J. G. LEYNER.

DOWN HOLE HANDLE SUPPORTED ROCK DRILL.

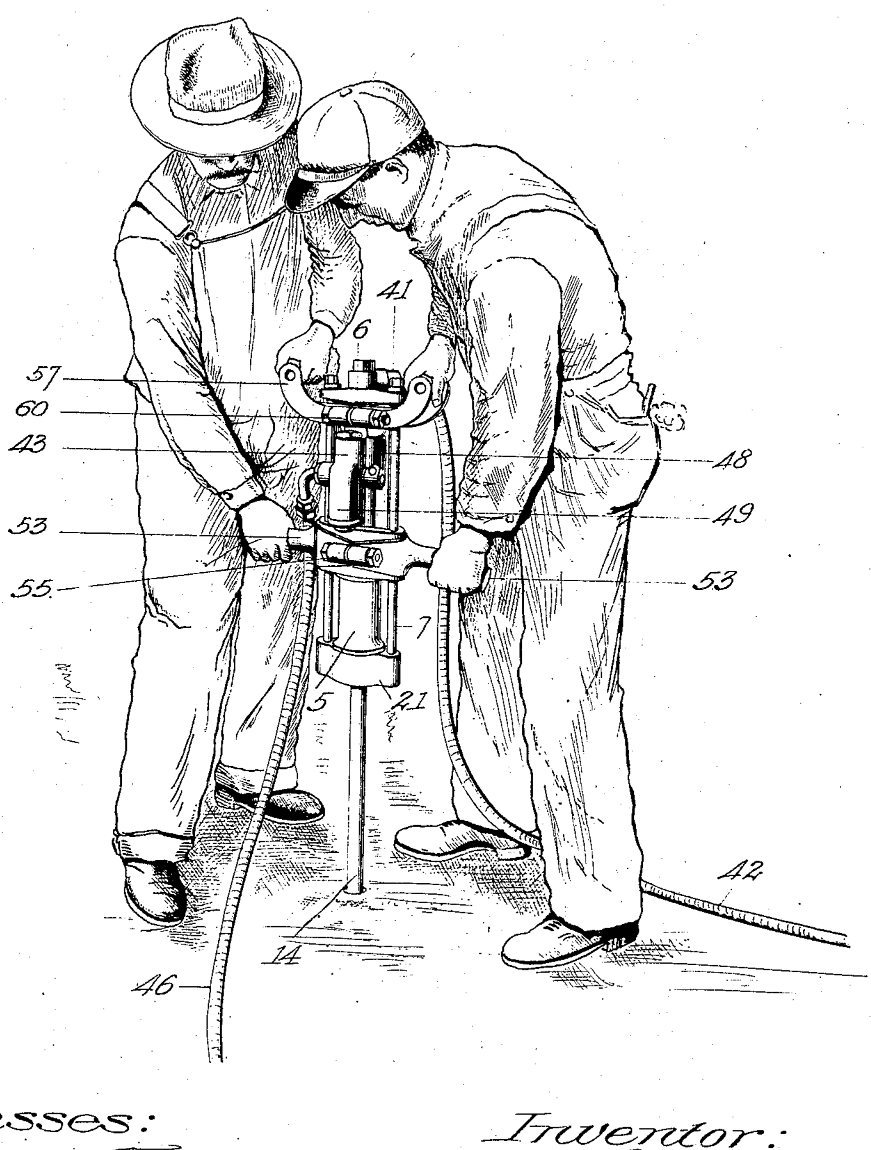
APPLICATION FILED MAR. 10, 1911.

