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R. S. TROTT.

ROCK DRILL.

APPLICATION FILED SEPT. 14, 1906.

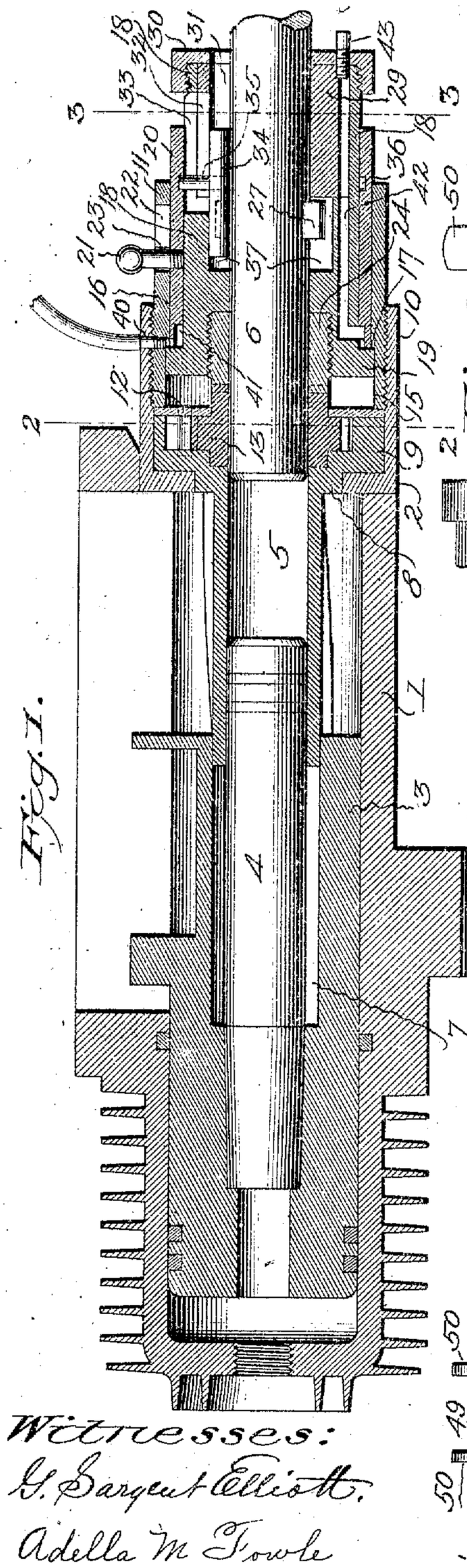

Fig. 1.

Fig. 6.

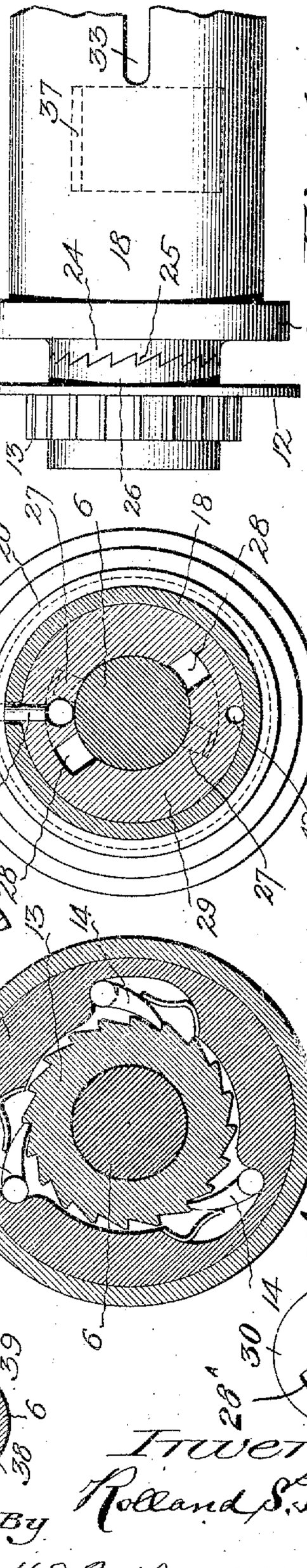

Fig. 4.

