

Fig. 7.

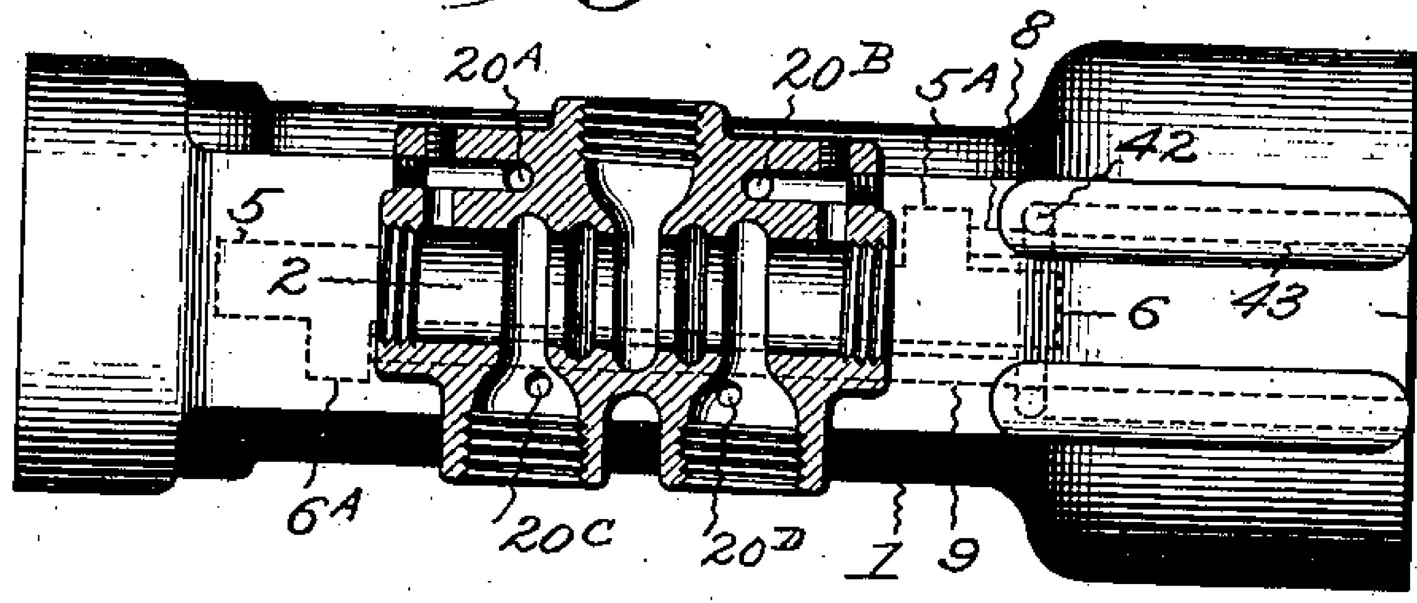


Fig. 8.

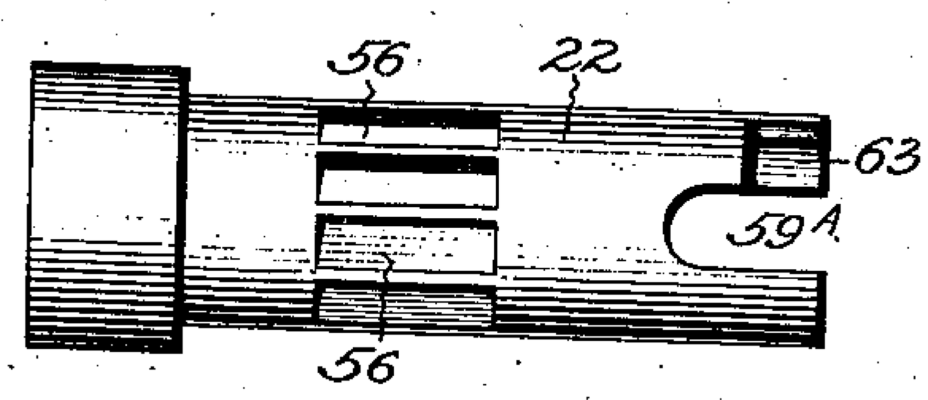


Fig. 9.

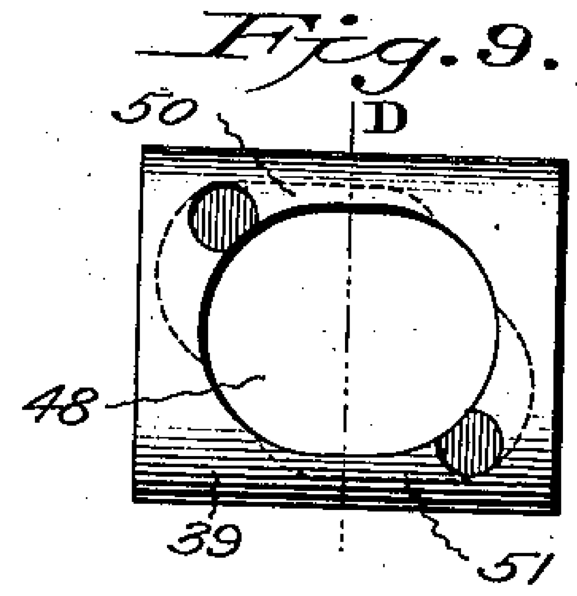


Fig. 10.

