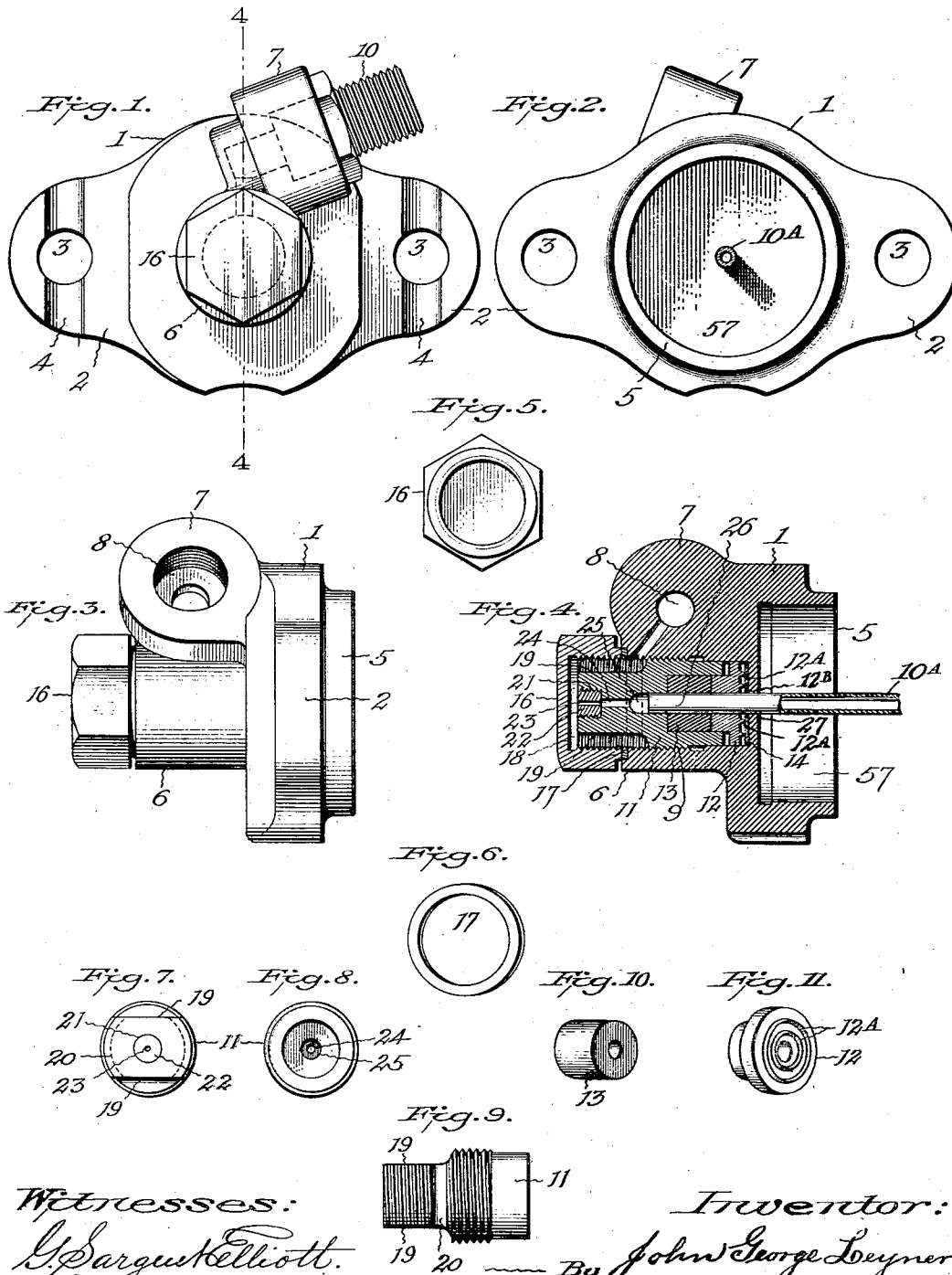


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WATER CONVEYING APPARATUS FOR EJECTING ROCK DRILLINGS FOR ROCK DRILLING ENGINES.
 APPLICATION FILED AUG. 15, 1911.

1,058,073.

Patented Apr. 8, 1913.