1,039,971.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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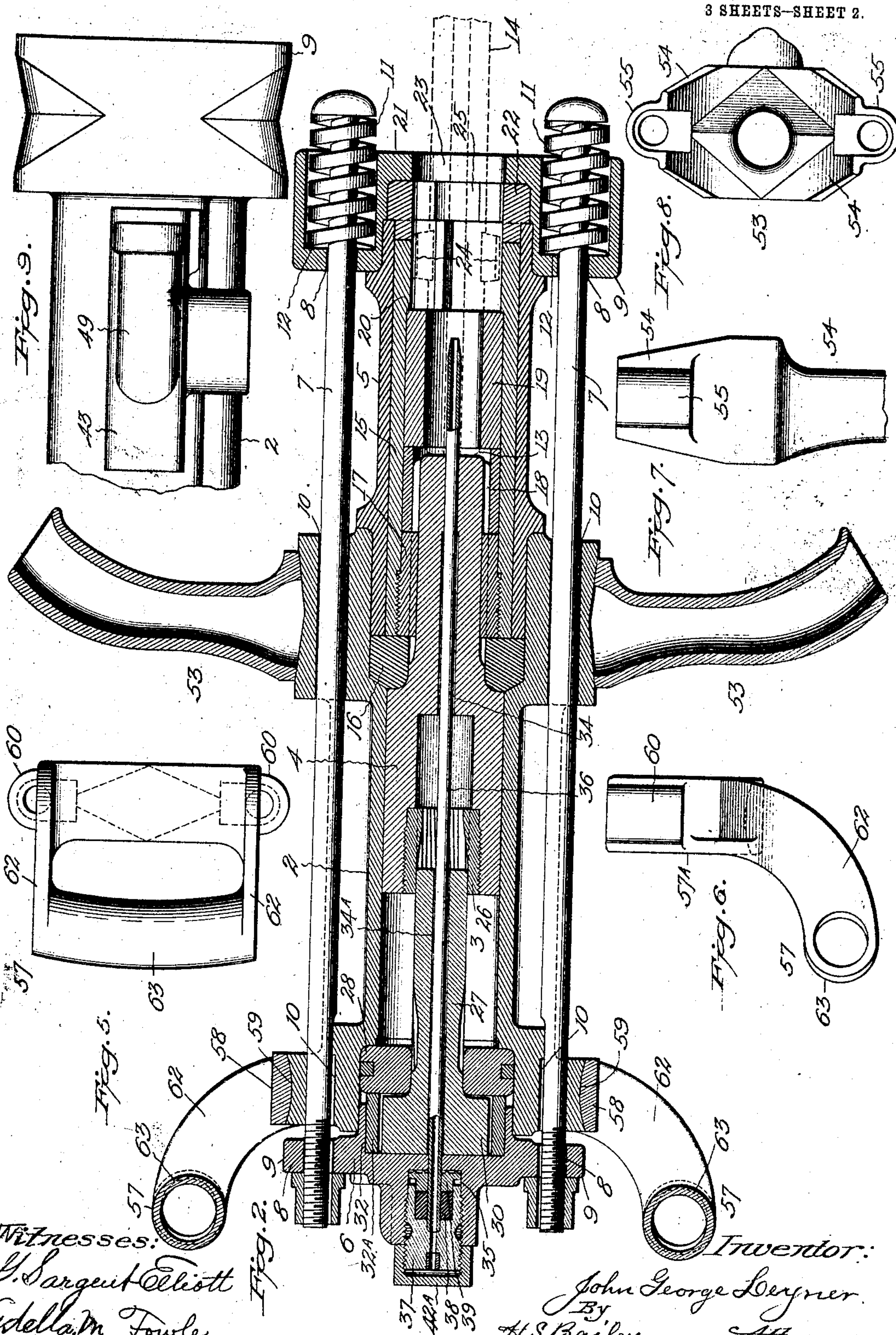

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3 SHEETS—SHEET 3.

Fig. 3.

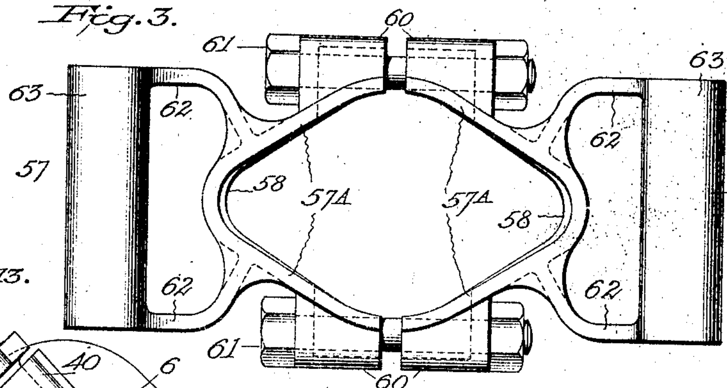


Fig. 13.