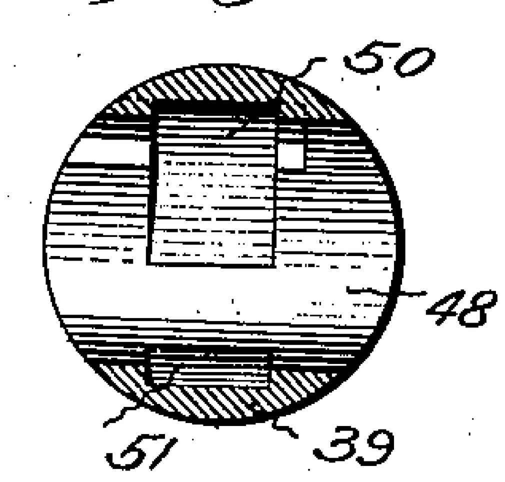


Fig. 11.

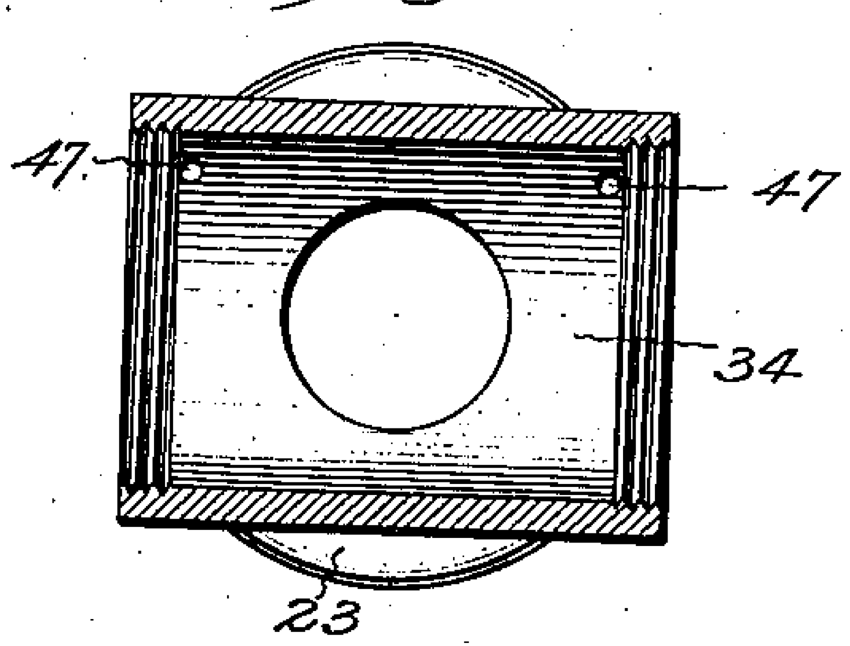


Fig. 13.

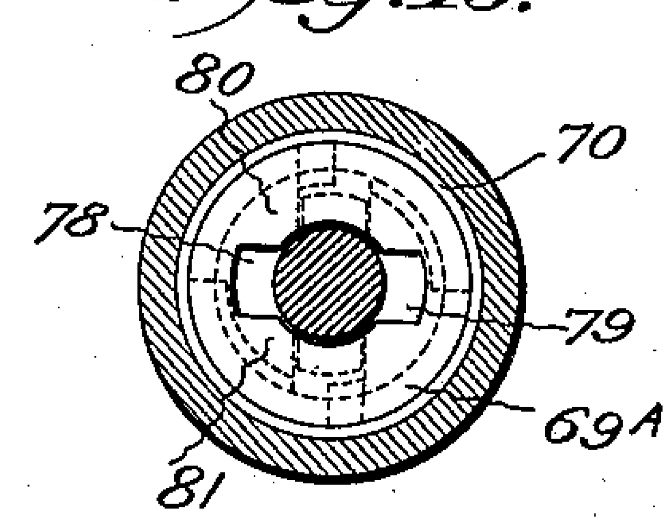


Fig. 12.