2 SHEETS—SHEET 1.



Witnesses:
G. Sargus Elliott.
Elizabeth Smith

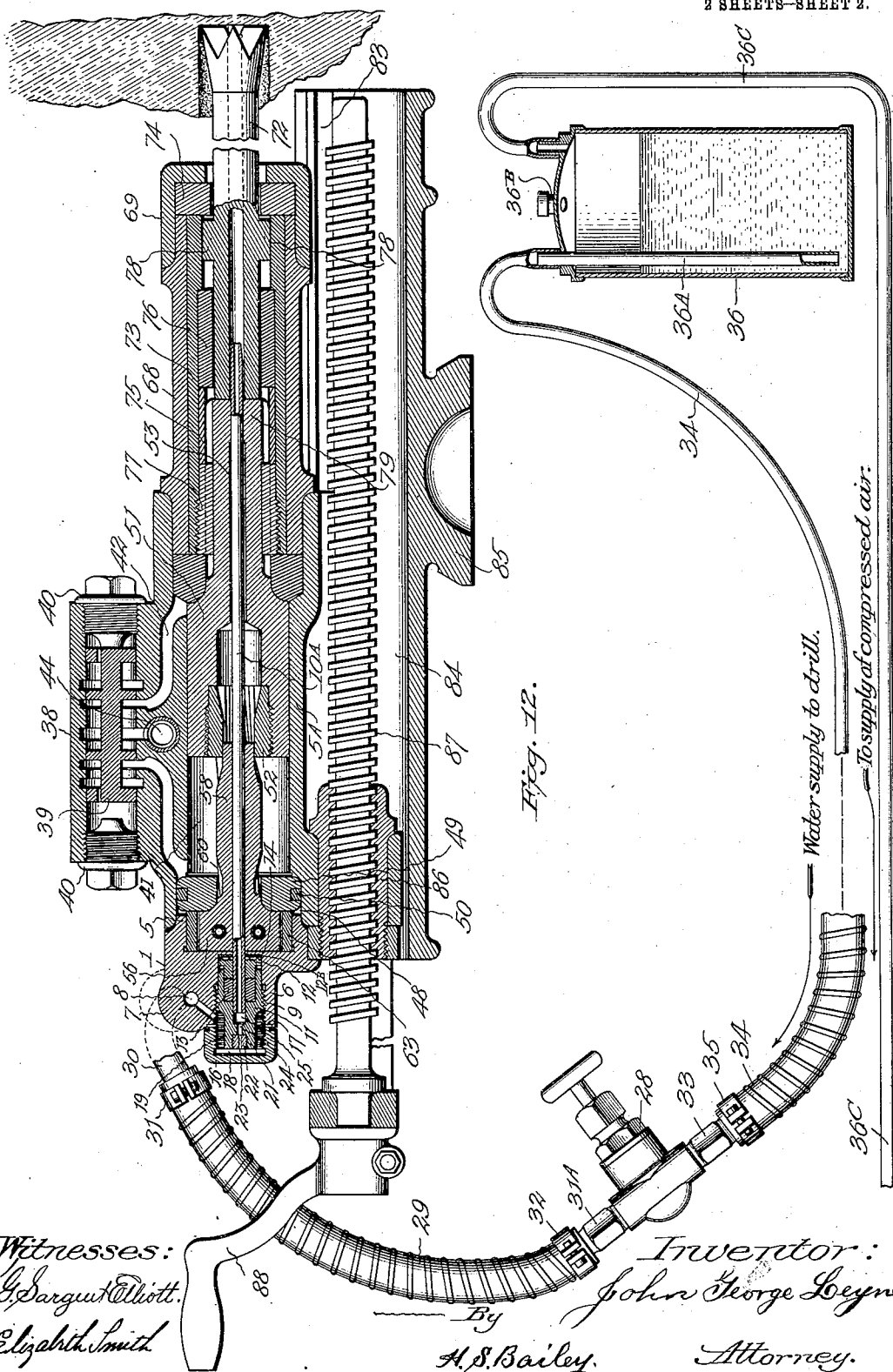
Inventor:
John George Leyner
 By *H. S. Bailey* Attorney.

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UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

WATER-CONVEYING APPARATUS FOR EJECTING ROCK-DRILLINGS FOR ROCK-DRILLING ENGINES.

1,058,073.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed August 15, 1911. Serial No. 644,151.

