No. 626,762. Patented June 13, 1899.

J. G. LEYNER.

DRILL HOLDING DEVICE FOR ROCK DRILLING ENGINES.

(Application filed June 14, 1898.)

(No Model.)

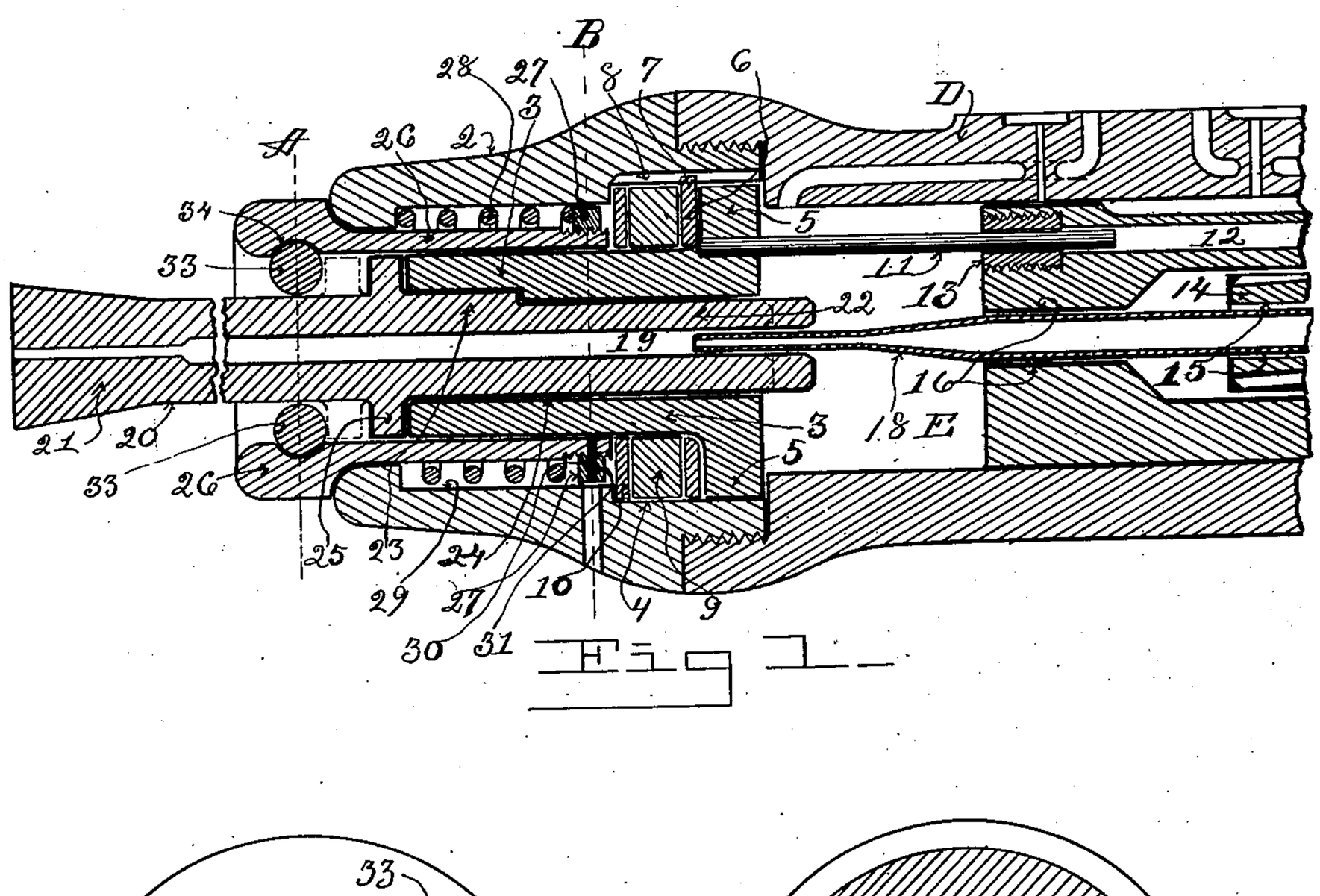

Fig 1.

