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H. HELLMAN & L. C. BAYLES.

ROCK DRILLING MACHINE.

APPLICATION FILED AUG. 12, 1904.

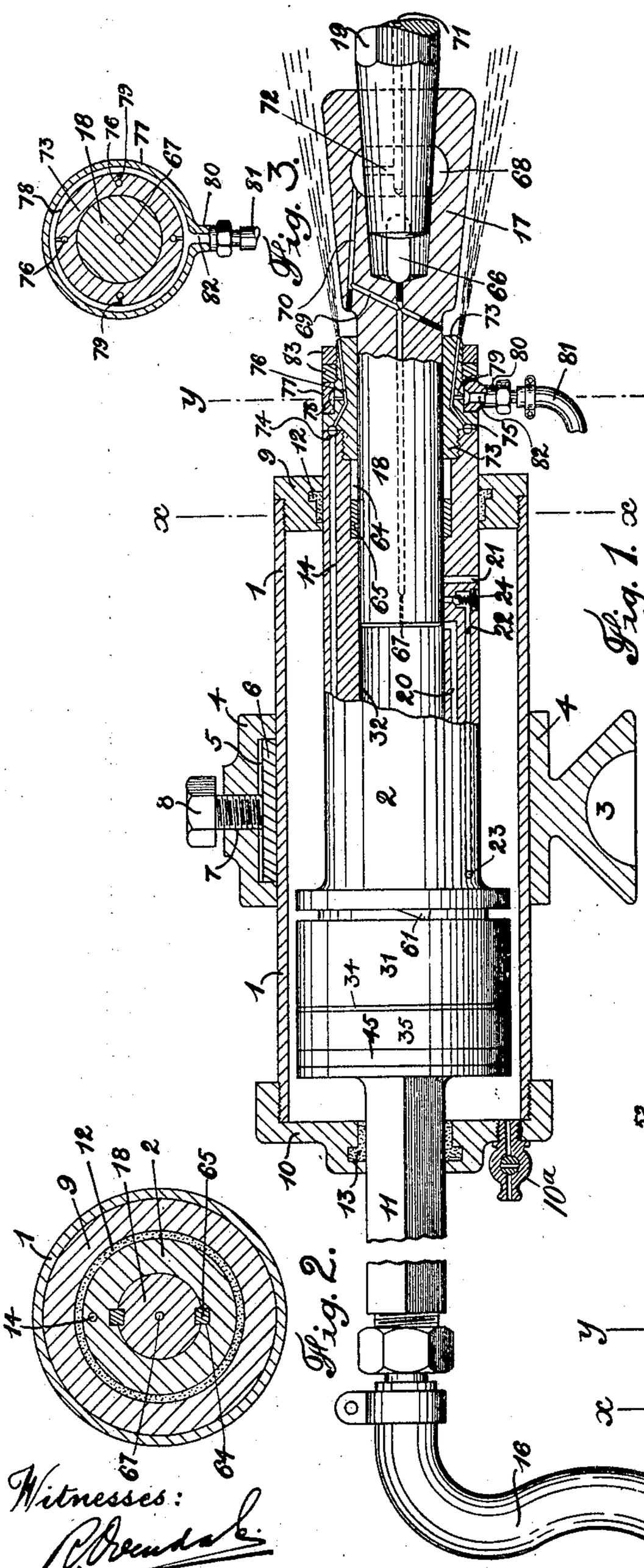

Fig. 1.

Fig. 2.

Fig. 3.

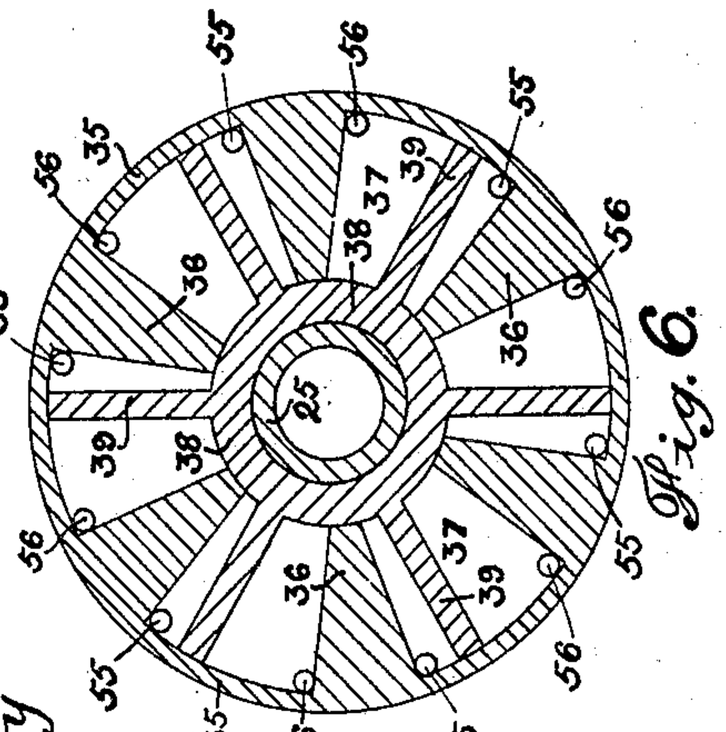

Fig. 6.