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Water-Conveying Apparatus for Ejecting Rock-Drillings for Rock-Drilling Engines, of which the following is a specification.

10 My invention relates to improvements in water conveying apparatus for rock drilling engines, that is adapted to eject rock cuttings from holes in rock while drilling them; and the objects of my invention are:
15 First, to provide a water conveying apparatus adapted to admit a supply of water to hollow drill-bits, through the axial center of the drilling engine. Second, to provide a water conveying apparatus that is provided
20 with means for removably and renewably supporting a water conveying tube, which is adapted to convey a supply of water to hollow rock cutting drill-bits of rock drilling engines, and that is provided with an
25 air pressure operated portable water storage and water supply tank that is connected directly to the drilling engine, and is arranged to provide a steady flowing volume of water of any predetermined adjustable pressure. I attain these objects by the mechanism illustrated in the accompanying
30 drawings, in which:

Figure 1, is a rear view of the cylinder head that forms a part of and supports the
35 greater part of my water conveying apparatus for rock drilling engines. Fig. 2, is a front view thereof, the pipe-receiving nipple shown in Fig. 1 being omitted. Fig. 3, is a side view of the rear cylinder head.
40 Fig. 4, is a vertical longitudinal sectional view on the line 4—4 of Fig. 1. Fig. 5, is a front view of the cap nut. Fig. 6, is a perspective view of the washer which is interposed between the cap nut and the end
45 of the head. Figs. 7 and 8 are rear and front views respectively of the water tube holding plug. Fig. 9 is a side view thereof. Fig. 10 is a perspective view of the rubber washer which is housed in the plug and sur-
50 rounds the water tube. Fig. 11 is a per-

spective view of the clamping washer, against which the rubber washer is compressed, and Fig. 12 illustrates a central longitudinal section through a modern type of rock drilling engine, and shows the co-
55 operative arrangement of my improved water conveying and rock cuttings ejecting apparatus to a complete operative rock drilling engine.

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

Referring to the drawings, the numeral 1 designates the rear cylinder head of a modern type of rock drilling engine. This cylinder head may be secured to the cylinder
65 of a rock drilling engine in any desired manner. I preferably however have illustrated this rear cylinder head provided with a flange portion, which is provided with oppositely projecting lug portions 2, through
70 which apertures 3 are formed that are adapted to receive bolts by which the cylinder head may be bolted to the rear end of a rock drilling engine. The outside surfaces of these lugs are provided with re-
75 cesses 4 that extend radially and diametrically across the bolt apertures, which are intended to be used for a projecting key portion on a nut where the bolt used is held
80 under a resilient pressure against the lug of the cylinder head. In case it is desired to use an ordinary flat faced or surfaced nut, these recesses across the bolt apertures
85 of the lugs may be dispensed with, if desired. The front side of this flange portion of the cylinder head is provided with a reduced hub portion 5, which is adapted to extend into the cylinder 5^A and bear on a rear part of it. An axial recess is formed
90 in the front side of the cylinder that is adapted to receive a part of the drill-bit turning mechanism, which will be described hereinafter. The flange portion of this cylinder head is provided with a rearwardly
95 extending hub portion 6, which is provided with an upwardly projecting lug portion 7, through which an inlet aperture 8 is formed that extends into an axial aperture 9 formed in the hub portion of the cylinder head from
100 its rear end. The entrance to the aperture

of the lug 7 is interiorly threaded and a nipple 10 is threaded to it. The aperture 8 is adapted to form a water inlet to the interior chamber 9 of the hub, and one end of a short piece of hose 29 is secured to it preferably by being threaded and then clamped thereto. A water inlet valve 28 is inserted in the hose and its opposite end is connected to a water conveying hose 34, which will be described hereafter.