Fig. 3.

Fig. 2.

Fig. 7.

Fig. 8.

Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

ROLLAND S. TROTT, OF DENVER, COLORADO.

ROCK-DRILL.

No. 875,869. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed September 14, 1906. Serial No. 334,659.

To all whom it may concern:

Be it known that I, ROLLAND S. TROTT, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Rock-Drill, of which the following is a specification.

My invention relates to a drill-bit holding and rotating mechanism for rock-drilling engines, and the objects of my invention are: First, to provide a drill-bit holding chuck, having means whereby an operator can manually and instantly insert and lock a rock-cutting drill-bit to a rock-drilling engine, or can manually and instantly unlock and remove a rock-cutting drill-bit from a rock-drilling engine, without stopping the drilling engine. Second, to provide means in connection with a drill-bit holding chuck by which the drill bit can be rotated step by step. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a longitudinal sectional view of a portion of a drilling engine, showing the application of my improved chuck. Fig. 2, is a transverse sectional view on the line 2—2 of Fig. 1. Fig. 3, is a similar view on the line 3—3 of Fig. 1. Fig. 4, is a plan view of a portion of the chuck, showing the clutch which connects it to the actuating ratchet wheel. Fig. 5, is a transverse, sectional view, showing a clamping device for securing one end of a hose to a hollow drill bit. Fig. 6, is a side view of Fig. 5, showing a hose extending from the end of the chuck, to the clamping device on the drill bit, and Fig. 7 is a sectional view of a fragment of the cylinder of the drilling engine and piston. Fig. 8 is a front elevation of the chuck cap.

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

Referring to the drawings, the numeral 1; designates the cylinder of a rock-drilling engine; 2, the front cylinder head, which is bolted to the front end of the cylinder casing. The cylinder is provided with a piston 3, which is provided with a drill-bit striking bar 4, which I term the hammer bar, and which is made long enough to project beyond the front end of the piston far enough to enter a spirally fluted and rifled sleeve 5, in which it is closely fitted but reciprocally mounted, and its front end is arranged and adapted to strike the shank of a rock-cutting drill-bit 6. The cylinder is also provided with an axial bore 7, surrounding the hammer bar, the inner peripheral surface of which is provided with spiral grooved teeth 7^A, and the piston is held against rotative movement by lugs 7^B on its sides, which reciprocate in slideways in the cylinder. The shank end of the rock-cutting drill-bit projects loosely in the front end of said rifled sleeve into the reciprocal path of the hammer bar of the piston.

The sleeve 5, has a hub 8, which is rotatably mounted in an axial bore of the front cylinder head, and from this hub projects a circular head or collar 9, which lies within the bore of a hub 10, which projects from the cylinder head. The peripheral surface of the rear end of this sleeve is provided with spiral rifle teeth, which extend loosely into the spirally-grooved bore 7, of the piston. The entrance to the hub of the cylinder head is threaded, and sleeve 11 is threaded to it, which extends to close to the face edge of the head portion of the sleeve, and between the end of this collar and the face edge of the sleeve a washer 12 is placed. This washer rests against the outer edge of a ratchet wheel 13, having a hub, one end of which is mounted in a counter-bore of the head 9, of the sleeve 5, while the other end extends through an axial hole in the washer 12.

In recesses formed in the head 9, I place three pawls 14, which are provided with trunnions which are pivotally journaled in holes formed in the head 9, of the rifle bar sleeve, and in the washer 12. The sleeve 11 screws tightly up against the face of the washer 12, and secures the washer between the end of the sleeve and the end of the head 9. This sleeve is provided with an axial bore of two diameters 15 and 16, the bore 15 of larger diameter being in its inner end, and a shoulder 17 is formed at the junction of these two axial bores.