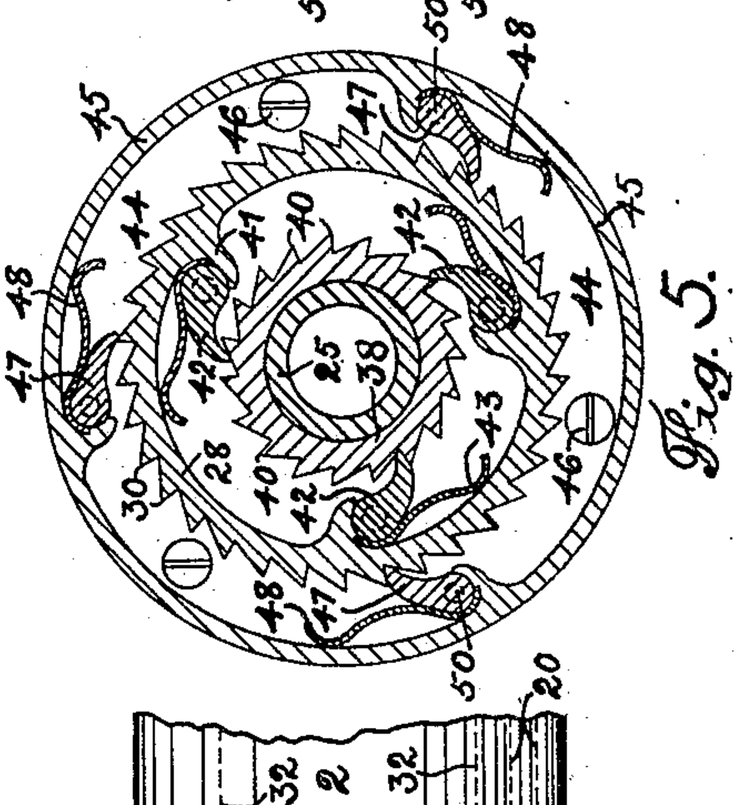

Fig. 5.

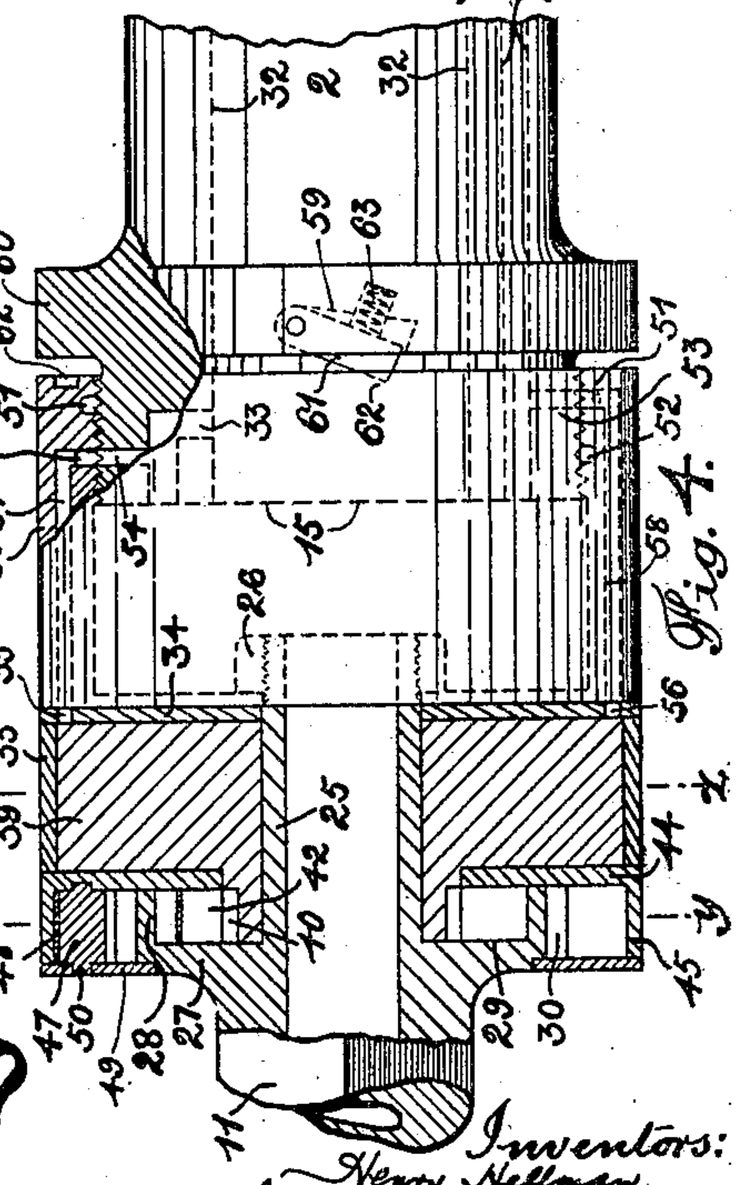

Fig. 4.

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ROCK-DRILLING MACHINE.

No. 819,756. Specification of Letters Patent. Patented May 8, 1906.

Application filed August 12, 1904. Serial No. 220,446.

To all whom it may concern:

Be it known that we, HENRY HELLMAN and LEWIS CONDICT BAYLES, citizens of the United States, residing at Johannesburg, Transvaal, have invented certain new and useful Improvements in Rock-Drills or Rock-Drilling Machines, of which the following is a specification.

Our invention relates to a rock-drilling machine or engine designed to operate or perform its several functions automatically.

A machine constructed as hereinafter described does not require constant attention or supervision on the part of the operator. The rotation of the drilling bit or tool and the feeding of the machine being both automatic, once the machine is started the operation is continuous so long as the drill or bit can strike or come into contact with the rock. When the machine has reached the limit of its range of feed, it is automatically put out of operation, so that no injury results to the machine.

The present improvements have reference, first, to means for mounting the machine or engine and for adjustably mounting or securing the protecting-casing in a supporting-sleeve; secondly, to means for conducting and admitting the actuating or operating fluid to the power-cylinder; thirdly, to means for automatically feeding the machine or engine or for traversing it longitudinally of its supporting and protecting casing; fourthly, to means for automatically imparting an intermittent rotary motion to the power-cylinder, and with it the drilling-bit or cutting-tool; fifthly, to means for transmitting the repeated impacts of the reciprocating percussive member of the machine or engine to the drill or bit; sixthly, to means for conducting a quantity of the operating fluid to or in proximity to the cutting extremity of the drill or bit to assist in the expulsion of the rock-cutting from between the cutting edges of said tool and the rock-face or the bottom of the hole being drilled and also for preventing the overheating of the drill or bit and that part or those parts which receive and transmit the impacts of the reciprocating percussive member to the drill or bit, owing to the sudden expansion of the fluid in its passage through or along said part or parts; seventhly, to means for forming and directing around the mouth of the hole being drilled a spray or sprays of water or other liquid which by contact with the particles of rock as they emanate from the hole and by saturating and moistening the same cause them to settle and prevent their being disseminated in the surrounding atmosphere, and, eighthly, to the general construction and arrangement of the machine or engine, as hereinafter described, and more particularly pointed out in the appended claims.