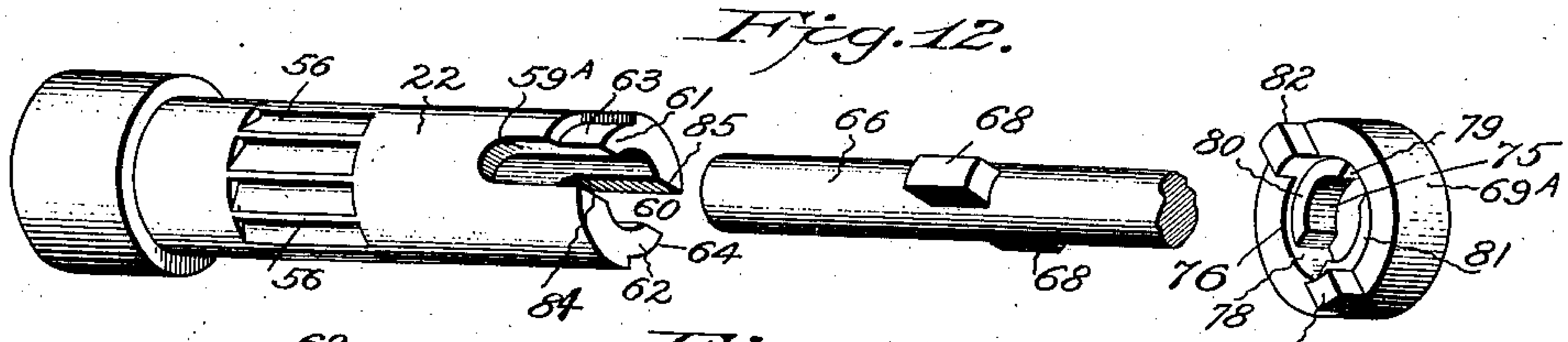


Fig. 14.

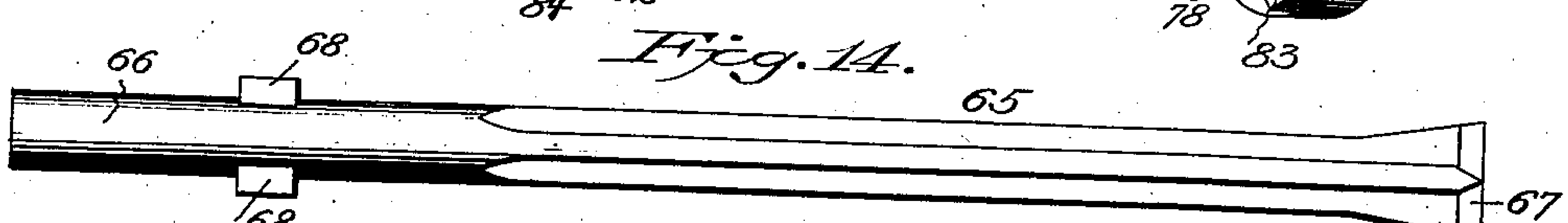
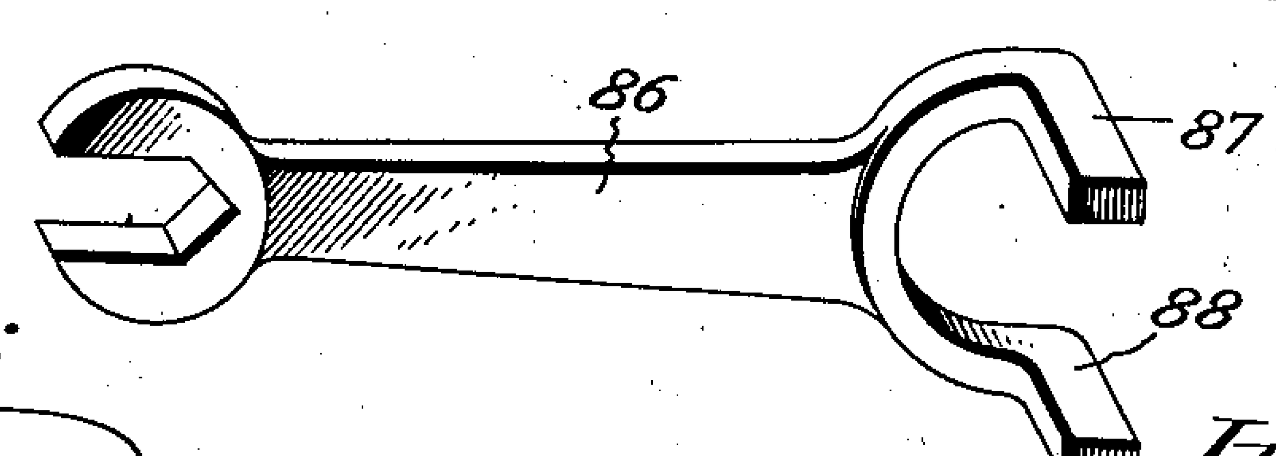


Fig. 15.



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UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

DRILL-BIT-ROTATING MECHANISM FOR ROCK-DRILLING ENGINES.

No. 816,021. Specification of Letters Patent. Patented March 27, 1906.

Application filed June 22, 1903. Serial No. 162,587.

To all whom it may concern:

Be it known that I, John George Leyner, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Drill-Bit-Rotating Mechanism for Rock-Drilling Engines; 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 intermittent drill-bit-rotating mechanism for rock-drilling engines; and the objects of my invention are, first, to provide a new and novel mechanism for rotating the rock-cutting drill-bit of rock-drilling engines; second, to provide a device for intermittently rotating the drill-bits of rock-drilling engines that will dispense with the use of a spirally-fluted rifled bar and the spirally-fluted nut and ratchet-and-pawl mechanism commonly used in rock-drilling engines for rotating their rock-cutting drill-bits; third, to provide a simple, durable, and efficient means for rotating the rock-cutting drill-bit of rock-drilling engines. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a top plan view of a rock-drilling engine embodying my rock-cutting drill-bit-rotating mechanism. Fig. 2 represents a central longitudinal section through a rock-drilling engine and of my improved drill-bit step-by-step rotating mechanism, showing a drill-bit in operative position in the drilling-engine. Fig. 3 represents a side elevation of Figs. 1 and 2. Fig. 4 is a rear end elevation. Fig. 5 is a section through Figs. 1 and 2 on line A. Fig. 6 is a section of Figs. 1 and 2 on line B. Fig. 7 is a sectional plan view of the valve-chest on line C of Figs. 2 and 3. Fig. 8 is a side elevation of the drill-holding chuck. Fig. 9 is a side elevation of the pawl-actuating piston. Fig. 10 is a cross-section of Fig. 9 on line D. Fig. 11 is a cross-section through the pawl-actuating-piston's cylinder. Fig. 12 is a perspective view of the drill-bit's receiving-chuck, the shank of the drill-bit, and the locking-collar. Fig. 13 is a section through the rock-cutting drill-bit's locking mechanism on line E of Figs. 1 and 2. Fig. 14 is a side elevation of a rock-cutting drill-bit having its shank formed as I preferably use them with my rock-drilling engines. Fig. 15 is a perspective view of the drill-bit's locking and unlocking wrench, and Fig. 16 is a sectional view on line F of Fig. 1.

Similar numerals of reference refer to similar parts throughout the several views.

Referring to the drawings the numeral 1 designates the cylinder of a compressed-air or other fluid operating rock-drilling engine, although I wish it distinctly understood that my present invention relates to an improved device for rotating step by step rock-cutting drill-bits and that my invention contemplates its adaptation to and use in electric or motor or spring operated or hand-operated rock-drills and in all types and characters of rock-drills and rock-drilling engines in which the rock-cutting drill-bit is rotated step by step while drilling the rock.

The cylinder is supported in a guide-shell 1^A, having guideways 1^B, in which slide guides 1^C, which extend laterally from a depending portion cast upon the bottom of the cylinder.

The mechanism for feeding the cylinder longitudinally through the shell is the same as that described in my Patent No. 709,022, dated September 16, 1902, and comprises the feed-screw 2^A, the operating-handle 2^B, which is clamped upon the outer end of the feed-screw, a cross-head 2^C, which supports the handle end of the feed-screw, and the nut 2^D, through which the feed-screw passes and which is secured in a sleeve 2^E, which depends from the rear end of the cylinder, by a shoulder at one end and a nut which is threaded to its opposite end. The cross-head 2^C is supported by a pair of rods 3^A, which are secured at their rear ends to ears 3^B, formed on opposite sides of the rear end of the shell by nuts 3^C. The rods at their forward ends are bolted to the ends of the cross-head in a similar manner. The free end of the feed-screw extends centrally through the pocket of the shell, and by turning the crank-handle the feed-screw is rotated in the cross-head and nut and the cylinder is moved forward or backward through the shell. The shell is adapted to be adjustably supported at any desired angle, and is therefore provided on its under side forward of its center with a depending hub 4^A in the form of a frustum of a cone, which is in practice secured in a clamping-ring, which in turn is adjustably secured to a horizontal or vertical column, stopping-bar, or tripod, these not being illustrated, as they form no part of the present invention.

The numeral 2 designates the valve-chest, which is formed integral with the cylinder.

Suitable air inlet and exhaust ports 5 and 6 are formed in the cylinder, which extend from the central portion of the cylinder to its opposite ends, and a center port 7, that is positioned between the ports 5 and 6. The ports 5 and 6 connect by lateral ports 5^A and 6^A with the ports 8 and 9, both of which lead to the front end of the drilling-engine, as will be explained hereinafter. The valve-chest is provided with air-inlet ports 10, 11, and 12 and with exhaust-ports 13 and 14. The ports 10, 11, and 12 register with the ports 5, 6, and 7 of the cylinder. A valve 15 is operatively mounted in the valve-chest and is provided with collars 16, which are arranged on a stem 17 to control the ports 10, 11, 12, 13, and 14. The rear end of the cylinder is provided with a rear cylinder-head 18, which is detachably secured to it. An operative piston 19 is reciprocally mounted in the cylinder, which is provided with a circumferential recess 20 at the central portion of its length, which connects with ports 20^A, 20^B, 20^C, and 20^D to operate the valve. I provide this piston with a hammer-bar extension 21, which I preferably form integral with the piston, which projects forward from the front end of the piston into a sleeve 22, which is rotatably mounted in the axial bore of a tubular-shaped front cylinder-head 23, which is threaded to a stepped portion 24, formed at the front end of the cylinder.

In the front end of the cylinder I form a counterbore 25 of larger diameter than the piston's bore, in which I fit a steel buffer-ring 26, which I term the "cylinder-ring," and against this ring I place a rubber buffer-ring 27, and at the side of the rubber ring I place a supplementary steel buffer-ring 28, which is positioned in a counterbore 29, which I preferably form larger in diameter than the counterbore in which the rings 26 and 27 are placed. The front end of the cylinder is interiorly threaded, and the front cylinder-head is threaded and screws into it against the shoulder 20, that is formed on the front cylinder-head and up against the ring 28, which acts as an abutment for the buffer-rings 26 and 27. In the opposite end of the cylinder adjacent to the rear cylinder-head a steel buffer-ring 30 is placed in a counterbore 31, against which the piston strikes on its backward stroke. A rubber buffer-ring 32 is placed at the side of the steel buffer-ring and between it and the rear cylinder-head 18.