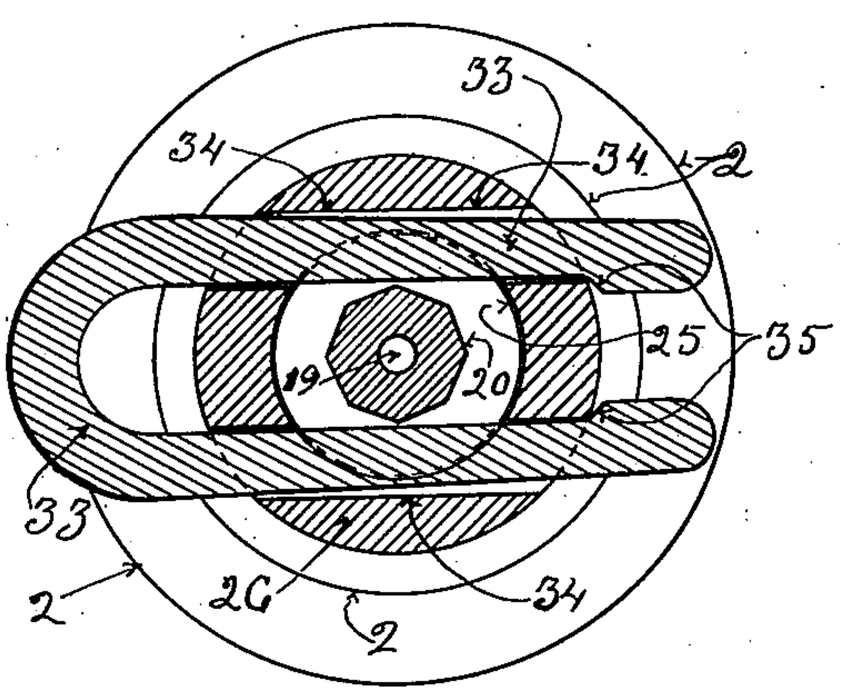

Fig 2.

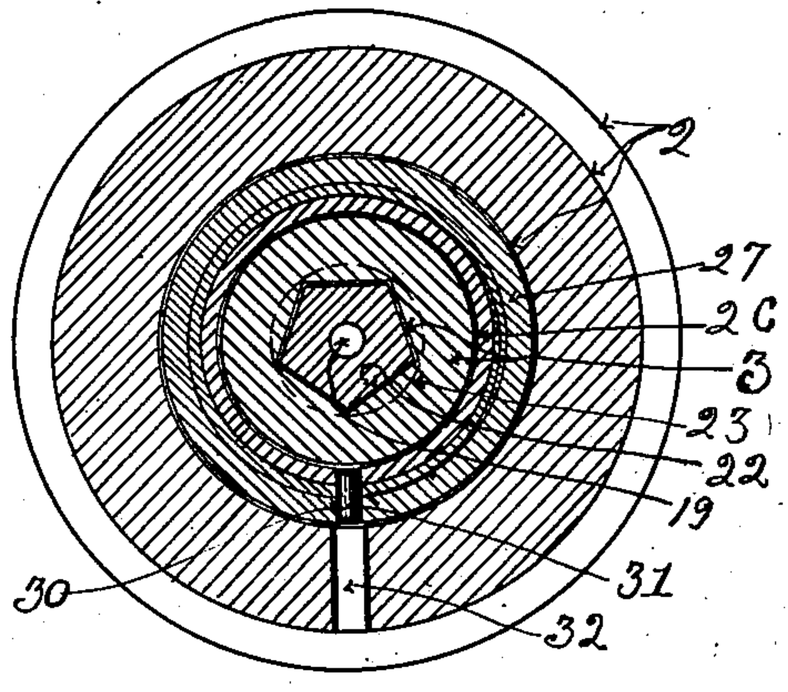

Fig 3.

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UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

DRILL-HOLDING DEVICE FOR ROCK-DRILLING ENGINES.

SPECIFICATION forming part of Letters Patent No. 626,762, dated June 13, 1899.