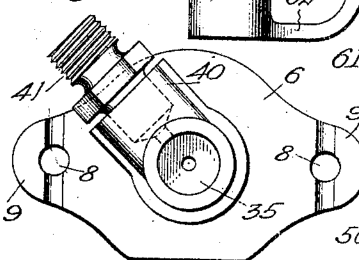


Fig. 4.

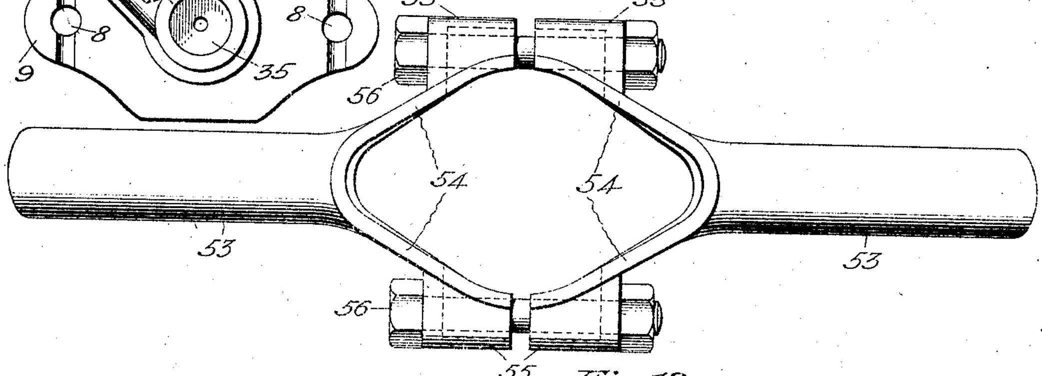


Fig. 10.

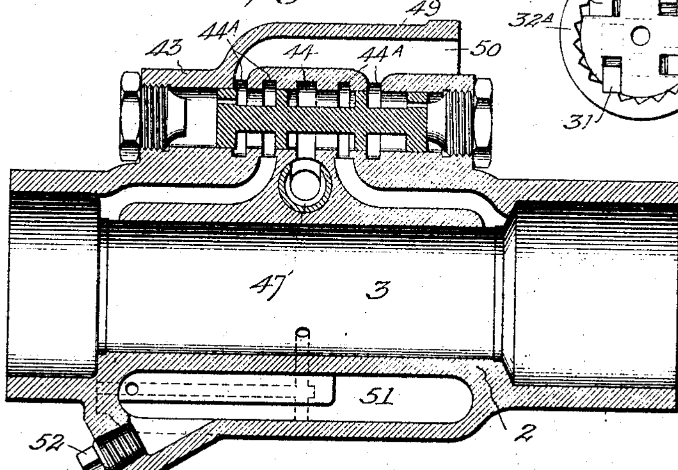


Fig. 12.

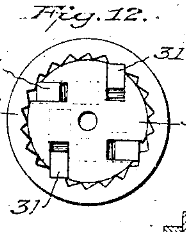
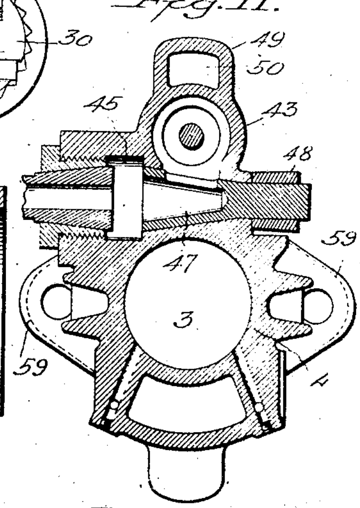


Fig. 11.



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UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO, ASSIGNOR TO THE J. GEO. LEYNER ENGINEERING WORKS COMPANY, OF LITTLETON, COLORADO, A CORPORATION OF COLORADO.

DOWN-HOLE HANDLE-SUPPORTED ROCK-DRILL.

1,039,971. Specification of Letters Patent. **Patented Oct. 1, 1912.**

Application filed March 16, 1911. Serial No. 613,497.

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 Down-Hole Handle-Supported Rock-Drill, of which the following is a specification.