In the bottom of the largest bore I place the inner end of a drill-holding chuck 18, the inner end of which is in the form of a collar 19, which is larger in diameter than the body of the chuck, and extends up into the larger axial bore of this sleeve. This collar normally lies a short distance from the shoulder 17, between the two bores, and when the chuck is moved forward its movement will be limited by the said shoulder, as will appear by reference to the drawings. The

body of this chuck extends from this shoulder beyond the end of the sleeve 11, a short distance, and it is made enough smaller in diameter than the sleeve to permit a sleeve 20, to be mounted upon it, which sleeve I term the chuck actuating sleeve, and it is made to fit closely but slidably in the sleeve 11, and over the body of the chuck, its inner end being against the collar 19, while its outer end extends a short distance beyond the outer end of the sleeve 11. The sleeve 20, is provided with a finger grasping pin 21, which extends up through a slot 22, formed through the top of the sleeve 11, the inner end of which slot is provided with a short right-angled bend 23, into which the pin slides by turning the actuating ring, and is locked against accidental longitudinal displacement. The drill chuck, the rifle sleeve, and the ratchet wheel are each provided with an axial bore, that is adapted to receive and fit snugly but loosely the hammer striking end of the shank of the rock-cutting drill-bit, and the inner end of the chuck is counter-bored and threaded, and a ring 24 is threaded to it, and this ring is also provided with an axial bore that fits loosely over the drill-bit. This ring projects inwardly beyond the end of the collar portion of the chuck, and in its edge a circumferential row of ratchet teeth 25, is formed.

The outer end of the hub of the ratchet wheel 13, is also provided with a circumferential row of ratchet teeth 26, that are oppositely arranged to the teeth in the edge of the ring 24, and are adapted normally to engage the teeth of the ring of the chuck, thus forming a clutch connection between the chuck and the ratchet wheel.

The rock-cutting drill-bit may be of any of the commonly used types, and its shank end is adapted to extend into the rifle sleeve into the reciprocal path of the hammer bar 4, of the piston hammer, and is provided on diametrically opposite sides with projecting lugs 27, which are adapted to pass through recesses 28, formed in a circular block 29, that fits into a counter-bore formed in the outer end of the chuck, which block is confined in the chuck by a cap 30, which is threaded to the outside of the end of the chuck and extends over the ends of both chuck and block. This cap has an axial aperture 30^A, through which the drill bit passes, and recesses 28^A, which register with the recesses 28 in the block 29, and which admit the lugs 27 of the drill bit. The drill-bit passes through an axial bore in this block.

The recesses 28 are made to fit the drill-bit lugs loosely, and extend entirely through the block to the bottom of the counter-bore in the chuck, and a circular aperture 31, extends longitudinally through the block just above its axial bore, and a slot 32, extends from this aperture through the periphery of the block, and from its rear end to within a short distance of its forward end. A slot 33, is also formed through the shell of the chuck to register with the slot 32 of the block, and a locking bolt 34 is passed into the aperture 31, and is provided with a pin 35, which extends up through the slots 32 and 33 into a circumferential slot 36, formed in the inner periphery of the chuck actuating ring 20, which allows the locking bolt to rotate with the chuck independent of the actuating ring, but at the same time allows the locking bolt to slide in the aperture 31, by means of the finger grasping pin 21. This locking bolt extends beyond the inner end of the block 29, and into a recess 37 in the chuck concentric with its axial bore, a similar recess being formed at a diametrically opposite point, and these recesses extend around far enough to permit the drill-bit's lugs, after being inserted through the recesses 28 of the block, to be turned to one side far enough to be out of the path of the locking bolt, and to bear against the walls of the recesses 37, in order that these walls may contact with the lugs of the drill-bit, and thus turn the said bit as the chuck rotates.

When a drill-bit is inserted in the chuck, its lugs are passed through the recesses 28, of the block 29, and into the recesses 37 of the chuck, the finger grasping pin 21, having first been moved forward, which moves the actuating ring and the locking bolt forward far enough to allow the upper lug to be turned past it against its engaging wall, after which the locking bolt is moved back together with the actuating ring, by the finger pin, which is then turned and locked in its slot 23, and effectually locks the drill-bit to the chuck.