Application filed June 14, 1898. Serial No. 683,400. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Drill-Holders; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in rock-drilling engines; and the objects of my invention are, first, to provide a device for holding and confining against displacement a rock-cutting drill-bit in a rock-drilling engine that is arranged to rest loosely and unclampably in operative position in the drilling-engine; second, to provide a device that will confine a drill-bit within striking distance of and within striking relation to the drilling-engine's piston at all times and that can be used or not at the will of the operator, and, third, to provide a resilient cushioning device for confining at the will of the operator a rock-cutting drill-bit within operative striking distance of the piston or blow-delivering member and mechanism of a rock-drilling engine. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of my invention and of such parts of an air or steam drilling-engine as are necessary to illustrate my invention. Fig. 2 is a section on line A of Fig. 1; Fig. 3, a section on line B of Fig. 1.

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

Referring to Fig. 1, D designates the cylinder, and E the piston, of a rock-drilling engine.

I have preferably illustrated my drill-bit-holding device applied to a drilling-engine which ejects the rock-cuttings from holes in rock while drilling them and in which the drill-bit is held loosely and unclampably. My invention may be used to hold a drill-bit of any type of rock-drilling engine in which the drill-bit is loosely supported and is struck by the piston. A full description of the type of engine I refer to is shown in application Serial No. 654,954, as only such parts are illustrated in the accompanying drawings as are located around and adjacent to my drill-holding collet. The cylinder is provided with a front cylinder-head 2, which is threaded to the end of the cylinder. A sleeve 3 is rotatively mounted in the axial bore 4 of the cylinder-head. At its inner end the sleeve has an enlarged round flange portion 5, which projects and fits loosely into a counterbore in the inner end of the cylinder-head. The flange portion of the sleeve is larger in diameter than the bore of the cylinder, and its inner end bears against the bottom of the counterbore in which the cylinder-head screws. Between the opposite side of the flange and the bottom of the counterbore and around the body of the sleeve I place a steel buffer-ring 6, which is provided with a key portion 7, that fits loosely into a keyway 8 in the cylinder-head to prevent its turning on the sleeve. A rubber buffer-ring 9 is also placed at the side of the steel ring, and a second steel ring 10 is placed on the opposite side of the rubber buffer-ring in the bottom of the counterbore. These rings are adapted to cushion the blows of the piston that strike against the end of the sleeve, which happens when the engine is running and the drill-bit is not in striking position against rock. From the flange-head of the sleeve one or more rods 11 project and extend loosely into a hole 12 drilled into the piston. The entrance to this hole is provided with a bushing 13, in which the rods fit slidably. The piston reciprocates on this rod, which is rigidly secured to the sleeve, and through the medium of the rifle-bar 14 and these rods the piston rotatively turns the sleeve step by step. The means for turning the piston step by step is illustrated in my United States Patent No. 568,089. Axially through the rifle-bar from end to end I drill a hole 15 and also axially through the striking end of the piston a similar-sized hole 16. A tube 18 projects axially through the rifle-bar and piston into a hole 19 drilled axially through the drill-bit 20 from end to end, which is larger in diameter than the end of the tube. The end of the tube is preferably reduced in diameter to adapt it to extend into the hole through the drill-bit for

a short distance and is enough smaller to leave a clear space all around it for the ingress of the actuating fluid from the cylinder into the hole in the drill-shank.