My invention relates to a new type of down hole rock drilling engine, and the objects of my invention are, first, to provide a manually operated down hole rock drilling engine that is capable of drilling down holes for blasting purposes, that uses the same sizes of drill-bit steel, and that will drill down holes to the general down hole blasting depth required in quarries, mine shafts, and in other rock work, as the largest tunneling and stoping rock drilling engines at present in use; second, to provide a down hole rock drilling engine in which duplex, manually operating, hand grasping members are arranged upon rock drilling engines in such a relative manner to their length and weight that rock drilling engines weighing from about seventy-five to one hundred and twenty-five pounds are so accurately and sensitively balanced that they can be manually handled with quick, alert, and direct movements and can be steadily held in any desired position, accurately directed to predetermined points and sensitively controlled during their operative rock-drilling movements, and, third, to provide a down hole rock drilling engine, in which a supporting shell for attaching drilling engines to columns and stoping bars is dispensed with, and in which the feed screw or compressed air operating cylinder now in use for feeding drills into rock is also dispensed with, and in which the weight of the drilling engine is properly directed to effect the down feed of the drilling engine by means of manually grasping members so positioned on the drilling engine in such relative positions to its weight, length, bulk, and center of specific gravity that the drilling engines of the largest and heaviest sizes in use can be operated by two men with ease and precision, and holes in rock of any size up to three inches in diameter can be drilled as fast to reasonable depths as with most of the column supported and screw or air feed rock drilling engines at present in use. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1 is a view showing a rock drill in operation, provided with the improved supporting handles. Fig. 2 is a longitudinal section through a rock drill, showing the improved handles applied thereto. Fig. 3 is a plan view of the upper pair of handles, showing the same bolted together, as when secured upon a drill. Fig. 4 is a similar view of the lower pair of handles. Fig. 5 is an end view of one of the upper handles. Fig. 6 is a side view of the same. Fig. 7 is a side view of a portion of one of the lower handles. Fig. 8 is a plan view of the same looking at the under side. Fig. 9 is a plan view of a portion of a drill cylinder provided with the keyways for receiving the lower handles. Fig. 10 is a vertical, longitudinal, sectional view through a drill cylinder of the kind shown in Figs. 1 and 2. Fig. 11 is a central, vertical, transverse section through the same. Fig. 12 is an end view of the rifle bar and ratchet ring used in connection with the drill shown in Fig. 2; and Fig. 13 is a rear end view of the rear cylinder head.

Referring to the drawings, I have illustrated a down hole rock drilling engine embodying my invention. My invention contemplates the application of attachable manually grasping handles to rock drilling engines of any kind, type, or character at such parts of them as will tend to best steady, guide, direct, and control their movements separate from and independently of any feeding and supporting members or mechanism they may have, as these unnecessary features can either be secured against movement to the cylinder portion of the drilling engine or be removed temporarily from them whenever it is desired to apply the handle portion of my invention to drilling engines already equipped with them, and this feature of my invention, together with that of a compact, powerful rock drilling mechanism that is free from the commonly used supporting shell and feed screw or other form of feeding apparatus and so cooperatively connected to the handle members at such parts of it to enable it to be easily and quickly handled by two men and yet drill the larger size holes to medium blasting depths is best embodied in rock drilling engines of the hammer piston type, and my invention has been especially invented and adapted and is illustrated in that type of rock drilling engine.

In the present state of the art, single handled, stone dressing, carving, and chipping air drills capable of drilling small shallow holes are in use, but the handle of these drills is placed on top of the cylinder and is adapted for the use of a single operator for light, shallow depth work. There is also an air feed drill in use, on the side of which there is a projecting handle portion which is adapted to be grasped by an operator and oscillated in a short arc of a circle to impart a partial rotary movement to the drill-bit. This drilling engine is, however, suspended between an abutment and the contact of its drill-bit against the rock, the drill being simply oscillated between these two centers by the handle portion. My invention differs radically from these handle provided drills, inasmuch as it presents an entirely new type of a rock drilling machine of equal drilling capacity for medium depth of blasting holes with the largest size tunnel and stoping drilling engines in use, and in that it is provided with two pair of handles projecting from such different parts of the drilling engine and arranged to permit two men standing on opposite sides of the drilling engine to grasp it at its cylinder or body portion and at its lower and upper end portions and in such a manner that the weight and the violent vibratory movement of the cylinder or body of the engine when running is divided between the two hands of the operators, and as the grasp of the hands of the operator is on opposite sides of the machine coöperating opposing pressure guiding movements and directing force is applied to the heavy powerful drilling engine, which enables two men to handle and control its movements at much greater speed and precision of movement and to tilt it at pleasure, as the lower holding pressure of their hands acts as a pivoting fulcrum to the moving pressure of their upper hands in tilting or guiding the drill in inclined, down hole drilling work. Then it is possible for one man or even two men to work with a light drill weighing from ten to seventy-five pounds with a single handle portion at its top.

