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H. HELLMAN & L. C. BAYLES.

ROCK DRILL.

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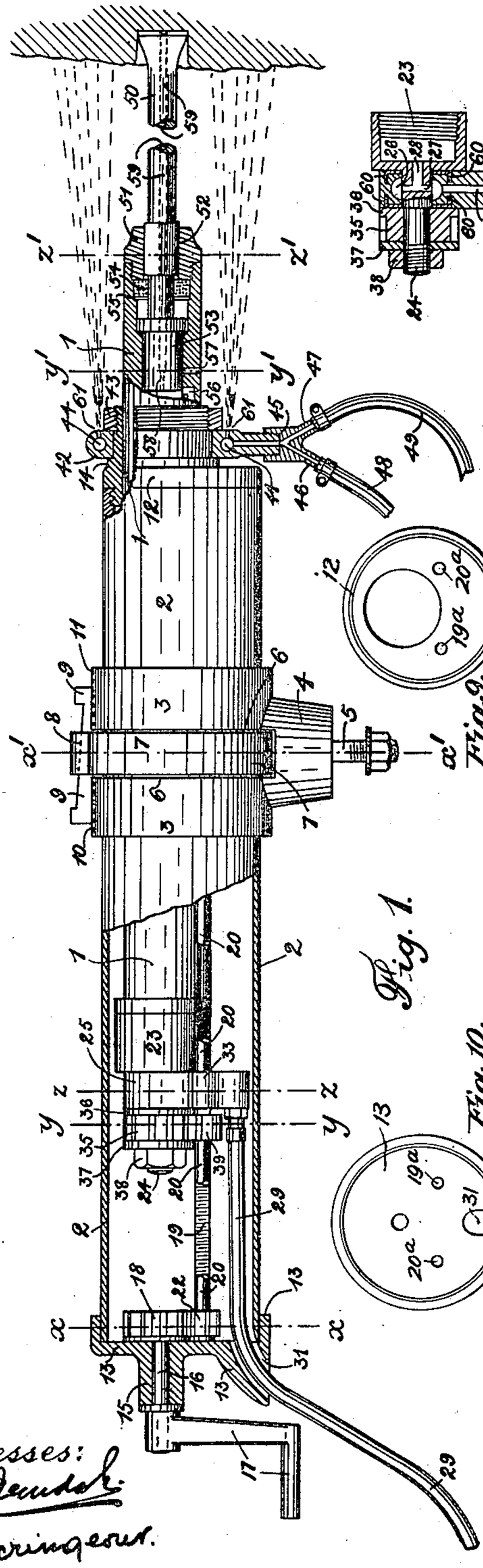

Fig. 1.

Fig. 8.

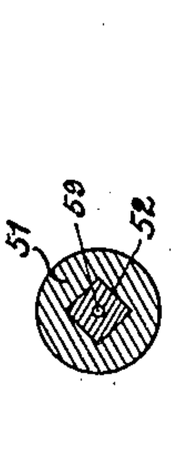

Fig. 7.

Fig. 6.

Fig. 5.

Fig. 4.

Fig. 3.

Fig. 10.

Fig. 2.

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ROCK-DRILL.

No. 819,755. Specification of Letters Patent. Patented May 8, 1906.

Application filed August 10, 1904. Serial No. 220,176.

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.

The present invention relates to rock-drilling machines or engines, and has for its object to provide an efficient and compact machine of comparatively small dimensions and one in which the operative parts are completely incased and the machine thereby rendered capable of withstanding the rough usage such machines receive at the hands of the operators.

The improvements have reference, first, to means for introducing the motive fluid into the power-cylinder; secondly, to means for feeding the machine or for traversing the power-cylinder longitudinally of its protecting and supporting casing; thirdly, to means for imparting rotary motion to the power-cylinder and drill-bit or cutting-tool; fourthly, to means for conveying a quantity of the motive fluid to or in proximity to the cutting extremity of the drill or bit to remove the rock cuttings from between the cutting edges of the bit and the bottom of the hole, which fluid by expansion serves to prevent the overheating of those parts through which it passes; fifthly, to means for forming and directing around the mouth of the bore-hole a spray or sprays of water to moisten or saturate the pulverized rock issuing therefrom to cause it to settle and prevent it passing into the surrounding atmosphere, and, sixthly, to the general construction and arrangement of the machine, as hereinafter more particularly described, and pointed out in the appended claims.