A drill-bit may be used with my drill-holding collet of any of the customary forms of drill-steel in use. The drill-bit is illustrated as upset at one end 21, and they may be formed and sharpened into any one of the several cutting-points used for rock-drill bits, as they are made with one, three, or more chisel-edges. The striking end 22 of the shank projects through the sleeve 3 into the cylinder and into the reciprocal path of the piston, which impinges against it at each full stroke. The striking end is preferably formed into a polygon of preferably five sides for several inches from the end. At the termination of the polygonal end a portion 23 is preferably turned round, and these two portions at this end are a trifle longer than the length of the sleeve, which is provided with an axial bore 24, that is formed partially round and partially of a similar polygonal form as the striking end of the drill-shank. The bore of the sleeve is made to fit the polygonal end and round portion of the striking end of the shank with a loose but snug fit. The drill-shank is provided with a collar 25 at the end of said round portion which bears against the end of the sleeve and defines the inward movement of the shank of the drill-bit into the cylinder. The drill-bit rests loosely and freely in the sleeve and cylinder-head and is not clamped or bolted to them, and consequently is free to be inserted instantly in them or to be withdrawn instantly from them by the operator. The sleeve does not extend quite to the end of the bore of the cylinder-head, a short space being left in which the collar of the drill-bit extends. The sleeve 3 is surrounded by a collet 26, which also projects into the bore of the cylinder-head. This collet is provided with a thread on its inner end, on which is screwed a nut 27. A coiled expansive spring 28 surrounds the collet and is seated in a counterbore 29, formed on the cylinder-head, which is adapted to receive it. The expansive spring resiliently holds the collet in its normal position in the cylinder-head around the rotative sleeve. In order to secure the nut 27 to the collet against unscrewing, I drill a hole 30 through both nut and collet and drive a pin 31 in it, as shown more clearly in Fig. 3. In order to drive this pin out when wishing to take out the collet from the cylinder-head, I provide a hole 32 in the cylinder-head in a position to register over the pin or in line with the pin, in which a smaller pin may be inserted to drive the pin 31 out of the nut and collet. In order to do this, the cylinder-head must be disengaged from the cylinder and the sleeve and drill-bit be first taken out of it. The collet projects forward beyond the face of the cylinder-head far enough to allow a staple-pin 33 to be inserted through its projecting end and straddle the drill-bit at a short distance in front of the collar of the drill-bit. The distance of space between the collar of the drill-bit and the staple-pin should be about a sixteenth of an inch less than the length of the striking end of the drill-bit that projects beyond the end of the sleeve into the cylinder. This clearance between the staple and collar gives the drill-bit a little forward cutting clearance independent of the forward feed of the cylinder, so that when the drill is back against the sleeve, as shown, the drill-bit can cut its way into the rock until its collar strikes the staple without any forward feeding movement of the cylinder. The staple-pin, as shown in Fig. 2, is inserted in holes 34, that are positioned close to opposite sides of the drill-shank and that extend clear through the collet, and the staple-pin projects clear through the collet, and its two prongs extend across and almost touch opposite sides of the shank of the drill-bit and present a rigid abutment to the collar. The cylinder should be fed forward just fast enough when drilling rock to keep the collar of the drill-bit substantially close to the end of the sleeve or midway between the sleeve and the staple-pin and with the cutting-point of the drill-bit firmly pressed by the feed against the rock, as the actuating fluid of the cylinder always moves the drill forward until it bears against the rock and holds it there before the piston strikes it. Consequently when the piston does strike it it is resting against the rock and only cuts into it as far as the blow of the piston drives it into it, which is but a trifle if the rock is normally hard and sound; but if the ground is soft and seamy the drill may be driven so far forward by one blow that its striking end will be driven inside of the sleeve, where the piston cannot strike it, and if it sticks in a seam the air must be shut off and the drill backed and started over. It is to prevent the drill's being driven too far forward, and to prevent its sticking in seams that the staple is used. It is not needed and is never used where the rock is hard and sound. Consequently the staple is positioned to give the drill-bit as much forward movement as possible and still keep its striking end projecting into the cylinder far enough to allow the piston to strike it and drive it forward, and when the collar of the drill-bit is against the staple and the drill is struck by the piston the collet is also driven forward; but its expansive spring and staple returns it and the drill-bit back to its normal position, so that the next blow of the piston will strike the end of the drill-bit, which if fed forward carefully, even if driven from the end of the sleeve against the staple at every blow of the piston, will cut a smooth round hole in any kind of bad rock. I form the prongs of the staple either a trifle wider or narrower than the holes are apart, so that it will have to be sprung into them, and its resilient tension when in

the holes will assist to hold it in them against displacement; but in order to provide a positive and simple method of securing the staple in the collet I preferably form it with the spread of its prongs narrower than the distance apart of the holes, so that it will have to be sprung apart in order to insert it in them. I then reduce the metal on the inside of each prong to form oppositely-opposing reduced or tapered surfaces which terminate and form a shoulder 35 on the inside of the prongs, and after the staple is pushed into the holes they spring toward each other after these shoulders pass beyond the lower edge of the holes and the shoulders overlap the lower edge of the holes, as shown in Fig. 2, and form projecting stops which effectually lock the staple against accidental displacement from the machine, while at the same time permitting it to be withdrawn from the collet easily by one hand of the operator, for when the staple is pulled by its yoke portion the prongs readily spring apart, as the shoulders are slightly beveled and will easily slide back into the holes. The collet is not attached to the sleeve, but is mounted loosely on it and also fits freely in the cylinder-head and can and does revolve more or less with the sleeve.