In the accompanying drawings I have preferably illustrated my invention embodied in a compressed air operated and combined intermingling air and water rock cuttings ejecting rock drilling engine, although I contemplate the embodying of my invention in rock drilling engines that use only air alone and also to those that use only water alone for ejecting the rock cuttings from the holes while drilling them, and also to rock drilling engines that do not use either air or water for ejecting rock cuttings from the holes while drilling them, I having preferably illustrated my invention to the Leyner type of rock drilling engine, as it embodies the highest efficiency in rock drilling engines in use, and many of the constructive features of the drilling engine illustrated in my present invention are as shown and described in my pending application, Serial Number 570,339, filed July 5, 1910, for improvements in rock drilling engines. Consequently, only such a general description of these old elements as is deemed necessary to describe an operative rock drilling mechanism is given herein. To this end, the numeral 2 designates a cylinder which is provided with an axial bore 3, in which a hammer piston 4 is reciprocally mounted. The cylinder is provided with a front cylinder head portion 5 and with a rear cylinder head portion 6. Each or both of these cylinder heads may be secured to the cylinder in any suitable manner. I preferably, however, secure these cylinder heads to the opposite ends of the cylinder by bolts 7, which I term resilient tension bolts, as they extend through apertures 8 formed in laterally projecting ear portions 9 formed on the cylinder heads and through recesses 10 formed in the opposite sides of the cylinder and have an expansive coiled spring 11 arranged between their heads and an abutment portion 12 formed on a cup portion of the front cylinder head which places them when tightened under a yielding clamping pressure that clamps the cylinder heads to the cylinder with a resiliently yielding pressure.

The hammer piston is arranged and adapted to strike against the shank end 13 of a rock cutting drill-bit 14, which is operatively mounted in the front cylinder head, in a suitable drill-bit holding chuck. The chuck I have illustrated comprises a chuck sleeve 15 that fits revolubly within the front cylinder head. This front cylinder head and the sleeve bear against a ring 16 positioned in the front end portion of the cylinder's hammer piston bore to define the limit of the drill-bit striking stroke of the hammer piston. A rifled nut 17 is threaded in the end of the chuck sleeve that lies adjacent to the cylinder ring 16, and bushings 18 and 19 are positioned between the nut and a shoulder 20 formed in the front end of the sleeve.

A cap 21 is placed over the end of the cylinder and a space is formed in it, in which a key ring 22 is placed, and an axial oblong shaped aperture 23 is formed in the end of the cap, through which the shank end of the drill and a lug portion 24 that is formed on the drill-bit extends. The lug 24 enters an oblong diametrically arranged aperture 25 in the key ring arranged to receive it, while the shank of the drill-bit extends through the adjacent end of the chuck sleeve and its bushings into the reciprocal path of the hammer piston, and by turning the drill-bit its lug and the key ring are turned in the cap at an angle to this diametrical slotted aperture in the cap that locks the drill-bit to the chuck against longitudinal displacement.

The hammer piston is provided with a hammer bar extension, the peripheral surface of which is provided with a circumferential row of straight rifle flutes, which fit reciprocally within the rifle flutes of the nut in the end of the chuck sleeve. The opposite end of the hammer piston is provided with an axial bore in which a spirally fluted nut 26 is secured and one end of a spirally fluted rifle bar 27 is extended reciprocally into the nut. The opposite end of the rifle bar extends to and through a rear cylinder ring 28, and its end is enlarged into a disk shaped portion 30, which is provided with a plurality of spring controlled pawls 31. This disk extends into an axial recessed bore 32 formed in the rear cylinder head and is seated in a ratchet ring 32^A, the interior wall of which is provided with ratchet teeth with which the pawls mesh in operative relation. This ring is seated in the recess 32 of the rear cylinder head.