In order that our invention may be the more readily comprehended, we append an explanatory sheet of drawings, which is marked with figures of reference corresponding to the following description thereof.

In the drawings, Figure 1 represents a longitudinal section of the protecting-casing, showing the machine or engine *in situ* and in part longitudinal section; Fig. 2, a transverse section on line *x x*, Fig. 1; Fig. 3, a transverse section on line *y y*, Fig. 1. Fig. 4 is an enlarged view of the rear end of the power-cylinder and its attachments, partly in section. Fig. 5 is a transverse section on line *x y*, Fig. 4. Fig. 6 is a transverse section on line *y z*, Fig. 4.

In the accompanying drawings we illustrate the several improvements adapted to a machine or engine in which the admission of the actuating or operating fluid alternately to either end of the power-cylinder or either side of the piston or equivalent reciprocating percussive member is controlled by means of a valve; but we would here remark that these improvements may be readily adapted to a machine or engine designed to operate without a valve—that is to say, to a machine or engine in which the piston or reciprocating percussive member itself controls the admission of the operating fluid and the distribution thereof in the power-cylinder.

In the specification of a prior application for Letters Patent filed by us on the 31st day of May, 1904, bearing Serial No. 210,519, we describe an arrangement for mounting or securing the protecting-casing 1 for the power or drill cylinder 2, which consists of a split sleeve, to which is attached the cone or equivalent device 3 for clamping it to a column-bar or other support.

Now according to our present invention we employ a solid sleeve 4, which, as shown in the drawings, carries the cone 3. In place of the cone we may use any other suitable

construction for the purpose of clamping or securing it in position. The sleeve 4 is constructed to form a recess 5 on the inside, in which recess 5 is arranged a gib or pad 6, which rests on the top of the protecting-casing 1. In the sleeve 4 above the pad 6 is formed a hole 7, which is formed with an internal screw-thread, through which hole 7 is screwed a set-screw 8. The inner end of the set-screw 8 abuts or engages the top of the gib or pad 6, so that by screwing down the screw 8 the gib 6 is forced downward and the protecting-casing thereby secured between the inner surface of the pad or gib 6 on the one side and the inside of the sleeve 4 at the opposite side. It will be evident that more than one of the set-screws 8 may be used, if desired, and that the gib 6 may be dispensed with, in which latter event the set screw or screws 8 would come directly into contact with the outside of the protecting-casing 1 inside the sleeve 4. By screwing outward the set-screw 8 and releasing the gib 6 the protecting-casing 1 may be slid longitudinally in either direction in the sleeve 4, after which it may be securely clamped by screwing down the set-screw 8 or screws, as previously explained.

The protecting-casing 1 is at the one end fitted with a bush or cap 9, which constitutes the guide in which the drill-cylinder 2 is slidably supported, and the other end is fitted with a cap or cover 10, which constitutes the rear guide for the drill-cylinder 2, through which slides a pipe 11, which serves for conducting the compressed air, steam, or other gaseous fluid into the drill-cylinder 2.

In order to render the feeding of the machine automatic, we provide means for admitting a supply of the operating fluid to the interior of the protecting-casing 1. To this end the forward guide 9 is fitted with a cup-leather 12, and in the rear guide 10 is fitted a similar cup-leather 13, which cup-leathers 12 13 are provided to prevent the escape of the operating fluid from the protecting-casing 1. Instead of cup-leathers we may use any other form of packing suitable for this purpose. With this arrangement the exhaust port or ports (indicated at 14) are formed in the walls of the drill-cylinder 2 in such a way that they open or exhaust through the forward end of said cylinder 2 and outside the protecting-casing 1.

The pipe or hollow bar 11, which, as previously explained, serves for conducting the operating fluid into the valve-box 15 at the rear end of the drill-cylinder 2, (see Fig. 4,) is made of square section externally, and the hole in the rear guide 10, through which it works, as also the cup-leather or other packing 13 fitted therein, are made of corresponding shape, so that the operating-fluid-supply pipe 11 is incapable of rotating in said rear guide 10. The rear extremity of the operating-fluid-supply pipe 11 is coupled up in any suitable manner with the hose or flexible pipe 16, through which the operating fluid is conducted to the pipe 11.

The chuck or drill-bit holding device 17 is formed with a rearward cylindrical extension 18, which is projected into the bore of the drill-cylinder 2 from the front end. This extension 18 receives the impacts of the reciprocating piston in a similar manner to the shank cap-piece referred to in our prior application, Serial No. 210,519, and said extension 18 being formed in one piece with the drill-bit-holding device 17 transmits the repeated impacts to the drill bit or tool 19. The operating fluid is admitted to the front of the drill-cylinder 2 along the inlet-port 20 for effecting the back and idle stroke of the piston, and 21 is a port which by permitting the free escape of any of the operating fluid that may leak from the supply-port 20 round the piston prevents such leakage reversing the piston when the latter moves forward and drives the extension 18 forward in the cylinder 2 in the event of the drill or bit not coming into contact with the rock or bottom of the hole being drilled. This action is described in our prior application above referred to in conjunction with the shank cap-piece.