The axial aperture 9 of the hub portion of the cylinder head is interiorly threaded and a plug 11 is threaded into it and extends to close to its bottom wall, where a metal clamping washer 12 is placed, and a rubber plug shaped washer 13 is seated in a recess in the plug 11 and is arranged to be clamped against the clamping washer 12 when the plug 11 is screwed into the aperture 9 against it. The inner end of the clamping washer 12 is provided with knife-edge circular ribs 12^A, and a washer 12^B, of wood fiber or rubber or leather, is placed between the rings of the washer 12 and the wall 14, and the rings of the washer are embedded into the washer 12^B by the pressure against it of the plug 11 and prevents the water from leaking past the rings 12^A and through the aperture 27 in the partition wall 14 of the cylinder head into the cylinder. This plug 11 is made enough longer than the threaded aperture in which it is placed to project from the rear end of the head far enough to receive a cap nut 16, which is threaded on it and is adapted to screw against the rear end of the head. A washer 17, which may be made of any suitable material, but which is preferably made of fiber material, is preferably placed on the plug 40 between the cap nut and the cylinder head.

The cap nut 16 is made enough longer than the end of the plug on which it screws to permit its aperture to extend beyond the end of the plug far enough to form a water collecting space 18, at the outer end of the plug; and the outer end of the plug is provided with two diametrically and oppositely arranged flattened portions 19, which leave spaces on opposite sides of the end of the plug between these flattened portions and the wall of the aperture 9 in the plug 11, through which the water flows from a circumferential groove 20, which is formed around the plug and which is arranged to register with the water inlet aperture 8. The plug 11 is also provided at its outer end with an axial threaded recess 21, in which a plug 22 is secured. This plug is provided with a small axial aperture 23, which registers with a larger aperture 24 that extends through the body of the plug and registers with a larger aperture 25 formed in the opposite end of the plug 11 from the small aperture 24 and registers with a larger aperture, in which the rubber washer 13 is

loosely seated. This rubber washer 13 is arranged to be compressed by the plug 11 when it is screwed into the rear cylinder head against the clamping washer 12, and its axial aperture is arranged to be contracted tightly enough around one end 26 of the water inlet tube 10^A to secure this tube firmly to the rubber washer and the plug 11. The rear end of this water inlet tube 10^A extends loosely through an aperture 27 formed in the rear cylinder head and through the axial aperture of the clamping washer 12 and through the axial aperture of the rubber washer 13, which holds it fast to the plug 11 and then into the counterbored aperture 25 formed in the axial aperture of the plug 11 which receives it loosely. The water inlet tube is thus firmly held and supported in the rear cylinder head by the plug 11, the clamping washer 12 and the rubber washer 13, and it can be withdrawn from the rear cylinder head whenever desired by removing the cap nut 16 and the plug 11 without removing the rear head of the cylinder.

The rear cylinder head is provided with a water controlling valve 28, which I term the inlet valve, which may if desired be attached directly to the inlet nipple 10, but which I preferably place in a short piece of flexible rubber hose 29, which I term the inlet valve hose, inasmuch as the drilling engine when running trembles and the valve is apt to move accidentally from positions at which it is set by the operator if connected directly to the nipple 10 of the cylinder head, or if connected in any manner directly to the head, but when it is placed in a piece of hose at a short distance from the rear cylinder head, the vibratory trembling movement of the drilling engine is absorbed by the hose and the valve will remain wherever set. This hose is provided with an elbow 30 at one end, which is clamped to one end of the piece of hose by a clamp 31, and the elbow is provided at its opposite end with a threaded coupling connection that is adapted to thread onto the nipple 10. A nipple 31^A is secured to the opposite end of the hose by a clamp 32, and the inlet valve 28 is secured to the nipple at one end and is provided at its opposite end to a nipple 33, which is adapted to be connected to one end of a water supply hose 34, by any suitable connection, but preferably by a clamp connection 35. This water supply hose leads to a supply of water under pressure. Any suitable supply of water under pressure enough to carry water through the drilling engine to the rock cutting lips of the drill-bit, may be used, but I preferably, in order to maintain a steady flow of water under a constant even pressure, employ a small portable water storage tank 36, which is preferably made of metal. This tank is pro-

vided with a water discharge pipe 36^A, which projects from its top and is arranged to extend down through the top of the tank to close to its bottom. The water supply hose 34 is connected to the outer end of the tank's water discharge pipe. This portable storage tank is preferably made of a size to be easily carried into and moved about the underground workings of mines, and preferably is made to hold about eighteen gallons of water, and is refilled from any suitable supply of water after being emptied, the tank being provided with a capped inlet nipple 36^B, through which the tank is filled. This tank is also connected by a hose 36^C, with a supply of compressed air, which can be piped from an air compressing plant to a convenient point to be connected to the tank hose.