The several improvements constituting our invention will now be described in detail by aid of the accompanying sheet of drawings, wherein—

Figure 1 represents a longitudinal part-sectional elevation of the complete machine or engine; Fig. 2, a transverse section on line $x\,x$, Fig. 1; Fig. 3, a transverse section on line $y\,y$, Fig. 1; Fig. 4, a transverse section on line $z\,z$, Fig. 1. Fig. 5 is a transverse section on line $x'\,x'$, Fig. 1. Fig. 6 is a transverse section on line $y'\,y'$, Fig. 1. Fig. 7 is a transverse section on line $z'\,z'$, Fig. 1. Fig. 8 is a longitudinal section of a portion of the rear end of the machine and its attachments. Fig. 9 is a view of cap 12 detached as seen from the inside. Fig. 10 is a view of cap 13 detached as seen from the inside.

The machine or engine consists of the power-cylinder 1, which is slidably supported in the cylindrical casing 2. The cylindrical casing 2 is adjustably mounted in and carried by the sleeve 3, which latter is constructed with the cone or tapered boss or projection 4, fitted with the bolt 5 for fixing it to the column-bar or other support. Instead of the cone 4 and bolt 5 the sleeve 3 may be provided with any other ordinary or suitable means for fixing it in position. The sleeve 3 is constructed with a central slot 6, which divides it into two parts or rings joined by the cone 5. In the slot 6 and encircling the casing 2 is arranged a ring 7. (Shown in Figs. 1 and 4.) This ring 7 is constructed to form a recess 8 on the inside, in which is located a wedge or tapered key 9. In the outside of the two parts of the sleeve 3 and longitudinally thereof are formed shallow grooves 10 11, in which the back or parallel edge of the key 9 rests when it is in position inside the recess 8 in the ring 7. The tapered or inclined edge of the key 9 fits in the recess 8, which latter is tapered to correspond. In assembling these parts the ring 7 is first placed in position in the slot 6 in the sleeve 3 and the recess 8 brought into line with the grooves 10 11 and the key 9 then projected along the grooves 10 11 through the recess 8. The casing 2 is now projected through the sleeve 3 and the inside of the ring 7. When the casing 2 has been adjusted or placed in the desired position in the sleeve 3, the wedge or key 9 is then driven forward in the recess 8 and by drawing up the ring 7 secures the casing 2 between the ring 7 on the one side and the interior surface of the sleeve 3 at the opposite side. The grooves 10 11 in the sleeve 3 prevent the ring 7 and key 9 moving round the sleeve 3, and the casing 2 is thereby securely fixed inside the sleeve 3. By driving the key 9 in the opposite direction the casing 2 is released, so that it may be moved longitudinally of the sleeve 3 in either direction and again secured in the manner above described.

The casing 2 is fitted with the caps or cov-

ers 12 13 at each end. The cap 12 for the front end of the casing 2, which is securely fixed thereto by means of screws or otherwise, is formed at the front with an eccentric boss or projection 14: The cap 12, as also the boss 14, are bored to form a loose fit with the exterior of the power-cylinder 1, so that the latter may slide freely therein in either direction. Thus the power-cylinder 1 is arranged eccentrically inside the casing 2, as is clearly illustrated in Figs. 1 and 5 of the drawings. The cover 13 on the rear end of the protecting-casing 2 is secured in any convenient manner. This cover 13 is constructed with an elongated boss 15, which forms a bearing for a short spindle 16. On the outer extremity of this spindle 16 is keyed or otherwise secured a crank 17, which serves for rotating said spindle 16 in either direction. On the end of the spindle 16 inside the casing 2 is fixed a toothed wheel 18. Inside the casing 2 and arranged longitudinally thereof are two parallel rods 19 20, the extremities of which run in bearings 19^a 20^a, formed in the inside of the caps 12 13, respectively. On the rear ends of the rods 19 20 are keyed pinions 21 22, which mesh or gear with the toothed wheel 18. When the spindle 16 is rotated by means of the crank 17, the two rods 19 20 are rotated through the medium of the toothed wheel 18 and pinions 21 22.