To provide for the admission of the operating fluid to the protecting-casing 1, a port 22 is formed in the drill-cylinder 2 between the inlet-port 20 and the escape-port 21, which latter port 22 is produced in a rearward direction through the walls of the cylinder 2 and communicates with the interior of the protecting-casing 1 at the rear end of the drill-cylinder 2, as is indicated at 23 in Fig. 1. This port 22 is fitted with a check-valve 24, which is kept on its seat by means of a spring and screwed plug screwed into the drill-cylinder 2 from the outside. This arrangement operates to admit the operating fluid to the protecting-casing 1 in the following manner: Should the drill or bit 19 not be in contact with or close to the rock, the piston at the end of its forward stroke will push the extension 18 forward in the cylinder 2 and uncover the port 22. When the port 22 is uncovered, the operating fluid then passes along it and escapes at 23 into the interior of the protecting-casing 1, and being unable to escape from said casing 1 said fluid moves the drill-cylinder 2 forward with a force equal to the pressure multiplied by the difference between the areas of the openings in the front and rear guides or the sectional areas of the drill-cylinder 2 and operating-fluid-supply pipe 11, respectively. The admission of the operating fluid to the protecting-casing 1 thus moves the drill-cylinder 2 forward in the protecting-casing 1, so that when the drill or bit 19 comes in contact with the rock it causes the drill-bit-holding device 17 and the extension

18 to be pushed backward in the cylinder 2 until the latter covers and closes the port 22, whereupon said port remains closed until such time as the drill or bit 19 has penetrated the rock sufficiently far to again push the extension 18 forward to again uncover the port 22, when the above cycle of operations is repeated. If desired, a petcock (shown at 10^a, Fig. 1) may be fitted in any convenient position on the protecting-casing 1 to be operated by the operator when it is desired to permit the operating fluid to escape from the protecting-casing 1—as, for instance, when he desires to move the drill-cylinder 2 backward in order to insert a longer drill or bit.

We will now describe the means we employ for imparting to the drill-cylinder 2, and with it the drill or bit 19, the intermittent rotary motion. As previously explained, the operating-fluid-supply pipe or hollow bar 11 is made of square or of a suitable polygonal section externally, and the aperture in the rear guide 10, as also the packing 13 fitted therein, through which the bar or pipe 11 reciprocates, are constructed to correspond. The forward extremity of the hollow bar or pipe 11 (see Fig. 4) is reduced to form a hollow cylindrical projection or extension 25, by which the motive fluid is conducted into the valve-box 15. The end of the extension 25 is formed with a screw-thread, which projects for a short distance into the valve-box chamber 15, and screwed over the inner end thereof is a nut 26, by which the pipe 11 is revolubly connected to the valve-box 15. The feed-pipe or hollow bar 11 is constructed with an annular projection 27, provided with a flange 28, which forms an annular recess 29 between said flange 28 and the rear end of the extension 25. Round this flange 28 are formed ratchet-teeth 30. (See Fig. 5.) 31 is the valve-box cap, which incloses the valve-box chamber 15, in which is located the valve controlling the admission of the operating fluid to either end of the piston. 32 represents the bore or interior walls of the drill-cylinder 2, and 20 and 33 the ports which serve for conducting the operating fluid alternately to either end of the drill-cylinder 2 and reciprocating piston. As previously explained, the valve (not shown in the drawings) operates in a manner well understood to alternately admit the motive fluid along the ports 20 33. At the rear of the valve-box cap 31 is located a ring or disk 34, which is fixed, by means of screws or otherwise, to the rear end of the valve-box. The extension 25 of the hollow feed-bar 11 is free to rotate in a hole at the center of the disk 34, through which it projects. Arranged next the disk 34 is what we may designate a "small" oscillating motor, which comprises a hollow cylinder 35, attached to the disk 34 or to the valve-box or valve-box cap 31, the hollow cylinder 35 being formed with the internal radial V-shaped wings 36, which between them form the radial chambers or compartments 37, and a device consisting of a hub 38, mounted concentrically on the extension 25 of the hollow feed bar or pipe 11, which hub 38 is formed with radial vanes or blades 39, which project into the radial compartments or chambers 37, formed between the adjacent wings 36.

The vanes or blades 39 are constructed so that they are capable of oscillating in the compartments 37 between the adjacent wings 36, and the vanes or blades 39 are constructed so that at their outer ends they make a comparatively air-tight fit with the interior of the cylinder 35. The inner ends of the wings 36, which abut the hub 38 between the radial vanes 39, are also constructed to make a comparatively air-tight fit with the hub 38. The rear end of the hub 38, carrying the vanes 39, projects into the annular recess 29, formed round the cylindrical extension 25 by the flange 28 on the feed bar or pipe 11. Round this portion of the hub 38 are formed ratchet-teeth 40. The inside of the flange 28 is constructed to form bearings or pivots 41 for three (more or less) pawls or catches 42, which engage the teeth 40. These pawls 42 are maintained in contact with the ratchet-teeth 40 by means of the three (more or less) springs 43. Round the hub 38 and between the inner edge of the flange 28 and rear end of the cylinder 35 is arranged a cylindrical or cup-shaped piece consisting of the disk or ring 44, formed with a flange or rim 45. This cup-shaped piece is attached, by means of the screws 46, to the wings 36. (See Fig. 5.) The two rings or disks 44 and 34, forming the ends of the several chambers 37, form an air-tight fit with the ends of the vanes or blades 39 and the wings 36. The flange or rim 45 on the ring or disk 44 incloses an annular space round the ratchet-teeth 30, formed on the flange 28, and inside the rim 45 are located three (more or less) pawls or catches 47, which are maintained in engagement with the ratchet-teeth 30 on the flange 28 by means of the springs 48.

49 is a ring which is arranged next and attached to the flange 45 and round the flange 28 in such a way that it incloses the annular space formed by the flange 45 round the ratchet-teeth 30. The pawls 47 are seated in recesses formed on the inside of the flange 45, and they may be provided with cylindrical projections or pivots 50, which project into recesses formed in the rings 44 and 49.