The compressed air flownig constantly and under a predetermined regulated pressure into the tank on top of the water therein, forces the water with a steady pressure into the rear cylinder head and through the water conveying tube into the hollow drill bit, where it mingles with a portion of the compressed air that flows into the front end of the cylinder, which also flows into the shank end of the drill bit around the water conveying tube, and the air and water mingle together and the water is discharged in jets as a spray by the expansive force of the air that flows intermittently into the forward end of the cylinder in front of the piston hammer from the valve chest of the cylinder. Consequently, while the water from the portable storage tank is forced into and through the drilling engine by compressed air flowing into the tank, air from the cylinder enters the drill bit and mingles with it and increases the force by which the water is driven out of the drill bit in jets as a spray, which is forcible enough to drive the rock cuttings from the hole being drilled and to thoroughly lay the dust that rises from the drilling.

In Fig. 12, I have illustrated my improved water conveying apparatus for rock drilling engines operatively connected to a rock drilling engine such as is embodied in my pending application No. 570,339, filed July 5, 1910. The rock drilling engine illustrated in Fig. 12 shows a rock drilling engine in which air and water are commingled together and fed to the rock cutting point of the drill bit, and it consists of a number of elements that do not form a part of my present invention, but they cooperate with my present invention to form a complete rock drilling engine, but as these features are fully described in that application, they will be only briefly referred to in this application. These features consist of a cylinder 5^A, which is provided with a valve chest 38, in which a valve 39 is reciprocally mounted.

The opposite ends of the valve chest are provided with removable plugs 40. The cylinder is provided with a suitable bore 41, and an operative system of ports 42 is formed in the walls of the cylinder and valve chest. A compressed air or other actuating fluid inlet aperture is formed in the cylinder in which a suitable valve 44 is operatively seated. The cylinder is provided with a counterbore 48, at its rear end, in which a ring 49, which I term a cylinder ring, is seated. This cylinder ring is provided in its periphery with a packing ring 50, to prevent leakage of air past the cylinder ring from the bore of the cylinder. A piston hammer 51, is reciprocally mounted in the bore of the cylinder, and its rear end is provided with a threaded axial aperture, in which a spirally fluted nut 52 is secured. A smaller axial aperture 53 is also formed entirely through the piston hammer, through which the water feeding tube 10^A extends, as will be fully explained herein-after.

The rifle bar comprises a head portion 56, that fits rotatably in a counterbore 57, formed in the rear cylinder head, and a stem portion 58 that projects from the head portion through the cylinder ring 49 into the bore of the cylinder. The stem portion of the rifle bar is provided with spirally arranged rifle flutes 60, that are arranged to mesh loosely into and slide freely in the fluted nut of the piston hammer, into the axial bore of which the rifle bar extends from the rear cylinder head; the piston hammer being arranged to reciprocate freely on the spiral flutes of the rifle bar. The rifle bar is provided with an axial aperture, through which the water conveying tube extends loosely. This water conveying tube also extends loosely through the axial aperture in the piston hammer, into the hollow shank of the drill bit.

The head portion 56 of the rifle bar is surrounded by a ratchet toothed ring 63, the inner peripheral surface of which is provided with a circumferential row of ratchet teeth. This ring is rotatively seated in the counterbore 57, but is held under a frictional clamping pressure between the bottom of the counterbore and the adjacent side of the cylinder ring 49 by resilient tension of the side bolts, not shown.

The cylinder is provided with a front cylinder head 68, which is provided with a cap portion 69, and the cylinder heads are clamped to the opposite ends of the cylinder, with a resilient tension pressure that enables them to yield under severe torsional strains without breaking, this feature not being illustrated, as it forms no part of the present invention.

The front cylinder head contains a drill bit holding chuck, which consists of a sleeve

73, a ring 74, the bushings 75 and 76, and the fluted nut 77. These parts are arranged to support a rock cutting drill bit 72, the shank end of which is provided with projecting lugs 78. The shank of the drill bit is adapted to be instantly inserted in and be withdrawn from the chuck, and its lugs are adapted to be locked in the sleeve so that the drill bit is rotated step by step by the sleeve, which is rotated by the fluted nut 77. The piston hammer is provided with a hammer extension portion 79, which is provided with straight flutes that fit reciprocally in the straight flutes of the fluted nut, and the chuck sleeve and the drill bit are held from turning on one stroke of the piston hammer, but are turned with the piston hammer on its other stroke by the spiral flutes of the rifle bar on which the hammer piston reciprocates, the rifle bar being locked by its pawls and ratchet rings 63 against rotation in one direction, and being turned by the hammer on one of its strokes, as is well understood.