The front cylinder-head comprises a long cylindrical member, that is adapted to support the rock-cutting drill-bit and its step-by-step rotative mechanism. A transverse cylindrical portion 34 is formed on the cylindrical head intermediate of its ends, the axial bore of which extends at right angles to the axial bore of the cylinder-head. This right-angled disposed cylinder extends, preferably, an equal distance on each side of the axial center of the front cylinder-head. The opposite ends of this cylinder are slightly counterbored and interiorly threaded, and cylinder-heads 37 and 38 are threaded into the ends of the cylinder. In the bore of this cylinder a pawl-carrying piston 39 is slidably fitted. This piston is a little shorter than the cylinder and has but a short stroke therein and is operatively reciprocated by the actuating fluid used to operate the rock-drilling engine, which is preferably compressed air, which flows to the opposite ends of the pawl-piston cylinder from the ports 5 and 6 of the piston-hammer's cylinder through the ports 8 and 9, which extend from these ports through the shell of the cylinder and front cylinder-head to the pawl-piston's cylinder. The ports 8 and 9 are arranged on opposite sides of the main cylinder and extend to the opposite ends of the pawl-piston cylinder, and as these ports are rather crooked I will describe the course of port 8. As the pawl-piston is a small light piece of steel the power required to reciprocate it in its cylinder is but a trifle. The ports are small passages, which I preferably make by drilling holes in the shell to form the ports, and as both ports are exactly alike, except that the port 9 is a little longer than the port 8, a description of one will apply to the other. The end 40 of the port 8 is drilled into the shell of the cylinder from the shoulder at the bottom of the counterbore 25 in the front end of the cylinder. The end portion 40 of the port 8 is intersected by a short inclined vertical hole 42, which is drilled from the top of the cylinder downward toward the axial center of the main cylinder into the port 8. This vertical portion of the port 8 is intersected by a horizontal hole 43, which is drilled into the front end of the cylinder. The portion 43 of the port 8 is intersected near the end of the cylinder by a vertically-inclined hole 44, which extends downward from the top of the cylinder and through the same into the front cylinder-head, where its lower end is intersected by a horizontal hole 45, which is drilled into the adjacent end of the front cylinder-head. The hole 45 is intersected by a horizontal hole 46, that is drilled into the side of the front cylinder-head at substantially right angles to the hole 45. The portion 46 is intersected by an inclined hole 47, that is drilled from the top of the front cylinder-head into the pawl-piston cylinder. As the front head screws into the cylinder provision must be made to bring both parts of the hole 44 to connect. I accomplish this by forming short circumferential recesses 42 in the periphery of the threaded end of the cylinder-head, which provides an offsetting passage that permits a clear passage even if the cylinder-head is screwed not quite to or beyond the position it occupies when the hole is drilled. The only difference between the port 8 and the port 9 is that the port 9 extends along the opposite side of the cylinder and that the portion 39^A of the port 9, which corresponds to the portion 39 of the port 8, extends to the port 6.

The air enters an exhaust from the pawl-piston cylinder through the ports 8 and 9 and reciprocates the pawl-piston therein. The center of the pawl-piston is provided with an oblong aperture 48, which extends transversely through its axial length and which is positioned to surround the axial center of the main cylinder. This oblong aperture 48 is longest along the length of the pawl-piston, and in the central portion of its inner periphery recesses 50 and 51 are formed, one at the top portion and one at the lower portion of the aperture, in which are pivotally secured and positioned pawls 52 and 53. Suitable springs 54 and 55 are arranged in the piston to bear resiliently on the tooth end of the pawls. Either coiled springs or wire springs or blade-springs may be used for this purpose, and they may be arranged in any suitable manner; but I preferably use the spring-wire springs illustrated. One end of each of these springs may be secured to the piston by any suitable means, while their opposite ends are arranged in the recesses 50 and 51 to bear resiliently against the tops of the pawls. I illustrate but two pawls; but more can be used, if desired. I arrange these pawls and the receiving-recesses in diametrically opposite corners of the aperture in the piston. The tooth ends of the pawls 52 and 53 bear operatively on a circumferential row of ratchet-teeth 56, that are formed in the peripheral surface of the drill-holding chuck 22. This drill-holding chuck comprises a tubular sleeve member which is rotatably mounted in the axial bore of the front cylinder-head. The bore of the front cylinder-head is made in two diameters, the inner diameter being the largest. The chuck is also made in two diameters and is inserted in the cylinder-head from its main cylinder end, its larger portion fitting in the larger diameter of the bore in the cylinder and fitting rotatably between the shoulder at the bottom of the counter-bore and the steel buffer-ring. The drill-holding chuck is provided with an axial bore of two diameters, 57^A and 57^B, the bore 57^A of which is the largest and is made to surround loosely the piston-hammer, which reciprocates in it. The smaller bore 57^B of the drill-chuck is adapted to receive loosely the shank end of any suitable rock-cutting drill-bit. The outer end of the drill-chuck extends slightly beyond the end of the front cylinder-head and is arranged to receive the shank end of the rock-cutting drill-bits in such a manner that they are held locked to it and are rotated by it; but at the same time are free to be inserted into and withdrawn from it.