For the purpose of conveying the motive fluid from the drill-cylinder 2 to the several compartments or chambers 37 for operating the motor two annular recesses 51 52 are formed inside the valve-box cap 31 at the front end, and 53 is a port placing the annular recess 51 in communication with the supply port 20, which communicates with the forward end of the cylinder 2. The other

annular recess 52 is placed in communication, through the port 54, with the supply-port 33 for the rear end of the cylinder 2. In the disk 34 are formed a number of apertures 55, which communicate in pairs with the chambers 37 at opposite sides of each of the vanes 39. The several apertures 55 serve for placing the supply-port 33 in communication with the compartments 37 at corresponding sides of each of the several vanes 39, while the other apertures 56 serve for placing said compartments 37 in communication with the supply-port 20 for the other end of the cylinder 2. In the valve-box cap 31 and formed longitudinally thereof are ports or passages 57, which place each of the several apertures 55 in the disk 34 in communication with the annular recess 52, and 58 represents corresponding ports or passages placing each of the several apertures 56 in communication with the other annular recess 51. It will now be understood that as the valve operates to admit the operating fluid alternately along the ports 33 and 20 to the rear and front end of the cylinder 2 the operating fluid is alternately admitted to the compartments 37 on opposite sides of the vanes 39 and that as the supply-ports 33 and 20 are in like manner alternately opened to exhaust the several compartments 37 are in like manner alternately opened to exhaust at opposite sides of the vanes 39.

The operation of the mechanism will now be readily understood and may be described as follows: When the operating fluid is admitted to the front end of the drill-cylinder 2 along the port 20, the fluid passes through the port 53 into the annular recess 51, whence it flows along the ports or passages 58 through the apertures 56 into the compartments 37 between the wings 36 and the vanes 39. The expansion of the fluid inside the several compartments 37 rotates the motor-casing or cylinder 35, and with it the valve-box 15, valve-box cap 31, drill-cylinder 2, and drill-bit 19, the several vanes 39 being held stationary by means of the pawls 42, located in the flange 28, formed on the feed-pipe 11. During this movement of the motor-casing the compartments 37 at the other side of the several vanes 39 are opened to exhaust through the supply-port 33 and valve. During this rotatory movement of the motor-casing the pawls 47 pass freely over the ratchet-teeth 30, formed on the outside of the flange 28 on the feed-pipe 11, and when the rotary motion stops the pawls 47 engage the teeth 30 and prevent any rotatory motion of the cylinder 2 in the reverse direction. When the operating fluid is admitted to the rear end of the cylinder 2 and the front end of the cylinder is open to exhaust, the fluid then passes along the port 54 into the annular recess 52 in the valve-box cap 31, whence it flows along the ports or passages 57 through the apertures 55 into the compartments 37 at the opposite side of the several vanes 39. This rotates the vanes 39 and hub 38 round the cylindrical extension 25 of the feed bar or pipe 11. When the rotation of the vanes 39 and hub 38 stops, the pawls 42 again engage the ratchet-teeth 40 on the hub 38 to keep the vanes 39 stationary. The operating fluid is then again admitted to the front end of the cylinder 2 and the above cycle of operations is repeated.

Although we describe and illustrate a particular form of motor for imparting the intermittent rotary motion to the drill-cylinder and drill-bit, it will be obvious that it may be of any other suitable construction adapted to impart the desired motion to the drill-cylinder and bit by means of the operating fluid employed for operating the machine.

In a recess 59, formed in the flange 60 at the rear end of the cylinder 2, is located a catch or detent 61, which engages recesses, catches, teeth, or projections 62, formed round the inside of the cap 31. This catch 61 serves to prevent the unscrewing of the cap 31 off the end of the drill-cylinder 2. To unscrew and remove the cap 31, the catch 61 is pushed into the recess 59 in the flange 60 against the small spiral spring 63.

To insure the synchronous movement of the chuck or drill-bit holding device 17 with the power-cylinder 2, two longitudinal grooves or feather-ways 64 are formed diametrically opposite each other in the bore of the cylinder 2 at the front end, and in two grooves or recesses formed diametrically opposite each other in the extension 18 are fitted two feather-keys 65, which project into the grooves 64, formed in the bore of the drill-cylinder 2. The feather-keys 65, being free to slide in the feather-ways 64 in the bore of the cylinder 2, allow the longitudinal movement of the extension 18 and drill-bit-holding device 17, while compelling them to rotate in unison with the drill-cylinder 2.

As previously explained, the chuck or drill-bit holding device 17 is formed in one piece with the extension 18, which latter is projected into the bore of the cylinder. In the construction illustrated said chuck 17 is an ordinary taper chuck and is formed with a taper hole in the front, into which is projected the tapered shank of the drill or bit 19. 66 is a driftway formed transversely of the chuck 17 for the insertion of a drift to displace the drill or bit 19 when necessary.

We provide for the passage through the extension 18 and into the chuck 17 and from the chuck 17 along the drill or bit 19 to or in proximity to the cutting end thereof of a quantity of the operating fluid from the drill-cylinder 2. The passage of this operating fluid through these parts serves the dual purposes of keeping the extension 18 (which receives the impacts of the reciprocating pis-

ton) cool and prevents it binding or cutting in the bore of the cylinder 2 and also assists in the expulsion of the rock-cuttings from between the cutting edges of the drill or bit 19 and the rock or bottom of the hole being drilled. To this end a hole 67 is formed longitudinally of the extension 18, opening into the cylinder 2 at the rear of said extension 18. The longitudinal hole 67 is preferably increased in area after it has entered the extension 18 for a short distance, so that as the operating fluid passes along or through said extension it is capable of expanding freely to prevent the overheating of the extension 18. Inside the chuck 17 and surrounding a portion of the shank of the drill or bit 19 when the latter is projected into it is formed an annular recess 68. The hole 67, formed longitudinally of the extension 18, is placed in communication with the annular recess 68 inside the chuck by means of two ports or passages 69 70. These two ports 69 70 are drilled through the chuck 17 and the outer ends are closed by means of plugs, so that the operating fluid is compelled to pass through the longitudinal hole 67 along the ports 69 70 into the recess 68. The ports or passages 69 70 are formed in the chuck 17 in the manner shown in order to avoid the cotter or drift hole 66. A hole 71 is formed longitudinally of the drill or bit 19 for conducting the operating fluid to or in proximity to the cutting extremity. This longitudinal hole 71 is placed in communication with the annular recess 68 inside the chuck 17 by means of a transverse hole 72, formed in the shank of the drill or bit 19. It will be understood that the passage of the operating fluid through the drill or bit 19 tends to keep the cutting extremity cool, which is an important advantage, particularly in the drilling of upwardly-inclined and dry holes, as it ordinarily becomes so much heated as to materially impair the durability of the steel.