23 is the cap, fitted on the rear end of the power-cylinder 1. This cap 23 may serve for inclosing the valve-box and valve which admits the motive fluid alternately to either side of the piston, or, should the machine be designed to operate without a valve, (to which type of machine our present invention would be equally applicable,) then the cap 23 for closing the end of the cylinder and for conducting the motive fluid into said cylinder would be constructed with a suitably-positioned port or ports for that purpose. Arranged around an extension 24 of the cap 23 (see Figs. 4 and 8) is a swivel or swivel-piece 25, whose primary function is the introduction of the motive fluid into the power-cylinder 1. To this end the swivel 25 is constructed with an annular internal groove or recess 26, and in that portion of the extension 24 projecting through the recess 26 are formed holes 27, which place said recess 26 in communication with a hole 28, formed longitudinally of said extension 24, which hole 28 communicates with the interior of the cylinder 1. (See Fig. 4.) As seen in Fig. 8, the swivel 25 is preferably fitted with cup-leathers or other suitable packings 60 at either side of the annular recess 26 to prevent leakage of the motive fluid from said swivel 25. To the swivel-piece 25 is attached the flexible pipe 29, which serves for conveying the compressed air or other motive fluid, and 30 designates the passages in the swivel along which said fluid flows from the flexible pipe 29 into the recess 26. The motive-fluid-supply pipe 29 passes through a suitably-curved hole 31, formed in the cover 13. The hole 31 is curved in order to prevent the pipe 29 coming into contact with the crank 17 and would also operate to prevent the formation of a kink in the pipe 29, which would tend to throttle the motive-fluid supply by restricting the area of the inlet-passage and so that the pipe 29 may pass into or out of the casing 2 as the power-cylinder 1 is moved in either a forward or rearward direction.

The swivel 25 is constructed with two lugs or projections 32 33, in which holes are formed and through which the two longitudinally-arranged rods 19 20 project. The rods 19 20, projecting through the holes in the swivel 25, act as guides and supports for the rear end of the power-cylinder 1. For the purpose of feeding the machine or for advancing or receding the power-cylinder 1 in the casing 2 the longitudinally-arranged rod 19 is formed with a screw-thread, and in the lug 32 on the swivel-piece 25 is fitted a nut 34, formed with an internal screw-thread corresponding to the thread on the rod 19, which screws through it. The nut 34 is keyed, as at 34^a in Fig. 4, or fixed in any other convenient manner in the swivel 25, so that it is incapable of rotary or longitudinal movement therein. When the rod or screw 19 is rotated, the nut 34, and with it the swivel 25 and power-cylinder 1, are traversed longitudinally of the casing in either direction, corresponding to the direction of rotation of the screw 19. On the extension 24 next the swivel 25 is fixed a toothed wheel 35, which is shrouded or formed with a flange 36 round the teeth on the one side, and on the end of the extension 24 next the toothed wheel 35 is placed a washer or ring 37, which is equal to or approximately equal to the diameter of the wheel 35. On the outer extremity of the extension 24 is screwed a nut 38, which serves for keeping in position thereon the swivel 25, toothed wheel 35, and washer 37. On the other longitudinally-arranged rod 20 at the rear of the lug 33 is arranged a pinion 39, which meshes with the toothed wheel 35 and is kept in gear therewith by means of the flange 36 on the one side of the teeth 35 and the washer or ring 37 on the other side. To allow the pinion 39 to move longitudinally of the rod 20 while preventing it rotating independently thereof, a longitudinal groove or feather-way 41 is formed in the rod 20, and in the pinion 39 is fixed a feather-key 40, which projects into said feather-way 41. The swivel-piece 25 is free to slide on the rod 20.

By the means described the feeding of the machine and rotation of the power-cylinder 1, and with it the drilling bit or tool 50, are simultaneously effected. These operations are accomplished in the following manner: The rotation of the crank 17 rotates the

toothed wheel 18 and through the medium of the pinions 21 22 the two longitudinally-arranged rods 19 20, as previously explained. The rotation of the screwed rod 19 causes the nut 34 to be traversed longitudinally of said screw and being fixed to the swivel-piece 25 and the latter being attached to the power-cylinder 1, the power-cylinder is accordingly moved forward or backward according to the direction of rotation of said crank 17, as may be required in the operation of the machine. The rotation of the other rod 20 drives the pinion 39, which, meshing with the toothed wheel 35, rotates the power-cylinder 1 bodily in its bearings in the swivel-piece 25 and front cap or cover 12 of the casing 2. As the power-cylinder 1 advances or recedes in consonance with the feed mechanism the pinion 39 is free to slide longitudinally of the rod 20 on the feather 40 in the feather-way 41, hereinbefore described.