In applying my drill-bit-rotating device to rock-drilling engines a number of ways may be employed for arranging the chuck 22 to receive and hold the drill-bits to rotate them and at the same time to allow them to be quickly inserted in and withdrawn from the chuck, and in the different types of rock-drilling engines in use different arrangements of shanks of drill-bits are used and different arrangements of the drill-bit-receiving end of the front cylinder-head are employed, thus necessitating changes in the arrangement of the chuck and its coöperating ports to hold the drill-bit in rotatively operative position. Consequently my invention contemplates the use of any and all means and devices by which a rock-cutting drill-bit is operatively connected to this chuck to be rotated by it. I preferably, however, use the rock-cutting drill-bit and the coöperating drill-bit-locking device of the end of the front cylinder-head herein illustrated, which is as follows: The outer end of the front cylinder-head is threaded, a shoulder 59 is formed at the end of the thread, and a cap 60 is secured upon the threaded portion. The drill-bit-receiving end of the chuck 22 is bifurcated diametrically to form the slots 59^A and 60, (see Fig. 12,) and the opposite ends 61 and 62 are provided with step portions 63 and 64 of less diameter, that extend circumferentially around each end about one-half of its semicircular periphery. The drill-bit 65 consists of a shank portion 66 and any suitable rock-cutting end portion 67. The shank is provided adjacent to its end with projecting lugs 68, two preferably being used, which are formed on diametrically opposite sides of the shank and are arranged and adapted to slip loosely into the slots 59^A and 60 in the end of the chuck and to bear against the sides of the chuck. The shank of the drill-bit fits loosely in the end of the chuck and its shank 66 extends through the axial bore 57^B of the drill-chuck into the reciprocal path of the piston's hammer-bar, which when the drill-bit is in operative position in the chuck strikes against its end on each and every forward stroke it makes in the cylinder. The drill-bit is thus seated in the chuck in such a manner that it can move axially independent of the chuck, but cannot move rotatively except when it is moved by the chuck which rotates step by step with the piston and carries the drill-bit with it, as will be more fully described hereinafter.

The projecting lugs on the shank of the drill-bit are made enough shorter than the length of the bifurcation in the end of the chuck to allow the drill-bit a predetermined axial movement of about three-eighths to five-eighths of an inch, and in order to confine the axial movement of the drill-bit under the varying conditions of the forward feed of the drill-cylinder in the shell and the variable forward movement of the drill-bit under the blows of the piston it is necessary to lock it in the chuck in such a manner that it can move axially about this distance independent of the chuck. For this purpose I employ a chuck-key 69^A, which is seated in a sleeve-ring 70, that fits loosely in the cap. This ring fits between the end of the front cylinder-head and a steel ring 71, and between this steel ring and the bottom of the cap a rubber buffer-ring 72 is placed, which I term the "chuck-buffer."

The chuck-key comprises a round narrow ring, which is provided with an axial bore of two diameters 75 and 76. The bore 76 is intersected by diametrically oppositely arranged axial slots 78 and 79, which extend in depth to the surface of the largest axial bore, (see Fig. 12,) in which a perspective view of the chuck-key is shown, thus dividing the smallest diameter of the bore into two oppositely-arranged semicircular lug portions 80 and 81, the axial center of which is provided with the arcs of an axial bore that is adapted to allow the shank of the drill-bit to extend loosely through the ring-key, while the slots permit the lugs on the drill-bit to pass through the ring-key. The side of the ring that faces the chuck bears loosely against the end of the chuck and is provided with two projecting lugs 82 and 83, which are arranged diametrically opposite each other and are adapted and arranged to project loosely over the steps 63 and 64 and to engage the shoulders formed by the junction of these step portions with the larger diameter of the ends of the chuck when the chuck-key ring is turned toward them and to strike against the sides 84 and 85 of the oppositely-arranged ends when turned in the opposite direction. When the chuck-key is turned so that its lugs strike the shoulders formed by the steps 63 and 64, its slots are in line with the slot through the ends of the chuck, and the shank of the drill-bit can be inserted into its operative position with its lugs in the slot of the chuck. The key is then turned until its lugs strike the sides 84 and 85, and its slot will then stand at right angles to the slot in the end of the chuck and to the lugs on the drill-bit, and the drill-bit will then be keyed in the chuck against axial displacement, but will still have an axial movement in the chuck sufficient for operative action. The chuck-key can be turned in either direction instantly with the wrench 86, which is provided at one end with oppositely-arranged right-angled fingers 87 and 88, that are adapted to fit in the slots of the chuck key ring and turn it in either direction. It is not necessary for the operator to look to see if the key-ring is in line with the slot in the chuck when he wishes to insert a drill-bit. He simply inserts by hand the shank of the drill-bit in the key-ring and chuck, passing the projecting lugs on the shank through the radial slots in the key-ring and into the slot in the end of the chuck. After the shank of the drill-bit has been inserted in the chuck and its projecting lugs have passed through the radial slots in the key-ring should the slot in the end of the chuck not be in alinement with the lugs a slight turn of the drill-bit by the operator's wrist will move the lugs into alinement with the slot, so that they can be inserted. When the slots are in alinement, the side lugs of the key-ring rest close to or substantially against the shoulders 63 64 at the end of the chuck, and after the drill-bit's projecting lugs have been inserted into the slot at the end of the chuck the operator gives the drill-bit and the chuck a short quick turn in the direction that will rotate the chuck on its ratchet-teeth far enough to bring the shoulders 84 85 of the chuck against the shoulders 82 83 of the side lugs of the key-ring, which is prevented from rotating with the chuck by the friction of its surrounding ring 72. The drill-bit is then locked to the chuck, as the slot in the chuck and the projecting lugs on the drill-bit then stand at right angles to the slots in the key-ring. The drill-bit is thus practically instantaneously inserted and locked by the hand of an operator to the drilling-engine.