The cylinder is provided with slideways, and is slidably mounted in guideways 83, formed in a shell 84, which is provided with a hub 85, that is adapted to be clamped by a chuck to a mine column. I do not illustrate this chuck or the mine column, as they do not form a part of my present invention. The cylinder is also provided with a depending nut portion 86, which is threaded, and a feed screw 87 is rotatably mounted on the shell and is threaded to the nut in such a manner that when the feed screw is turned by a crank handle 88, with which it is provided, the cylinder is fed slidably forward or backward in the guideways of the shell.

The general operation of the drilling engine is as follows: Compressed air is admitted to the valve chest and valve by the inlet valve and reciprocates the hammer piston, which strikes against the end of the drill bit. The reciprocating strokes of the hammer piston on the rifle bar and in the nut of the chuck sleeve, impart through the medium of the pawls and ratchet ring, a step by step rotary movement to the chuck sleeve and to the drill bit. Water is turned into the rear cylinder head through the water inlet valve 28, and flows through the tube 10^A, into the end of the hollow drill bit where air from the cylinder which also enters the end of the drill bit, mingles with it and discharges as a jet or spray from the end of the drill bit, into the bottom of holes in rock while drilling them.

While I have illustrated my water conveying apparatus attached to a particular type of rock drilling engine, I do not wish to be limited to the application of it to that type of drilling engine, and do not wish either to be limited to the construction of the rear cylinder head and water conveying tube and its supporting mechanism shown,

as many changes might be made without departing from the spirit of my invention and the scope of the appended claims.

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

1. In a rock drilling engine, the combination of the cylinder and the front cylinder head and cap, the drill bit holding chuck adapted to receive and support a hollow drill bit, the hammer piston, the rear cylinder head provided with an axial aperture and a water inlet aperture extending into its side and connecting with its axial aperture, the ratchet ring and rifle bar, said rifle bar being operatively connected to said hammer piston to rotate said chuck, an axial aperture through the axial center of said rifle bar and said piston, and means for connecting said cylinder and cylinder heads together, with an axial aperture in the rear end of said rear cylinder head, a plug threaded to said aperture, provided with flattened portions at its outer ends, a cap threaded over the end of said plug and against the rear end of said cylinder head provided with a water space between said plug and the inside of said cap, a water channel in the end of said plug connecting the space at the outer end of said plug to the water inlet aperture in said rear cylinder head, an axial aperture through said plug, a water conveying tube having one end extending into said rear head into the axial aperture of said plug, said plug being provided with an enlarged aperture in its inner end, a rubber washer fitting in said aperture and provided with an axial aperture in which said tube fits closely, a clamping washer between the end of said plug and the adjacent inner wall of the plug's aperture in said rear cylinder head, said clamping washer being provided with knife-edge ribs arranged on its wall engaging face and adapted to be slightly embedded into said wall, said rubber washer being arranged to be compressed by said plug against said clamping washer and thus clamped around and to said water inlet tube with sufficient pressure to hold and secure said tube to said rear head, said tube being arranged to extend loosely from said rear cylinder head through said rifle bar and hammer piston into said chuck and having its forward end adapted to project into said hollow drill-bit.

2. In a rock drilling engine, the combination of the cylinder, the front and rear cylinder heads, the hammer piston, the drill-bit holding chuck, and the rifle bar and ratchet ring mechanism operatively arranged within said cylinder and the hollow drill-bit operatively supported by said chuck and arranged to project into the reciprocal path of said hammer piston, said hammer piston and rifle bar and said rear cylinder head being provided with an axial aperture, and said

rear cylinder head being provided with a water inlet aperture connecting with its axial aperture, with a water conveying tube extending into the axial aperture of said rear cylinder head and arranged in water receiving relation to said water inlet, means including a rubber plug mounted on said tube and means for compressing the same for securing said tube to said rear cylinder head, said tube being arranged to project from said rear cylinder head loosely into and through said rifle bar and hammer piston, and into the shank end of said drill-bit.