In the forward end of the drill-cylinder 2 is screwed or otherwise secured the front head 73, in which is supported and reciprocates the extension 18 of the drill-chuck 17.

For the purpose of forming and directing around the mouth of the hole a spray or sprays of water we prefer to employ the operating fluid exhausting along the port 14 to the front of the cylinder 2. With this object an annular groove 74 is formed in the end of the drill-cylinder 2, with which said exhaust-port 14 communicates. In a flange formed round the front head 73 and on the inside is formed an annular groove 75, which when the front head 73 is in position in the cylinder 2 coincides with the annular groove 74. Formed longitudinally of the front head 73 are four (more or less) ports or passages 76, which open to the front of the front head 73 and, as illustrated, preferably diverge in the direction of the front of the machine or are inclined outward, so as to cause the sprays to encompass a larger area of the rock-face round the mouth of the hole. These several ports or passages 76 communicate at the other end with the annular groove or recess 75. Round the front head 73 in front of the flange is arranged a swivel or swivel-piece 77, which is constructed with an internal annular recess 78. This recess 78 is placed in communication with the longitudinal ports or passages 76 by means of the transverse ports or passages 79, formed in the front head 73. It will now be perceived that the several longitudinal ports or passages 76 are placed in communication with the exhaust-port 14 by means of the annular grooves 74 75 in the end of the cylinder 2 and front head 73, respectively, and that these several ports or passages 76 are also placed in communication with the annular recess 78 in the swivel 77. The swivel 77 is formed with a nipple or branch 80, to which is attached a water or other liquid supply pipe 81. The water passes from the pipe 81 through the hole 82 in the nipple 80 into the annular recess 78 in the swivel 77. The pipe 81 communicates with a source of supply of water or liquid under pressure. The action of this arrangement is as follows: The exhaust fluid passing along the exhaust-port 14 enters the longitudinal ports or passages 76 at the inner end, and the water being admitted to said passages 76 through the ports 79 from the swivel 77 the water commingles with the exhaust fluid and issues from the passages 76 at the front in the form of a spray, as is clearly illustrated in Fig. 1. To maintain the swivel 77 in position round the front head 73, the forward end of the latter is provided with a screw-thread, over which are screwed the lock-nuts 83.

Instead of using the exhaust fluid from the machine it will be evident that the fluid could be used at the initial pressure.

What we claim as our invention, and desire to protect by Letters Patent, is—

1. A rock-drilling machine or engine, comprising a power-cylinder, a drill or bit operatively carried by the cylinder, connections for imparting rotary movements of the cylinder to the bit, and a motor carried by and rotating said cylinder.

2. A rock-drilling machine or engine, comprising a protecting-casing, a power-cylinder housed within the casing, a drill or bit operatively carried by said cylinder, connections for imparting the rotary movements of the cylinder to the drill or bit, and a motor carried by the cylinder and housed within the casing for rotating said cylinder.

3. A rock-drilling machine or engine, comprising a power-cylinder, a drill or bit operatively carried by said cylinder, connections for imparting the rotary movements of the cylinder to the drill or bit, a motor carried by

and rotating said cylinder, and means carried by the cylinder for admitting motive fluid to the motor.

4. A rock-drilling machine or engine comprising a power-cylinder, means arranged in the front end of said power-cylinder for carrying the drill or bit, said means permitting the drill or bit to move longitudinally of the power-cylinder while compelling it to rotate in unison therewith, an oscillating motor carried by said power-cylinder, means for introducing the operating fluid to said cylinder, and means for admitting the fluid to the motor to rotate the power-cylinder and with it the drill or bit.

5. A rock-drilling machine or engine comprising a power-cylinder, means located at the front end of said cylinder for carrying the drill or bit and for compelling said drill or bit to rotate in unison with said cylinder, an oscillating motor carried by said cylinder, means for introducing the operating fluid to said cylinder and means for admitting the operating fluid to the motor to rotate the power-cylinder and drill-bit part of a revolution during the return stroke of the reciprocating percussive member and for permitting movement of said motor without effecting rotation of the cylinder on the forward stroke of said reciprocating percussive member.

6. A rock-drilling machine or engine comprising a power-cylinder, a drill or bit operatively carried by said power-cylinder and means for compelling said drill or bit to rotate in unison with the cylinder, an oscillating motor carried by said cylinder comprising a member connected with said power-cylinder and a member disconnected from said cylinder, means for permitting said disconnected member of the motor to rotate freely in one direction while preventing it rotating in the opposite direction so that the fixed member is compelled to rotate and carry with it the power-cylinder and drill or bit, and means for introducing the motive fluid to the power-cylinder and motor.

7. A rock-drilling machine or engine comprising a power-cylinder, a drill or bit operatively carried by said power-cylinder, means for compelling said drill or bit to rotate in unison with the power-cylinder, an oscillating motor carried by said cylinder comprising a member connected with said cylinder and a member disconnected from said cylinder, a pipe for introducing the operating fluid to said cylinder, means for preventing rotation of said pipe, pawl-and-ratchet mechanism between said pipe for preventing the disconnected member of the motor from rotating in one direction so that the other member of the motor is compelled to rotate the cylinder and drill or bit, and pawl-and-ratchet mechanism between said pipe and the connected member of said motor for preventing the connected member from moving when the disconnected member is moved.