To unlock the drill-bit, the right-angled fingers of the wrench 86 are inserted in the radial slots of the key-ring and it is turned until its side lugs strike the shoulders on the reduced portion of the chuck, which brings the slots of the key-ring in alinement with the slot in the chuck, and consequently with the lugs of the drill-bit.

The operation of my rock-cutting drill-bit-rotating mechanism is as follows: I have preferably illustrated and described my improved drill-bit-rotating mechanism in operative connection with the valve and ports mechanism of a piston-hammer type or compressed-air-operating rock-drilling engine. This valve mechanism and its operation, as well as that of the piston-hammer, is very clearly illustrated and described in my Patent No. 709,022, dated September 16, 1902, and it is only necessary to mention here that in the preferred construction, which is herein illustrated, the actuating fluid, which may be either air or steam, enters the inlet-port and operatively reciprocates the valve in its chest through the mechanism of the suitable ports and admits air alternately to the opposite ends of the cylinder through the ports 5 and 6, which reciprocates the hammer-piston therein. The air also exhausts through the ports 5 and 6 in alternate order to the atmosphere. As the air passes through the ports 5 and 6 a portion of it enters the ports 8 and 9 in alternate order and flows to the ends of the pawl's piston-cylinder and reciprocates the pawl's piston therein. The air exhausts back through the ports 8 and 9 and 5 and 6 to the atmosphere, and as the piston reciprocates it causes the pawls to engage in alternate order the ratchet-teeth of the drill-chuck. Thus the pawl 52 on its forward stroke pushes against the tooth 56 in the direction of the arrow F and rotates the chuck a distance equal to the stroke of the piston, while at the same time the pawl 53 is moved backward in position to engage a ratchet-tooth at the opposite side of the drill-chuck and moves against it on the opposite stroke of the pawl-piston and again turns the chuck a distance equal to the stroke of the piston and pawl. I preferably make each tooth of the ratchet of the chuck of a little less length than the stroke of the piston, so that the pawls will surely drop off of them at each stroke of the piston and positively turn the chuck. If desired, however, the pitch of the teeth may be made fine enough to permit the pawls to operatively ride over two or more teeth of the drill-chuck's ratchet-tooth portion at each reciprocal stroke of the pawl's piston. The reciprocative movement of the pawl-piston and its pawls thus rotates the drill-holding chuc k at each stroke of the hammer-piston, as the top pawl 52 is forced to turn the chuck by its piston's movement, caused by the flow of air through the port 8 into its cylinder when the piston-hammer moves backward, and the bottom pawl 53 is forced to turn the chuck by the opposite stroke of its piston when the air flows into the port 9 on the forward stroke of the hammer-piston, thus rotating the drill-bit-holding chuck and the rock-cutting drill-bit which is locked to it step by step at each stroke or blow of the piston-hammer. The drill-holding chuck and the drill-bit which is locked to it are thus rotated step by step at each and every stroke in either direction the hammer-piston makes in its cylinder by a portion of the actuating fluid operatively reciprocating the pawl's piston in unison with it.

My invention greatly simplifies the mechanism commonly used on drilling-engines for intermittently rotating rock-cutting drill-bits. It is also strong, durable, and not liable to get out of order.

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

1. In a drill-bit-rotating device for rock-drilling engines, a suitable casing, a piston reciprocating in said casing, an aperture in said piston, a drill-bit-holding chuck rotatably supported in said casing and extending through the aperture in said piston, a circular ratchet-tooth band portion on said drill-chuck, spring-controlled pawls mounted on said piston in operative relation to the ratchet-teeth of said chuck, and means for reciprocating said piston, substantially as described.

2. In a drill-bit-rotating device for rock-drilling engines, a suitable supporting-casing, a piston arranged to reciprocate in said casing and containing an aperture, spring-controlled pawls secured to said piston in said aperture, a drill-bit-holding chuck rotatably mounted in said supporting-casing and extending through the aperture in said piston, ratchet-teeth surrounding the periphery of said drill-holding chuck and positioned thereon in operative relation to said pawls, a rock-cutting drill-bit-receiving aperture in said drill-holding chuck, a drill-bit adapted to fit in said chuck, means for attaching said rock-cutting drill-bit to said chuck and means for reciprocating said piston and pawls to rotate step by step said drill-holding chuck, substantially as described.