The means for supplying and directing one or more sprays of water or other suitable liquid around the bore-hole comprises a swivel 42, which is mounted on a cylindrical part of the eccentric boss 14 on the front cover 12 of the casing 2. The front end of said boss 14 is formed with a screw-thread over which is screwed a nut 43, which maintains the swivel 42 in position. The swivel 42 is constructed with an annular hole 44 and has screwed or otherwise suitably attached to it a piece 45, formed with two branches 46 47, to which are attached flexible pipes 48 49, the one communicating with a source of supply of compressed or other gaseous fluid and the other with a source of supply of water or other suitable liquid under pressure. The air-supply may be taken from the main supply-pipe, and it may be preferred to so connect the pipe 48 with said main supply-pipe as to admit the air to the swivel 42 simultaneously with its admission to the power-cylinder 1. In the front of the swivel 42 four (more or less)small apertures 61 are formed, which communicate with the annular hole 44, through which apertures 61 the spray issues. These holes 61 may, if desired, be slightly inclined outward to cause the sprays to encompass a larger area of the rock-face.

The means we illustrate for rotating he drill or bit 50 in unison with the power-cylinder 1 are substantially those described and illustrated in a prior application for United States Patent filed by us, Serial No. 210,519, in which the power-cylinder has fixed to it at the front end a cap 51, formed with a hole 52 of square or polygonal section, in which fits the shank end of the drill or bit 50, formed with a part of corresponding shape, which insures the synchronous rotation of the drill or bit 50 with the power-cylinder 1. We also show the shank-piece 53, which serves for receiving and transmitting the impacts of the reciprocal piston to the drilling-bit or boring-tool 50. 54 is the resilient pad, and 55 a protecting ring or washer located in the front end of the power-cylinder 1 inside the cap 51 for receiving the impact of the shank-piece 53 should it be driven forward owing to the drilling-bit 50 not being in contact with or in close proximity to the bottom of the hole and at the same time for preventing the escape of the motive fluid round the inner shank of the bit 50. 56 is the port for admitting the motive fluid to the front end of the power-cylinder, and 57 the port which allows the motive fluid to escape round the piston and prevent it reversing it when the shank-piece 53 is moved forward and the machine put out of operation until such time as the shank-piece 53 and piston are pushed back in the cylinder 1 by the feeding forward of the machine or otherwise. While we illustrate this particular arrangement, our present invention is not restricted to such a construction, and the several improvements forming the subject-matter of this application may be employed or adapted to other constructions in which the drill-bit is preferably rotated by and in unison with the power-cylinder.

The means we provide for conducting a quantity of the motive fluid from the front end of the power-cylinder 1 to the bottom of the hole being drilled consists in forming longitudinally through the shank-piece 53 a hole 58. The aperture 58 is of suitably-small dimensions, so that only a small quantity of the motive fluid is able to pass through it. The hole 58 in the shank-piece 53 is increased in diameter at a short distance from the inner end. The object we have in view in increasing the diameter of the hole 58 is to utilize the fall in temperature which results, owing to the rapid expansion of the air in its passage through the shank-piece 53, so that the overheating of said shank-piece is thereby prevented. The repeated impacts of the piston on the shank-piece 53 will raise the temperature of the latter, and as it is desirable that said piece 53 should be a fairly good fit in the bore of the cylinder the means described avoid the possibility of the shank-piece 53 binding in the cylinder, as it would do were the temperature of the shank-piece 53 raised sufficiently.

A hole 59 is formed longitudinally of the drill-bit or cutting-tool 50. The hole 59 in the shank of the bit is alined with the hole 58 in the shank-piece 53, so that the motive fluid is free to flow from the shank-piece 53 along the hole 59 and to issue at or in proximity to the cutting point or edges of the bit 50. By directing a quantity of the motive fluid in this manner between the cutting edges of the tool and the bottom of the hole the rock cuttings are blown away from the cutting-face of the tool, and by the repeated reciprocations of the tool 50, combined with the action of the motive fluid issuing at the cutting-

point, the pulverized rock issues from the mouth of the bore-hole, where it is met by the sprays and the solid particles thereby saturated and caused to settle. In the case of downwardly-inclined and wet holes the water and particles of rock are kept constantly agitated and the cuttings are thereby prevented from settling or accumulating in the bottom of the hole. It will be obvious that by removing the cuttings from between the cutting edges of the drill-bit and the bottom of the hole immediately they are formed the efficiency of the bit is thereby materially increased. The motive fluid, flowing along the drilling bit or tool 50, also tends to prevent the undue heating of the same. It is well known that in the operation of rock-drilling machines or engines the cutting end of the drill or tool ordinarily becomes very much heated, more especially in the drilling of upwardly-inclined and dry holes, so much so that the durability of the bit is thereby materially impaired.