8. A rock-drilling machine or engine comprising a power-cylinder, a support in which said cylinder is slidably mounted, a drill or bit operatively carried by said power-cylinder, means for compelling said drill or bit to rotate in unison with the power-cylinder, an oscillating motor carried by said cylinder comprising a member connected with said cylinder and a member disconnected from said cylinder, a pipe for introducing the operating fluid to said cylinder, means for preventing rotation of said pipe, pawls carried by said pipe engaging ratchet-teeth formed on the disconnected member of the motor and pawls carried by said connected member engaging ratchet-teeth formed on the pipe so that when the disconnected member of the motor is held stationary the connected member and with it the cylinder and drill-bit are rotated, and when the connected member and with it the cylinder and drill-bit are held stationary the disconnected member is free to rotate substantially as described.

9. A rock-drilling machine or engine comprising a power-cylinder, a support in which said cylinder is slidably mounted, a drill or bit operatively carried by said power-cylinder, means for compelling said drill or bit to rotate in unison with the power-cylinder, an oscillating motor carried by said power-cylinder comprising a member connected with said cylinder and a member disconnected from said cylinder, a pipe for introducing the operating fluid to said cylinder, said pipe being formed with an extension upon which the disconnected member is loosely mounted and with a flange formed with ratchet-teeth, pawls carried by the pipe engaging ratchet-teeth formed on the disconnected member of the motor and pawls carried by the connected member of the motor engaging the ratchet-teeth on the pipe so that when the disconnected member of the motor is held stationary by the pipe the connected member, cylinder and drill-bit are rotated part of a revolution and so that the disconnected member is free to rotate to allow the connected member, cylinder and bit to remain stationary, substantially as described.

10. In a rock-drilling machine or engine, a power-cylinder carrying the percussive apparatus, a drill or bit operatively carried by said cylinder in such manner that the drill or bit is compelled to rotate in unison with the cylinder, an oscillating motor carried by said cylinder comprising a member connected to said cylinder and a member disconnected therefrom, means for alternately admitting the operating fluid to either end of said cylinder and at the same time for admitting the fluid to the oscillating motor, a pipe for introducing the operating fluid to said cylinder

and means between said pipe and the two members of the motor for permitting the free movement of the disconnected member and for preventing the rotation of said disconnected member and permitting the connected member and with it the drill-cylinder and drill-bit to be rotated, substantially as described.

11. In a rock-drilling machine or engine, in combination, a power-cylinder, a drill or bit operatively carried by said cylinder, an oscillating motor carried by said cylinder, means for alternately admitting the operating fluid to either end of said cylinder and at the same time to said motor, a pipe for introducing the operating fluid into the power-cylinder, means for revolubly attaching said pipe to the power-cylinder, means for preventing the rotation of said pipe, said pipe being formed with an extension carrying the disconnected member of the oscillating motor and formed with a flange provided with ratchet-teeth, pawls carried by said flange engaging ratchet-teeth formed on the disconnected member of the motor for permitting said member to rotate in one direction only, pawls carried by the other member of the motor which is connected to the power-cylinder for preventing said connected member from rotating in one direction while permitting it to rotate in the reverse direction, substantially as described.

12. In a rock-drilling machine or engine in combination, a power-cylinder, a drill or bit operatively carried by said cylinder, means for compelling said drill or bit to rotate in unison with said cylinder, means carried by said cylinder for alternately admitting the operating fluid to ports communicating with either end of said cylinder, an oscillating motor connected with and carried by said cylinder comprising a member attached to said cylinder formed with a plurality of radial wings and a disconnected member formed with a plurality of radial vanes working in the compartments formed between said radial wings, ports placing said compartments in communication with the main supply-ports at opposite sides of said radial vanes so that as the main supply-ports are each alternately opened to admit the operating fluid and to exhaust said compartments at opposite sides of the radial vanes are in like manner alternately opened to admit the operating fluid and then to exhaust, means for introducing the operating fluid into the cylinder and means for preventing the rotation of the disconnected member of the motor while permitting the rotation of the member connected to the cylinder and alternately for preventing the rotation of the connected member and permitting the rotation of the disconnected member, substantially as described.

13. In a rock-drilling machine or engine, in combination a power-cylinder, a drill or bit operatively carried by said power-cylinder, means for compelling said drill or bit to rotate in unison with said cylinder while permitting it to move longitudinally thereof within certain limits, a support in which said cylinder is slidably mounted, a pipe for introducing the operating fluid to said cylinder said pipe being revolubly connected to said cylinder, means for preventing rotation of said pipe, said pipe being constructed with a cylindrical extension and with an annular projection and flange formed with external ratchet-teeth and constructed internally to form bearings for a plurality of pawls, a cap arranged on the rear end of said cylinder, means located in said cap for alternately admitting the operating fluid to either end of said cylinder, an oscillating motor comprising a member fixed to said cap and cylinder and a member disconnected therefrom mounted on the extension on the feed-pipe next the cap, chambers formed in said connected member in which vanes formed on the disconnected member oscillate, ports formed in the cap placing the main supply-ports in communication with said chambers at opposite sides of the several vanes, spring-controlled pawls carried by the connected member in gear with the ratchet-teeth on the flange on the operating-fluid-supply pipe and spring-controlled pawls carried on the inside of said flange in gear with the ratchet-teeth formed on the hub of the disconnected member to permit the disconnected member to rotate in one direction and to prevent it moving in the reverse direction so that the connected member is compelled to rotate part of a revolution and carry with it the power-cylinder and drill or bit, substantially as described.

14. In a rock-drilling machine or engine, in combination, a power-cylinder, carrying the percussive apparatus a cap screwed on the rear end of said cylinder, means located in said cap for alternately admitting the operating fluid to either end of said cylinder, means for preventing the rotation of said cap consisting of a spring-controlled catch or detent located in a recess formed in a flange at the rear end of said cylinder, said catch engaging teeth or indentations in the front of said cap, substantially as described.