3. In a rock drilling engine, the combination of the cylinder, the hammer piston, the chuck, the rifle bar, the rear cylinder head provided with a water inlet aperture provided with a hose coupling, an axial threaded aperture in said head from its rear end to near its front end, a small aperture through the center of the bottom wall of said threaded aperture, a clamping washer in said threaded aperture bearing against said bottom wall, the wall side of said clamping washer being provided with circular knife-edge projecting lugs which are arranged and adapted to engage the surface of said wall and prevent leakage of water past said clamping washer and through said wall's aperture into said cylinder, a metal plug provided with an axial aperture in the threaded aperture of said rear cylinder head, a rubber washer in said metal plug arranged to bear against said clamping washer, a water conveying tube projecting loosely through said hammer piston and rifle bar into and through the aperture in the wall of said rear cylinder head and into and through said rubber plug into said metal plug's axial aperture, said rubber plug being arranged to be compressed by said metal plug sufficiently to cause it to tightly clamp said water tube and to hold the same in said head, said threaded plug being provided with a cap and with water passages arranged to conduct water from said water inlet aperture of said rear head to said tube.

4. In a rock drilling engine, the combination of the rear head provided with an axial aperture of two diameters, the smaller of which is arranged to receive a water conveying tube and is in the bottom wall of the larger aperture, with the clamping washer mounted in said tube and positioned against the bottom wall of said larger aperture in said rear cylinder head, the rubber plug fitting over said tube and the threaded plug arranged to be threaded to the larger aperture and adapted to be screwed against said washer plug and adapted to compress it to cause it to compress and clamp said plug to said tube and thus secure said tube in said rear cylinder head, said threaded plug being provided with a small threaded aperture in its rear end, a small disk-shaped

plug threaded into said aperture, a needle aperture through said small plug, and an aperture through said head's plug arranged to connect said needle aperture with said tube, said head plug being arranged to project rearward of said head, a cap threaded to said plug provided with a water space beyond the end of said head's plug, a washer on said plug between said cap and said head, said cap being arranged to screw against said washer and compress it against said head, and the outer end of said head's plug being provided with oppositely arranged flattened surfaces and with a circumferential water groove connecting the water inlet aperture of said head with the water space in said cap and with said needle aperture in the small disk-shaped plug of the plug of said rear head and with said water conveying tube.

5. In a rock drilling engine, a rear cylinder head having a main water-inlet and a rear threaded bore, a water-conveying tube passing through said cylinder head into said bore, packing in said bore around said tube, a threaded plug in said bore having a central passage and adapted to compress said packing and clamp said tube in alinement with said passage, said plug having a rear extension with reduced portions and threaded unreduced portions, and a threaded cap on said extension, whereby passages are formed between said main water-inlet and the passage of said plug.

6. In a rock drilling engine, a rear cylinder head provided with a main water-inlet, a rear bore, and a connecting-passage; a water-conveying tube passing through said cylinder head into said bore, packing in said bore around said tube; a plug secured in said bore having a central passage, and adapted to compress said packing and clamp said tube in alinement with said passage, said plug having a rear extension with reduced portions connected by annular grooves, said reduced portions or their connecting grooves being adapted to receive water directly from said connecting-passage in the cylinder head; and a cap engaging the unreduced portions of said plug; whereby passages are formed between said main water-inlet and the passage of said plug.

7. In a rock drilling engine, a rear cylinder head provided with a main water-inlet, a rear bore, and a connecting-passage; a water-conveying tube passing through said cylinder head into said bore, packing in said bore around said tube; a cylindrical plug secured in said bore having a central passage, and adapted to compress said packing and clamp said tube in alinement with said passage, said plug having a rear extension with opposite flattened portions connected by annular grooves, said flattened portions or their connecting grooves being

adapted to receive water directly from said
connecting-passage in the cylinder head;
and a cap engaging the portions of full
diameter of said plug forming a water-
5 space between said cap and the rear end of
said plug, and whereby passages are formed
between the main water-inlet and the pas-
sage of said plug.

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

JOHN GEORGE LEYNER.

Witnesses:

G. SARGENT ELLIOTT,
ELIZABETH SMITH.