When it is desired to use water to eject the rock-cuttings from the rock-cutting lips of the drill-bit, when drilling holes in rock, I use a drill-bit, with an axial aperture 38, extending into it from its rock-cutting lips to within a short distance of its opposite end, and at a point on the drill beyond the chuck; when the drill is in position a transverse aperture 39 extends through the drill shank so as to intersect the axial aperture, and through the hub of the cylinder head and sleeve 11, I form an aperture 40, which connects with a circumferential aperture 41, formed in the end of the chuck's actuating sleeve, which connects with an aperture 42, extending through the chuck, the block 29, and the cap 30. A nipple 43, is threaded to the hole 42, and one end of a short section of hose 44, is secured to the nipple, and the other end of this hose is secured to a clamp 45, which is secured to the drill, over the ends of the transverse hole 39. This clamp comprises a pair of arms 46, which straddle the drill, and are pivoted together above the drill. One of the arms carries a lug 47, which fits into one

end of the hole 39, a rubber washer being secured around the lug to make a water-tight connection. The other arm is provided with a nipple 48, which fits into the opposite end of the hole 39, a packing or gasket being secured around the nipple, as shown. The other end of the hose 44, is secured to this nipple, and the water which enters the chuck through the aperture 40, passes out through the hose 44, to the drill-bit. By the construction the chuck, drill-bit, and hose will revolve together, thus avoiding any twisting of the hose. The clamp is held in place by an expansion spring 49, which lies between two upright fingers 50, which are integral with the arms 46, and the pressure exerted by the spring 49, causes the nipple 48 and lug 47, to be forced into the ends of the hole 39, and thus securely clamp the hose to the drill-bit. By gripping the fingers 50, and pressing them together, the clamp may be removed.

As the piston reciprocates in the cylinder, its rifle grooved bore reciprocates on the rifled sleeve on the forward stroke of the piston by its pawl running away from the teeth of the ratchet-wheel 13, but on the rear stroke of the piston, which is held from rotating by its side lugs, the sleeve is also rotated and its pawls engage the ratchet wheel and rotate it, and when the drilling engine is running, the chuck is thrown into and kept in engagement with the ratchet wheel 13, by moving the chuck's actuating ring rearward by means of the finger grasping pin 21, which moves the ratchet teeth of the chuck into engagement with the ratchet teeth of the ratchet wheel. The chuck is then locked in engagement with the ratchet ring, by turning the actuating ring, and moving the pin into the right-angled or offset slot 23. In case it is desired to withdraw a drill-bit from the chuck, and insert a new one, it is not necessary to stop the piston or drilling engine, as it requires but a few seconds to accomplish this, and it is only necessary to turn the finger pin and sleeve and move the pin and sleeve outward, which draws the chuck out of engagement with the ratchet teeth of the ratchet wheel, and at the same time moves the locking bolt forward, so that it is only necessary for the operator to grasp the drill-bit, turn it slightly, and withdraw it from the chuck, and insert another one, and lock it in the chuck and throw the chuck into engagement with the ratchet wheel, which is still intermittently rotating, and lock the finger pin in its offset slot.

When the sleeve 20, is thrown forward by the pin 21, it first withdraws the bolt 34 so as to allow the lugs on the drill to pass it as the drill is turned when withdrawn or inserted, but when the end of the sleeve contacts with the cap 30, the chuck will be moved forward until the end 19 contacts with the shoulder 17 of the sleeve 11, when the clutch mechanism will be uncoupled, and the water inlet closed by collar 19.

My invention is adapted to all characters and types of air, steam, or other fluid pressure operated rock-drilling engines, and is particularly adapted for use with the gasolene gas operated rock-drilling engine invented by me and now pending in the United States Patent Office in a companion application filed September 4, 1906, Serial No. 333,279.