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

1. In a rock-drilling machine or engine, in combination, a casing, a power-cylinder therein, a cap fixed at the rear end of the power-cylinder, formed with a rearward extension, a swivel arranged on said extension and adapted to admit the motive fluid through said extension to the power-cylinder, a pipe for conducting the motive fluid to said swivel, packings arranged at either side of said swivel to prevent the escape of the motive fluid from between the swivel and the extension upon which it is arranged, and screw connections leading from the outside of the cap and passing through the swivel, for moving the power-cylinder.

2. In a rock-drilling machine or engine, in combination, a casing, a power-cylinder therein, a cap at the rear end of the power-cylinder, formed with a rearward extension, a swivel arranged on said extension formed with an internal annular recess, ports formed in said extension and placing said extension in communication with the power-cylinder and packings fitted in the swivel to prevent the escape of the motive fluid from between the swivel and extension, and means for conducting the motive fluid into said swivel, and screw connections leading from the outside of the cap and passing through the swivel, for moving the power-cylinder.

3. In a rock-drilling machine or engine, in combination, a power-cylinder, a cylindrical casing completely surrounding said cylinder and slidably and rotatably supporting the same, a drill or bit carried at the forward end of said cylinder, a feed-screw arranged longitudinally of and inside the protecting casing, a swivel loosely embracing a part carried by the power-cylinder and having a working connection with the feed-screw, and means for rotating the screw to move the power-cylinder in the protecting-casing.

4. In a rock-drilling machine or engine, in combination, a power-cylinder, a cylindrical casing completely surrounding said cylinder and slidably and rotatably supporting the same, a drill bit or tool carried by the forward extremity of said cylinder, a swivel-piece having passages for leading the motive fluid to the power-cylinder and loosely embracing a part carried thereby and having a working connection with a feed-screw, and means for rotating the screw to move the power-cylinder in the protecting-casing.

5. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably and rotatably mounted, a drill bit or tool carried by the forward extremity of said cylinder, a swivel-piece having passages for leading the motive fluid to the power-cylinder and loosely connected therewith and having a working connection with a feed-screw, a pinion arranged on the rear end of said screw, a spindle carried by the protecting-casing, a toothed wheel fixed thereon and gearing with the feed-screw, to move the power-cylinder in its protecting-casing.

6. In a rock-drilling machine or engine, in combination, a protecting-casing, a power-cylinder slidably mounted therein, a cap fitted at the rear end thereof formed with a rearward extension, a swivel adapted to introduce the motive fluid into the power-cylinder through said extension, a feed-nut carried by said swivel, a feed-screw arranged longitudinally of the casing working through said nut, a toothed wheel arranged on the extension of the cylinder-cap, a rod or spindle arranged longitudinally of the casing, a pinion mounted thereon and slidable longitudinally thereof gearing the toothed wheel on the extension and means for rotating the feed-screw to feed the drill and for rotating the rod or spindle to rotate the power-cylinder, substantially as described.

7. In a rock-drilling machine or engine, in combination, a power-cylinder, a cap fitted at the rear end thereof formed with a rearward extension, a swivel mounted thereon for introducing the motive fluid to the power-cylinder, means for introducing the motive fluid to said swivel, a toothed wheel on the extension, a feed-nut carried by the swivel, a feed-screw supported longitudinally of the power-cylinder working through said nut, a rod or spindle arranged longitudinally of the power-cylinder projected through a hole in the swivel, which rod or spindle in conjunction with the feed-screw serves to support and guide the rear end of the power-cylinder, a pinion on the extension and means for compelling said pinion to rotate with said rod or spindle while permitting it to slide longitudinally thereof and for compelling it to remain

in gear with the toothed wheel on the extension, and means for rotating the feed-screw and rod or spindle to advance or recede the power-cylinder and for rotating the same, substantially as described.

8. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a cap fitted at the rear end thereof formed with a rearward extension, a swivel arranged on said extension, ports placing said swivel in communication with the power-cylinder, a toothed wheel on the extension, a feed-nut carried by the swivel, a feed-screw journaled in the ends of the casing working through said nut, a pinion fixed on the rear end of said screw, a rod or spindle journaled in the ends of the casing, a pinion on the rod or spindle gearing the toothed wheel on the cylinder-cap extension, means for compelling said pinion to move longitudinally of the rod or spindle to maintain it in gear with the toothed wheel, means for compelling said pinion to rotate with the rod or spindle while permitting it to slide longitudinally thereof, a spindle journaled in the rear end of the casing, a toothed wheel fitted on the inner end thereof engaging the pinions on the rear end of the feed-screw and rod or spindle and means for rotating said toothed wheel to rotate the feed-screw and rod or spindle to advance or recede the power-cylinder and to rotate the same, substantially as described.