The hammer piston and rifle bar are provided with axial apertures 34 and 34^A, and the rear cylinder head is provided with an axial aperture 35, in which a water tube 36 is secured by a plug 37 and clamping parts 38 and 39, which are secured in the aperture, and a water inlet passageway extends from its axial aperture 35 to and through a projecting hub portion 40 formed on the outside of the rear cylinder head, the entrance to which is threaded, and a hose coupling nipple 41 is threaded to it and a hose 42, a fragment of which is shown connected to the outside end of the nipple. A shut-off faucet is placed in the hose close enough to the cylinder head to be within easy reach of the operator on that side of the drilling engine. A cap 42^A is arranged to close the entrances to the axial aperture 35 in the rear cylinder head. The hose leads to a supply of water under pressure.

The cylinder is provided with a valve chest 43, in which a set of air inlet and exhaust ports 44 and 44^A are formed and arranged to operatively admit air to the opposite ends of the cylinder to reciprocate the hammer piston therein. The valve chest is provided with an air entrance aperture 45, to which an elbow is secured in any suitable manner to swivel therein, and to the outer end of this elbow one end of a hose 46 is secured, the opposite end of which extends to a supply of compressed air under suitable pressure to operatively reciprocate the hammer piston in the cylinder. A valve 47 is operatively seated in the air entrance port and extends through and beyond the opposite side of the valve chest from the air inlet elbow far enough to receive a handle 48, which is handy to the operator working on that side of the drilling engine. The top of the valve chest is provided with an exhaust hood portion 49, in which an exhaust port 50 is formed, from which the air exhausts into the atmosphere.

In the shell of the under side of the cylinder an oil reservoir chamber 51 is formed, which is cast in the shell of the cylinder. An oil entrance is formed into this reservoir and a plug 52 is threaded or otherwise secured in the aperture.

The guideways that are always present on the cylinders of drilling engines that are reciprocated in a supporting shell are dispensed with, and there are no projections below the oil reservoir shell portion of the cylinder. Consequently the drilling engine is but a trifle thicker in depth and also in width than the diameter of its cylinder and presents a compact and closely assembled appearance to the eye, and it is on this account much easier handled and balanced when grasped at the opposite end portions of the cylinder, and these opposite end portions of the cylinder are provided with hand grasping handle portions so arranged as to enable the operator to grasp the drilling engine at the point of most forcible vibratory movement, at which points it responds when running to comparatively light lateral pressures of the operators, as I have found in practice that the machine can be moved about much easier and with the use of much less of the operator's strength when the hammer piston is running than when it is not running, the machine when running being somewhat like a live weight as it bounces with a rapid vertical reciprocal movement into the air, and when not running it is like a dead weight and has to be dragged along or lifted bodily.