15. In a rock-drilling machine or engine, in combination, a power-cylinder carrying percussive apparatus, a protecting-casing, guides fitted in said casing and in which the cylinder is slidably mounted and supported, packings located in said guides for preventing the escape of the operating fluid, a supply-pipe passing through said guides and packings and communicating with the cylinder, for admitting operative fluid thereto, and means for admitting a quantity of the operating fluid to the protecting-casing when the drill or bit does not come into contact with the rock or the bottom of the hole being drilled.

16. In a rock-drilling machine or engine, in

combination, a power-cylinder carrying the percussive apparatus, a protecting-casing, guides fitted in the ends of said casing in which the cylinder is slidably mounted and supported, packings located in said guides for preventing the escape of the operating fluid through said guides, means arranged at the forward end of the cylinder for carrying the drilling bit or tool said means operating to admit a quantity of operating fluid to the protecting-casing in the event of the bit or tool not striking the rock.

17. In a rock-drilling machine or engine, in combination, a power-cylinder carrying the percussive apparatus, a protecting-casing, guides fitted in the ends of said casing in which the cylinder is slidably mounted and supported, packings located in said guides for preventing the escape of the operating fluid through said guides, means arranged at the forward end of the cylinder for receiving and transmitting the impacts of the reciprocating percussive member to the drill bit or tool, said means controlling the admission of a quantity of the operating fluid to the protecting-casing to feed the drill when the bit or tool does not come into contact with the rock or bottom of the hole being drilled.

18. In a rock-drilling machine or engine in combination, a power-cylinder carrying the percussive apparatus, a protecting-casing, guides fitted in the ends of said casing in which the cylinder is slidably mounted and supported, packings located in said guides for preventing the escape of the operating fluid through said guides, means arranged at the forward end of the cylinder for receiving and transmitting the impacts of the reciprocating percussive member to the drill bit or tool said means controlling the passage of the operating fluid from the cylinder along a port exhausting into the protecting-casing to feed the drill when the bit or tool does not come into contact with the rock or bottom of the hole being drilled.

19. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing, a port formed in said cylinder placing the interior thereof in communication with the interior of the protecting-casing, covers forming guides fitted at either end of said protecting-casing, packings arranged in said guides for preventing the escape of the operating fluid from said casing, a drill-bit-holding device formed with an extension projected into the front end of the power-cylinder said extension serving to receive and transmit the impacts of the reciprocating percussive member to the drill bit or tool and for admitting a quantity of the operating fluid to the interior of the casing when said extension is driven forward by the reciprocating percussive member owing to the drill or bit not coming into contact with the bottom of the hole being drilled, substantially as described.

20. In a rock-drilling machine or engine, in combination, a power-cylinder carrying the reciprocating percussive member, said cylinder being formed with a port for conducting a quantity of the operating fluid to the forward end of said cylinder, means arranged at the forward end of said cylinder for carrying the drill bit or tool, a front head fitted to the front end of said cylinder, ports or passages formed in said front head communicating with the port along which the operating fluid is conducted to the front of the machine and means for introducing water or other liquid to said ports or passages to commingle with the operating fluid to form a spray or sprays which are directed around the mouth of the hole, substantially as described.

21. In a rock-drilling machine or engine, in combination, a power-cylinder formed with a port leading to the front end thereof which forms the exhaust-port and with an annular recess in the end thereof in communication with said port, a front head fitted to the forward end of said cylinder formed with an annular recess coinciding with the recess in the end of the cylinder, a plurality of ports or passages formed in the head diverging or inclined outward, and means for also conducting a quantity of water or other fluid to said ports or passages, substantially as described.

22. In a rock-drilling machine or engine, in combination, a power-cylinder carrying the reciprocating percussive apparatus, a protecting-casing in which said cylinder is slidably mounted, a sleeve for adjustably supporting said casing, a front cover for said casing forming a guide for said cylinder, a packing for preventing the egress of the operating fluid from said casing between said guide and cylinder, a fluid-supply pipe connected to the rear end of the cylinder for conducting the motive fluid thereinto, a cover forming a guide and support for said operating-fluid-supply pipe and the rear end of the cylinder, a packing in said guide for preventing the egress of the operating fluid between said guide and pipe, an oscillating motor arranged at the rear end of said cylinder for rotating said cylinder part of a revolution during the rear or return stroke of the reciprocating percussive member, means for controlling the admission of the operating fluid to either end of said cylinder said means operating to control the admission of the fluid to said motor, means for receiving and transmitting the impacts of the reciprocating percussive member to the drill bit or tool said means operating to admit a quantity of the operating fluid to the protecting-casing in the event of the drill-bit not coming into contact with the rock to automatically feed the drill forward, means for compelling the drill or bit to rotate in unison with the power-cylinder, means for conducting a quantity of the operating fluid to the cutting end of said drill or bit and means for

producing and directing sprays of water or other liquid round the mouth of the hole being drilled, substantially as described.

23. In a rock-drilling machine or engine, a power-cylinder, a protecting-casing surrounding the cylinder and having a forward head through which the cylinder slidably and rotatably projects, packing fitting between said head and cylinder, a tubular motive-power-supply portion rotatably connected with the power-cylinder and extending rearwardly therefrom and slidably and non-rotatably passing through a rear head of the casing, and packing between the exterior of said tubular non-rotatable portion and the rear head.

24. In a rock-drilling machine or engine, a power-cylinder, a protecting-casing surrounding the cylinder, and having a forward head through which the cylinder slidably and non-rotatably projects, packing fitting between said head and cylinder, a tubular motive-power-supply portion rotatably connected with the power-cylinder and extending rearwardly therefrom and slidably and non-rotatably passing through a rear head of the casing, and packing between the exterior of said tubular non-rotatable portion and the rear head, in combination with a solid sleeve wherein the casing is slidably mounted, and provided with means for locking the casing within the sleeve.

In witness whereof we have hereunto set our hands in the presence of two subscribing witnesses.

HENRY HELLMAN.
LEWIS CONDICT BAYLES.

Witnesses:
CHAS. OVENDALE,
R. OVENDALE.