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

1. In a rock drill for changing drill-bits without stopping the engine, a cylinder, a reciprocating non-rotative piston mounted therein, a pawl and ratchet and rifle toothed drill-bit rotating mechanism connected to said piston, a drill-bit in the reciprocative path of said piston, a drill-bit holding chuck arranged to hold said drill-bit, and means including a clutch device for throwing said drill holding chuck into or out of engagement with said drill-bit rotating mechanism when said piston and drill-bit rotating mechanism is in operation.

2. In a rock drill for changing drill-bits without stopping the drilling engine, the combination with an operative rock-drilling cylinder, and a reciprocative non-rotative piston, of a rifled sleeve and nut, and a ratchet toothed pawl mechanism arranged to operatively rotate a drill-bit, a drill-bit holding chuck arranged in operative relation to said drill-bit rotative mechanism, a drill-bit operatively supported by said drill chuck, a clutch surface on said drill-bit rotating mechanism, an opposing clutch surface on said clutch, and means for manually moving said chuck into and out of engagement with said drill-bit rotative mechanism.

3. In a rock drill for changing rock-drill-bits without stopping the drilling engine, the combination with a cylinder and a piston, of a rifle sleeve, a ratchet wheel, a drill-holding chuck, a manually operating chuck actuating ring and finger pin, and the opposing clutch surfaces between said chuck and said ratchet ring.

4. In a rock drill for changing rock-drill-bits without stopping the drilling engine, the combination of a cylinder, a piston, a drill-bit, and a drill-bit rotating mechanism, provided with a clutch surface, with a drill-bit holding chuck provided with a clutch surface opposing and adapted to register the clutch surface on said drill-bit rotating mechanism, and reciprocally mounted in said cylinder, and means including a finger grasping pin for moving said chuck into and out of engagement with said rotating mechanism's clutch surface.

5. In a rock drill for changing drill-bits in

a rock-drilling engine without stopping the engine, the combination of a drill-bit, and a drill-bit striking and rotating mechanism, with a drill-holding chuck reciprocally mounted relative to said rotatable mechanism, means for manually engaging said chuck with and detaching it from said drill-bit rotating mechanism.

6. The combination with the cylinder, of a piston reciprocally and non-rotatably mounted therein, a rifled sleeve, a ratchet ring connected to said sleeve by spring-controlled pawls, and a drill-bit holding chuck arranged to be manually connected and disconnected to and from said ratchet ring.

7. The combination of a cylinder having a forward extension thereon, a piston having a rifled aperture therein and provided with a forwardly extending hammer bar, a sleeve having a rifled exterior into which said hammer bar extends and on which said rifled aperture reciprocates, a ratchet wheel mounted in the forward extension of said cylinder, spring controlled pawls carried by said sleeve to engage said ratchet wheel, a clutch surface on said ratchet wheel, a drill bit holding chuck reciprocally mounted in said cylinder extension provided with a clutch surface opposing the clutch surface on said ratchet wheel, means including a finger grasping pin for moving and locking said chuck clutch in engagement with the clutch on said ratchet wheel, and for disengaging said chuck clutch from the clutch on said ratchet wheel, and means for substantially attaching and releasing a drill-bit to and from said drill-holding chuck.

8. The combination of a cylinder, a piston, a rifle sleeve, and a drill-bit, the cylinder head having a hollow hub, a ratchet toothed ring, provided with a side face ratchet tooth clutch surface, a drill-bit holding chuck slidably mounted to move to and from said rachet toothed ring and provided with a ratchet toothed clutch surface adapted to register in the clutch surface of said ring, a drill-holding chuck actuating ring surrounding said chuck loosely and connected thereto, a sleeve connected to said cylinder head, a slot through said sleeve above said ring, a finger grasping pin extending up through said slot and slidable therein, and adapted with said actuating ring to move said chuck into or out of engagement with said ratchet clutch ring, an offset slot in each end of said sleeve, in which said pin fits, a recess in said chuck, means including a sliding bolt which is revolubly connected to said actuating ring and said operating pin, and lugs on said drill-bit for instantly locking or releasing said drill-bit to or from said chuck.