The handle portions which are secured at the opposite end portions of the cylinder form the most essential feature of my new down-hole drilling machine; and, while they may be secured to any desired part of the drilling engine and in any desired manner, such as being cast or welded or otherwise formed integral with or threaded or clamped or bolted to the drilling engine, I preferably removably bolt them to the opposite end portions of the cylinder and secure them thereto against accidental rocking or rotary movement by forming the opposite ends of the cylinder with a keyway form of recessed bearing surface against and in which they fit. This feature of my invention I preferably carry out in the following manner: The laterally projecting lug portions at the opposite ends of the cylinder through which the side bolts that clamp the cylinder heads to the ends of the cylinder are located are provided with two oppositely arranged recessed surfaces that intersect each other centrally between both. These two sided downwardly inclined recesses are extended around the outer ends of these projecting lugs in the form of triangular shaped recesses, and they are arranged to die out near the top and bottom portions of the cylinder, the recesses being deepest at the outer curved end portions of the lugs. These double inclined side recesses form keyway recesses in the lugs, and in them the handles are arranged and adapted to fit and are formed to partially embrace the opposite sides of the cylinder and to be clampingly and removably bolted together around the cylinder. These two pairs of hand grasping handles may be of any desired form or shape, and they may be arranged to partially or wholly surround the cylinder. I preferably, however, carry out this feature of my invention in the following manner: The handles 53 for the lower end of the cylinder comprise preferably tubular pieces of cast steel, although, if desired, they can be formed of any other suitable material and can be made of tubing. The inner ends of the two handles are bifurcated or forked into two-curved yoke shaped portions 54, that are made of a width to fit the width of the tapering recesses of the opposite sides of the lower end of the cylinder and are curved and otherwise shaped to fit tightly over the curved ends of the lugs and their opposite sides and to lap up onto the curved top and bottom portions of the cylinder. The inner curved end portion of the yoke portion of the lower handles is provided with a projecting bevel sided tapering key portion that fits into the recessed keyway portion of the cylinder. Each of the ends of the yoke portion of the handles is provided with a projecting lug 55, through which an aperture is formed and the lugs and apertures of each handle portion are arranged to register opposite each other when in place on the cylinder, and they are clampingly bolted together rigidly to the cylinder by bolts 56, which extend through the apertures of the lugs of the opposite handles, which when tightened clamp the key portion of the yoke end of the handles tightly into and against the bottoms of the keyways of the cylinder, as the ends of the yoke portions of the handles are arranged to approach close to each other, but are not long enough to bear against each other. The handles thus project laterally from the opposite sides of the drilling engine opposite to each other and in a transverse plane to the longitudinal axis of the cylinder. The outer ends of these lower handles are preferably given a slightly downward curve in order to afford a surer hold for the operators than a straight handle would offer. The upper pair of handles 57 are provided with similarly arranged yoke portions 57^A and are provided with similar keyway portions 58 which fit in similar keyway recesses 59 in the upper end of the drilling cylinder, and they are provided with lugs 60 and with bolts 61, and are clamped to the upper end of the cylinder in the same way as the lower handles. The handle portion of the upper handles, however, is preferably of a different form and shape and is preferably curved outward and upward from their yoke portions, and is divided into two separated side yoke portions 62, that terminate in a round handle portion 63 that extends across the yoke portion between their ends thus forming an upwardly curved crossbar form of handle with a loop aperture between it and the cylinder yoke portion of the handles, and these cross-bar handles extend alongside of the drilling engine and on opposite sides of it, and with these handles slightly above the main part of the adjacent cylinder head of the drilling engine, which arrangement gives free access to these handles on their inner or cylinder sides. These upper handles are arranged to permit the operators to exert vertical downward pressures and upward lifting pressures, while the lower handles are used more particularly to steady and direct and guide the drill-bit when starting holes and drilling them until they are deep enough. The upper handles are also placed to project laterally from the opposite sides of the cylinder and in horizontal alinement to the vertical center of the drilling engine.

The operation of my improved down-hole rock drilling engine is as follows: Two men take the drill and insert a drill of from a foot to two feet in length and place it against the rock at the point where they want to drill a hole. The drilling engine is then righted into a position to drill a vertically straight or an inclined hole, as desired, and the operators turn on the air and water by moving the air valve's handle and the faucet of the water inlet hose to admit these fluids to the cylinder. I preferably arrange the water faucet on the opposite side of the drilling engine from the air inlet valve, so that one operator can manipulate the air valve and the other operator the water valve. The operators, having turned on the air and water, grasp the lower handles, and as the drill and the drilling engine under the violently rapid reciprocations of the hammer piston have a slight vertical, rapid trembling, and vibratory movement, they exert downward and adjustable lateral pressures enough on the handles as required and on the lower handles especially to steady, direct, guide, and hold the rock cutting point of the drill-bit to the point where they desire to drill a hole, and the weight of the drilling engine is sufficient to bear with a controlling steady pressure on the handles to feed the drilling engine down into the rock. When a hole has been started and drilled to the length of the first drill, the drilling engine is lifted out of the hole and the drill-bit is removed and a longer one is placed in the chuck and the drilling is resumed and the operation is repeated until the depth of hole required is reached.

It requires two men to set up the commonly used drilling engine supporting column in a mining tunnel or shaft, or to move and adjust a tripod in a quarry and set the large size drilling engines in position to drill a hole, and while they are doing this two men can drill one or two or three holes of ordinary blasting depth by hand with one of my improved double handled, down-hole rock drilling engines, depending on the hardness of the rock and the general conditions. The lower handles are placed close to the point where the hammer strikes against the drill-bit, and they receive the greatest vibration and are the most important in steadying and guiding and directing the drill-bit, and these two pairs of handles permit the heaviest and most powerful drilling engines to be accurately directed, steadied, and handled with quick, easy movements without wasting any time or making false indirect movements in the drilling of down-holes.