9. In a rock-drilling machine or engine, in combination, a protecting-casing, a power-cylinder slidably mounted therein, a cap fitted at the rear end of the power-cylinder formed with a rearward extension, ports formed in said extension communicating with the interior of the power-cylinder, a swivel arranged on said extension communicating through said ports with the interior of the power-cylinder, a pipe for conducting the motive fluid to said swivel, an aperture formed in the end of the protecting casing or cover through which the motive-fluid-supply pipe projects, a feed-nut carried by the swivel, a feed-screw journaled in the ends of the protecting-casing working through said feed-nut, a pinion fixed on the rear end of said feed-screw, a rod journaled in the ends of the protecting-casing passing through a hole in the swivel, a pinion fixed on the rear end of said rod, a pinion arranged on said rod and movable longitudinally thereof in a feather-way formed therein, a toothed wheel fixed on the cylinder-cap extension gearing the pinion movable longitudinally of the rod, and means for compelling the pinion to remain in gear with the toothed wheel on the extension, a spindle journaled in the ends of the protecting-casing, a toothed wheel fixed on the inner end thereof, pinions gearing the inner ends of the screw and rod and a crank for rotating said spindle to rotate the screw and rod through the toothed wheel and pinions to feed and rotate the power-cylinder, substantially as described.

10. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a cap fitted at the forward end of said protecting-casing formed with an eccentric bore through which the power-cylinder works, a cap fitted at the rear end of said casing, a screw journaled longitudinally of the casing and a parallel rod journaled in the ends of the casing, means for simultaneously rotating said screw and rod, a swivel carried on the rear end of the power-cylinder, said swivel carrying a nut through which the screwed rod works and through a hole in which swivel the rod projects to support and guide the power-cylinder, means for introducing the motive fluid into said swivel, and gear-wheels on the rear end of the cylinder and longitudinal rod for rotating the cylinder, substantially as described.

11. In a rock-drilling machine or engine, in combination, a protecting-casing, a power-cylinder slidably mounted in said casing, a swivel for conducting the motive fluid to said cylinder said swivel carrying a feed-nut, a feed-screw journaled in the ends of the casing working through said feed-nut for traversing the cylinder longitudinally of the casing, a rod journaled in the ends of the casing formed with a longitudinal feather-way, a pinion fitted with a feather-key traversing said feather-way to compel the pinion to rotate with the rod while permitting it to slide longitudinally, a toothed wheel secured at the rear end of the power-cylinder constructed with a shroud or flange at one side and fitted with a ring or washer at the other side of the teeth for keeping the pinion on the rod in gear with said toothed wheel and for compelling the pinion to move longitudinally of the rod as the cylinder is advanced or receded in the protecting-casing, substantially as described.

12. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing inclosing the same in which said cylinder is slidably mounted, means for mounting and securing said protecting-casing on a column-bar or other support adjustable longitudinally of said protecting-casing, means located at the rear end of the power-cylinder for admitting the motive fluid to either end of said cylinder, a feed-nut carried by said means, a feed-screw journaled longitudinally of the casing working through said nut for advancing and receding the power-cylinder, a gear-wheel carried by the rear end of the power-cylinder, a longitudinally-arranged rod journaled in the protecting-casing, a pinion mounted thereon in gear with the wheel at the rear of the power-cylinder, said pinion being movable longitudinally of said rod, and means for compelling said pinion to slide lon-

gitudinally of the rod to maintain it in gear with the toothed wheel when the cylinder is moved in either direction in its protecting-casing, and means for rotating the feed-screw and rod, substantially as described.

13. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a cap fitted at the front end of said casing, a swivel mounted on said cap, apertures formed in said swivel for directing a spray or sprays around the mouth of the bore-hole, and means for conducting water and air to said swivel to form the spray or sprays, substantially as described.

14. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a cap fitted at the front end of said casing formed with an extension, a swivel mounted on said extension formed with an annular hole, a piece formed with two branches attached to said swivel and communicating with the annular hole, a pipe connected to one branch for conducting compressed air or other gaseous fluid to the swivel and a pipe connected with the other branch for conducting water or liquid under pressure to the swivel, and a plurality of apertures formed in the front of the swivel for directing a spray or sprays round the mouth of the bore-hole, substantially as described.