9. The combination of a cylinder, a piston, a drill bit, a chuck and a sleeve, a ratchet wheel having a clutch surface thereon, a washer mounted on said ratchet wheel, pawls pivotally mounted between said washer and sleeve, a drill holding chuck having recesses therein, lugs on said drill bit fitting loosely in said chuck recesses, a locking bolt slidably mounted in said chuck, a locking bolt actuating ring mounted loosely on said chuck and connected thereto, and a finger grasping pin secured to said bolt actuating ring and extending within reach of an operator, means for rotatably connecting said locking bolt to said actuating ring whereby said grasping pin and ring operatively connect and disconnect said drill-holding chuck to said ratchet toothed clutch ring.

10. The combination with a cylinder, a cylinder head, a piston, and a drill-bit, said drill bit having projecting locking lugs on its shank end, and a water passage in it to its rock-cutting point, of a rifled sleeve, a ratchet toothed ring rotatably mounted in said cylinder head spring-controlled pawls on said rifled sleeve for connecting said ratchet toothed ring to said sleeve to be intermittently rotated thereby, a clutch surface on said ratchet toothed ring, a drill-holding chuck reciprocally and rotatably mounted in said cylinder head and provided with a clutch surface registering into said ratchet toothed ring's clutch surface, means including a manually operated sliding member for moving said chuck to engage and release said ratchet toothed ring, said chuck provided with recesses arranged to receive the lugs of said drill-bit, and a sliding bolt connected to said manually operating sliding member for releasably locking said drill-bit to said chuck, and means provided with a water passage through said cylinder head and chuck for admitting water to said drill-bit water passage.

11. In a rock drill for rock-drilling engines, the combination with a cylinder head, of a piston-operated, rifled sleeve rotatably mounted therein, a ratchet wheel mounted in said sleeve, and pawls in said sleeve for actuating said ratchet wheel; a chuck having a clutch face, which is engaged by a corresponding face on said ratchet wheel; and having a cylindrical bore, the face of which chuck is provided with oppositely positioned concentric recesses; a block in said bore, having longitudinal holes which open into said recesses; a bolt in said block, which extends into one of said recesses in said chuck, a pin in said bolt which extends through alined slots in said block and said chuck; a sleeve on said chuck, having an inner peripheral groove in which said pin projects, and a water channel in its inner end, connecting with an inlet, and with a channel through the chuck and block; a sleeve in said cylinder head surrounding said channeled sleeve; a pin for moving said channeled sleeve to withdraw the bolt; and a cap on the end of the chuck, which is engaged by

the channeled sleeve, to unlock the clutch mechanism, and close the water inlet.

12. In a rock drill, the combination with a drill bit having a shank provided with a side lug, of a chuck, a rifle bar and piston having a reciprocating movement, and a cylinder, connections whereby the chuck may be intermittently rotated step by step in said cylinder by said reciprocating movement of said rifle bar and piston, said chuck having an axial aperture adapted to receive the shank of said drill bit and having a concentric recess in which the side lug of said drill bit fits loosely, a cap fitting over said chuck provided with an axial aperture adapted to admit the shank and lug of said drill bit, the recesses in said cap being arranged out of alinement with a portion of the lug receiving recess in said chuck.

13. In a rock drilling engine, the combination of a cylinder, a piston, a rifle bar, a drill bit provided with a side lug, and a drill holding chuck, connections between said rifle bar and said chuck for rotating the latter, said chuck being provided with an axial aperture adapted to receive the shank of the drill bit, a recess in the end of said chuck extending concentrically around the axial bore of said chuck adapted to receive the side lug of said drill bit, and a cap connected to the end of said chuck provided with an axial aperture adapted to admit said drill bit to said chuck, but arranged out of alinement with the concentrically extending end of said lug receiving recess in said chuck.

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

ROLLAND S. TROTT.

Witnesses:
G. SARGENT ELLIOTT,
ADELLA M. FOWLE.