After a hole has been well started and attained a sufficient depth to enable the drill-bit to assist in holding the drilling engine in an operative position by bearing against the side of the hole being drilled, one of the operators can handle the machine alone and the other can assist in getting two or three other machines started on down-holes.

My invention provides a new and valuable time saving rock drilling engine for drilling down holes in quarry work, in sinking mine shafts, and for such other down-hole work as is required in other kinds of rock work; and, while I have illustrated and described the preferred construction and arrangement of my invention, I do not wish to be limited to the construction and arrangement shown, as many changes might be made without departing from the spirit of my invention.

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

1. A down-hole rock drilling engine comprising an operative rock drilling engine comprising a cylinder provided with keyway recessed portions at its opposite end portions, hand grasping handle members arranged to fit against the ends of said cylinder and provided with projecting key portions arranged and adapted to fit into the keyway recessed portions, and means for securing said handle portions to said cylinder.

2. A down-hole drilling machine comprising a rock drilling engine having a cylinder provided with curved ended lateral lug portions at its opposite ends, circumferentially curved recesses in said lugs arranged to form keyway recessed portions, two oppositely arranged hand grasping handle portions provided with keyway portions arranged and adapted to fit partially around the end portions of said cylinder and into said keyway recesses, and means for removably securing said hand grasping handles to said cylinder in said keyways, said hand grasping members being of any desired shape and arranged at any suitable angle from said cylinder.

3. In a down-hole rock drilling engine, the combination of an operative hammer piston rock drilling engine provided with a cylindrical shell portion, with two pairs of hand grasping handles having yoke shaped ends, a key portion on the inner part of each of said yoke ends, said yoke ends being arranged to fit against and onto said shell, said cylindrical shell being provided with keyway recesses arranged to receive the key surfaces of said handles, and means connected to said handles for securing them to said cylindrical shell.

4. A down-hole rock-drilling engine comprising a cylinder, a piston reciprocally mounted in said cylinder and adapted to strike a drill-shank, a set of independent, oppositely-arranged and upwardly-extending handles removably disposed adjacent the upper end of the engine and providing means for effecting downward pressure upon the drill and also means for lifting the engine, and a set of oppositely-arranged handles removably secured to said engine in the region of striking of said piston against said drill-shank, whereby the working end of said engine can be best steadied and guided.

5. In a down-hole rock-drilling engine, two pairs of oppositely-disposed handles removably secured to said engine, the upper of said two pairs curved upwardly and extending far enough above the top end of said drilling engine to form a clearance space between them and the adjacent parts of the drilling engine, and the lower of said two pairs of handles extending approximately horizontally from and secured to said engine in the region of striking of the piston against the drill-shank, whereby the working-end of said engine can be best steadied and guided.

6. In a down-hole rock drilling engine, the combination of the operative rock drilling engine, said drilling engine comprising a cylinder provided with tapering, rounded,

projecting lugs at its opposite sides and at its opposite ends said tapering rounded ends being provided with encircling, concaved grooves adapted to form keyway recesses with two pairs of manually grasping handles, said handles being arranged to project from opposite sides of the cylinder and adapted to be grasped by two operators standing on opposite sides of said cylinder, said two pairs of handles being placed at the upper and lower ends of said cylinder and arranged with yoke shaped inner ends arranged to fit over and partially embrace the opposite ends of said cylinder and provided with projecting key portions arranged to extend and fit into said keyway portions of said cylinder, lugs on the ends of the yoke portions of said handles, bolt holes through said lugs, said lugs and bolt holes of each pair of handles being arranged to register opposite each other, end bolts extending through the apertures of the lugs of each pair of handles and arranged to clampingly bolt each pair of handles rigidly to said cylinder, said lower handles being arranged to project in a horizontal plane from opposite sides of said cylinder and having their outer end portions curved rearwardly, and said upper handles being curved upwardly and having their hand grasping portions arranged to stand along the opposite sides of said cylinder and at right angles to the direction of said lower handles.

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

JOHN GEORGE LEYNER.

Witnesses:
ROBERT J. WALTMAN,
GEORGE R. GRIEVE.