15. In a rock-drilling machine or engine, in combination, a power-cylinder, a shank-piece fitted in the forward end thereof which receives and transmits the impacts of the reciprocating percussive member to the drilling bit or tool formed with a longitudinal hole for permitting a quantity of the motive fluid to pass from the power-cylinder through said shank-piece, a drill bit or tool carried by the forward end of said power-cylinder and constructed to rotate in unison therewith and formed with a longitudinal hole which coincides with the hole in the shank-piece for conducting a quantity of the motive fluid to the cutting end of the drill or tool to remove the rock-cuttings and for keeping the shank-piece and drilling bit or tool cool, substantially as described.

16. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a cap fitted on the forward end of said power-cylinder formed with an extension, a swivel mounted on said extension constructed with an annular hole, a piece fitted to said extension-swivel formed with two branches, a pipe attached to one branch for conducting compressed air or other gaseous fluid to said swivel and a pipe attached to the other branch for conducting water under pressure to said swivel, apertures formed in the front of the swivel for directing sprays round the mouth of the bore-hole, a shank-piece fitted in the forward end of said cylinder which receives and transmits the impacts of the reciprocating percussive member to the drill-bit, said shank-piece being formed with a longitudinal hole, a cap fitted at the end of the power-cylinder formed with a hole of square or polygonal section, a drill-bit formed with a portion of its shank or corresponding section fitting said cap so that the drill or bit is compelled to rotate in unison with the power-cylinder and with a longitudinal hole for conducting the fluid passing through the shank-piece to the bottom of the hole to blow out the rock-cuttings, substantially as described.

17. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a shank-piece fitted in the forward end of said cylinder formed with a hole longitudinally thereof for permitting a quantity of the motive fluid to pass through it from the power-cylinder, a drill or bit carried by the forward end of said cylinder engaging the front end of the shank-piece, means for compelling said bit to rotate in unison with the power-cylinder, said bit being formed with a longitudinal hole for conducting the motive fluid passing through the shank-piece to or in proximity to the bottom of the hole for removing the rock-cuttings, a swivel mounted on the cap or front end of the protecting-casing, pipes communicating with said swivel for conducting compressed air or other motive fluid and water or other liquid to said swivel, apertures formed in the swivel for directing sprays round the mouth of the bore-hole to saturate the particles of rock as they escape from the bore-hole, means adjustable longitudinally of the protecting-casing for mounting and securing the same, and means for simultaneously feeding and rotating the power-cylinder in its protecting-casing, substantially as described.

18. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing inclosing said cylinder, a cap fitted on the front of said cylinder formed with an eccentric boss and bore in which the power-cylinder slides, a swivel mounted on said eccentric boss, pipes communicating with said swivel for conducting motive fluid and water to said swivel, apertures formed in the swivel for directing sprays around the mouth of the bore-hole, means for conducting a quantity of motive fluid to the cutting-point of the drill bit or tool for blowing out the rock-cuttings from the hole being formed, a sleeve carrying the supporting-casing, a ring for securing said protecting-casing in said sleeve, a swivel mounted on the rear end of the cylinder inside the casing for admitting the motive fluid to the cylinder, a toothed wheel at the rear of the cylinder next the swivel, a nut carried by the swivel, a feed-screw working

through said nut, a rod carrying a pinion in gear with the toothed wheel at the rear of the swivel, said pinion being movable longitudinally of said rod while compelled to rotate therewith, pinions on the rear ends of said screw and rod and means for simultaneously rotating said screw and rod to move the power-cylinder in either direction in its protecting-casing and for rotating said cylinder to rotate the drilling bit or tool, and means for conveying motive fluid to the swivel at the rear end of the power-cylinder, substantially as described.

19. In a rock-drilling machine or engine, in combination, a protecting-casing, a power-cylinder slidably mounted therein, a cap fitted at the rear end thereof and formed with a rearward extension, a feed-screw arranged longitudinally of said cylinder, a toothed wheel arranged on the extension of the cylinder-cap, a rod or spindle arranged longitudinally of the casing, a pinion mounted thereon and slidably longitudinally thereof in mesh with a toothed wheel on the extension, and means for rotating the feed-screw to feed the drill, and for rotating the rod or spindle to rotate the power-cylinder, substantially as described.

20. In a rock-drilling machine or engine, in combination, a casing, a power-cylinder therein, a cap fitted at the rear end of the power-cylinder, formed with a rearward extension, a swivel mounted thereon for introducing motive fluid to said cylinder, a guide-rod for the swivel, a feed-screw supported longitudinally of the power-cylinder, and connections whereby the feed-screw will drive the swivel, said connections including a pinion on the aforesaid rear end of the cap, and means for compelling said pinion to rotate while permitting it to slide upon the guide-rod aforesaid, and for compelling it to remain in gear with the toothed wheel on the extension, and means for rotating the feed-screw and the guide-rod to advance or recede the power-cylinder and for rotating the same, substantially as described.

21. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing in which said cylinder is slidably mounted, a cap fitted at the rear end thereof, and formed with a rearward extension, a swivel arranged on said extension, ports placing said swivel in connection with the power-cylinder, a toothed wheel on the extension, a feed-screw journaled in the ends of the casing and connecting with the swivel to drive the same, a pinion fixed on the rear end of said screw, a rod or spindle journaled in the ends of the casing, a pinion on the rod or spindle in mesh with the toothed wheel on the cylinder-cap extension, means for compelling said pinion to move longitudinally of the rod or spindle to maintain it in gear with the toothed wheel, means for compelling said pinion to rotate with the rod or spindle while permitting it to slide longitudinally thereof, a spindle journaled in the rear end of the casing, a toothed wheel fitted on the inner end thereof engaging the pinion on the rear end of the feed-screw, a rod or spindle and means for rotating said toothed wheel to rotate the feed-screw and a rod or spindle to advance or recede the power-cylinder and to rotate the same, substantially as described.

22. In a rock-drilling machine or engine, in combination, a protecting-casing, a power-cylinder slidably mounted therein, a cap fitted at the rear end of the power-cylinder and formed with a rearward extension, ports formed in said extension connecting with interior of the power-cylinder, a swivel arranged on said extension and connecting through said parts with the interior of the power-cylinder, a pipe for conducting motive fluid to said swivel, a feed-screw journaled in the ends of the protecting-casing and connecting with the swivel to drive the same, a pinion fixed on the rear end of said feed-screw, a rod journaled in the ends of the protecting-casing, and with which the swivel has a sliding engagement, a pinion fixed on the rear end of said rod, a pinion arranged on said rod and movable longitudinally and non-rotatably thereof, a toothed wheel fixed on the cylinder-cap extension and connected with the pinion and movable longitudinally of the rod, and means for compelling the pinion to remain in gear with the toothed wheel on the extension, a spindle journaled in the ends of the protecting-casing, a toothed wheel fixed on the inner end thereof, pinions gearing the inner ends of the screw and rod, and a crank for rotating said spindle to rotate the screw and rod through the toothed wheel and pinions to feed and rotate the power-cylinder, substantially as described.

23. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing, in which said cylinder is slidably mounted, a cap fitted at the forward end of said protecting-casing and provided with an eccentric bore through which the power-cylinder works, a cap fitted at the rear end of said casing, a screw journaled longitudinally of the casing, a parallel rod journaled in the ends of the casing, means for simultaneously rotating said screw and rod, a swivel carried on the rear end of said power-cylinder, connections whereby the feed-screw drives the swivel, connections whereby said swivel slidably engages the rod to support the power-cylinder, means for introducing motive fluid into said swivel, and gear-wheels on the rear end of the cylinder and a longitudinal rod for rotating the cylinder, substantially as described.

24. In a rock-drilling machine or engine, in combination, a protecting-casing, a power-cylinder slidably mounted in said casing, a

swivel for conducting the motive fluid to said cylinder, a feed-screw journaled in the ends of the casing and connections whereby the feed-screw drives the swivel for traversing the cylinder longitudinally of the casing, a rod journaled in the ends of the casing, a pinion slidably and non-rotatably mounted thereon, a toothed wheel secured at the rear end of the power-cylinder, means for keeping the pinion and rod in gear with said toothed wheel and for compelling said pinion to move longitudinally of the rod as the cylinder is advanced or receded in the protecting-casing, substantially as described.

25. In a rock-drilling machine or engine, in combination, a power-cylinder, a protecting-casing inclosing the same and in which said cylinder is slidably mounted, means for mounting and securing said protecting-casing on a column-bar or other support adjustable longitudinally of said protecting-casing, means for admitting the motive fluid to either end of said cylinder, a feed-screw journaled longitudinally within the casing, and connections, engaging the means for admitting the motive fluid, whereby the feed-screw is utilized for advancing and receding the power-cylinder, a gear-wheel carried by the rear end of said cylinder, a longitudinally-arranged rod journaled within the protecting-casing, a pinion mounted thereon in gear with the wheel at the rear of the power-cylinder, said pinion being movable longitudinally of said rod, and means for compelling said pinion to slide longitudinally of the rod to maintain it in gear with the toothed wheel when the cylinder is moved in either direction in this protecting-casing, and means for rotating the feed-screw and rod, substantially as described.

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.