3. In a drill-bit-rotating device, the combination of a drill-holding chuck rotatably mounted and arranged and adapted to receive and operatively support and hold a rock-cutting drill-bit to rotate it, a piston provided with an aperture surrounding loosely said chuck, means for reciprocating said piston at right angles to the axis of said chuck, a ratchet-toothed peripheral surface on said chuck, spring-controlled pawls pivotally mounted in said piston and arranged and adapted to bear in operative meshing relation on the ratchet-teeth of said chuck and means for reciprocating said piston and pawls to rotatably move step by step said drill-holding chuck and rock-cutting drill-bit, substantially as described.

4. In a drill-bit-rotating device for rock-drilling engines, the combination of the cylinders, the piston-hammer and the front cylinder-head and the rock-cutting drill-bit, with a drill-holding chuck rotatably mounted in said front cylinder and provided with an axial aperture in which said piston-hammer reciprocates, means for releasably securing said drill-bit in said chuck in striking relation to the reciprocal strokes of said piston-hammer, a circumferential ratchet-toothed peripheral surface on said chuck, a block surrounding said chuck loosely, spring-controlled pawls operatively mounted on said block and arranged and adapted to bear operatively on the ratchet-teeth of said chuck and means for reciprocally moving said block and pawls to rotatably turn said chuck and drill-bit intermittently step by step, substantially as described.

5. In a drill-bit-rotating device for rock-drilling engines, the combination with the cylinder, the valve-chest and valve, the ports in said valve-chest and cylinder, the drill-bit-holding chuck and the rock-cutting drill-bit, of a cylinder arranged transversely across the longitudinal axis of said chuck, a piston in

said cylinder arranged to reciprocate therein, suitable ports leading from said piston-hammer's valve-chest and cylinder to the opposite ends of said transversely-arranged cylinder, an aperture in said piston through which said chuck extends, a circumferential row of ratchet-teeth on the peripheral surface of said chuck positioned within the aperture in said piston, and spring-controlled pawls pivotally secured in the aperture in said piston and arranged and adapted to operatively bear on the ratchet-teeth of said chuck, substantially as described.

6. In a drill-bit-rotating device for rock-drilling engines, the combination with the cylinder, and the air inlet and exhaust ports, of the front cylinder-head detachably secured to said cylinder, the drill-holding chuck rotatably mounted in said cylinder-head provided with a circular band of ratchet-teeth, the piston arranged to reciprocate at right angles to said chuck and provided with pawls arranged and adapted to engage the ratchet-teeth of said piston and partially rotate said chuck at each stroke of said piston, suitable ports extending from the ports of said cylinder to the opposite ends of said pawl-actuating piston and arranged to operatively reciprocate said piston and said pawls to rotate said chuck step by step, and means for rotatably securing a rock-cutting drill-bit to said chuck within operative striking distance of the reciprocal strokes of said piston-hammer, substantially as described.

7. In a drill-bit-rotating device for rock-drilling engines, the combination with the cylinder, of a drill-holding chuck rotatably mounted in said cylinder-head having a circular row of ratchet-teeth on its periphery, a block or piston surrounding said chuck loosely, spring-controlled pawls pivotally secured in said block or piston in operative relation to said ratchet-teeth of said drill-chuck, means for reciprocating said block or piston and pawls operatively against the ratchet-teeth of said drill-holding chuck to intermittently rotate it and means for operatively securing a rock-cutting drill-bit to said drill-bit-holding sleeve and said front cylinder-head, substantially as described.

8. In a drill-bit-rotating device for rock-drilling engines, the combination with the cylinder and an operative drill-bit-holding chuck, of a circular ratchet-toothed surface on said chuck, a cylindrical chamber surrounding said chuck and its ratchet-tooth surface, a piston surrounding said chuck, means including suitable ports for reciprocating said piston in said cylindrical chamber and spring-controlled pawls pivotally secured to said piston in operative bearing relation to said ratchet-toothed surface of said chuck and arranged and adapted to push against the teeth of said chuck and rotate it step by step at each reciprocal stroke of said piston, substantially as described.

9. In a drill-bit-rotating device for rock-drilling engines, the combination with the front cylinder-head, of the drill-chuck rotatably mounted in said cylinder-head, having a circular row of ratchet-teeth on its periphery, a block having an oblong aperture therein arranged to permit said block, a transverse reciprocal movement on said chuck, circular recesses extending into one side of said block, recesses in the inner peripheral surface of the aperture in said block, a pawl pivotally mounted in each recess and in each peripheral recess in said block and arranged in bearing contact with the ratchet-teeth of said chuck, springs secured at one end to said block and arranged to resiliently bear on said pawls, means for reciprocating said pawls to rotate said chuck intermittently step by step, and means for operatively securing rock-cutting drill-bits in said chuck and front cylinder-head, substantially as described.

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

JOHN GEORGE LEYNER.

Witnesses:

CLARENCE A. LAWSON,

LUTHER H. WYGANT. Jr.