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

1. The combination in a rock-drilling engine, of the cylinder and the piston, with the front cylinder-head having a rotative sleeve arranged to be turned step by step by said piston, a drill-bit operatively supported by said sleeve, a collet surrounding said sleeve, an expansive spring arranged to resiliently hold said collet in normal operative position, an abutment collar or stop on said drill-bit arranged and adapted to receive and define the backward thrust of said drill-bit and a removable pin in said collet arranged to be engaged by said abutment collar or stop, substantially as described.

2. The combination in a rock-drilling engine of the cylinder, the piston and the front cylinder-head with the sleeve supported therein, a drill-bit operatively supported by said sleeve; a collet surrounding said sleeve, means for holding said collet resiliently in operative position in said cylinder relative to said drill-bit and sleeve and a suitable pin or key removably arranged in said collet to operatively confine said drill-bit to said sleeve, substantially as described.

3. The combination in a rock-drilling engine of the cylinder, the piston, the front cylinder-head, with a water-conveying tube projecting from the rear cylinder-head with a drill-holding sleeve, revolubly mounted in said cylinder-head; an axial bore through said sleeve, a drill-bit operatively supported by said sleeve and arranged to be operatively rotated step by step by said piston and sleeve, and having said drill-bit project into the reciprocal path of said piston and arranged to be impinged by said piston, a collet loosely mounted on said sleeve, a spring arranged to hold said collet in operative relation to said sleeve and drill-bit, an abutment on said drill-bit and a suitable pin or key removably secured in said collet and arranged and adapted to be engaged by the abutment of said drill-bit, whereby said drill-bit is held in said sleeve against accidental displacement, substantially as described.

4. The combination of the cylinder, the front cylinder-head and the piston, with the sleeve having rods projecting into suitable apertures adapted to receive them in said piston, the collet surrounding said sleeve, the nut threaded to its end, the expansive spring arranged between said nut and shoulder of said cylinder-head, the staple-pin and the drill-bit operatively supported in said cylinder-head by said sleeve, collet and staple-pin, substantially as described.

5. The combination in a rock-drilling engine, of the cylinder, the piston and the front cylinder-head containing a drill-holding sleeve arranged to be operatively rotated in said cylinder-head by said piston, a drill-bit operatively supported by said sleeve, a collet surrounding said sleeve, means for holding said collet in resilient operative relation on said sleeve and having said collet arranged and adapted to hold said drill-bit within striking distance of said piston, substantially as described.

6. The combination of the cylinder, the piston and the cylinder-head, with the sleeve and drill-bit, a collet loosely surrounding said sleeve and arranged and adapted to resiliently reciprocate axially in said sleeve, a thrust-abutment on said drill-bit and a slip-pin in said collet arranged to be engaged by said thrust-abutment, substantially as described.

7. The combination of the cylinder and the piston with the drill-holding sleeve, the rods extending from the sleeve into said piston and the collet and staple-pin, substantially as described.

8. The combination with the cylinder, the piston and the front cylinder-head, of the drill-holding sleeve; the rods secured thereto and extending into said piston, the hollow drill-bit provided with a thrust-abutment, a collet surrounding said sleeve and arranged to resiliently receive the concussion of said drill-bit and the staple-pin arranged and adapted to be engaged by said thrust-abutment and to automatically lock itself against accidental displacement from said collet, substantially as described.

9. The combination of the cylinder, the piston, and the cylinder-head, with the drill-holding sleeve arranged to be rotated by said piston, the hollow drill-bit supported by said sleeve, the collet and its staple-pin, substantially as described.

10. The combination with the cylinder and the piston of the front cylinder-head, the drill-holding sleeve, the drill-bit having a

thrust abutment-collar and with a collet mounted on said drill-holding sleeve in said cylinder-head and arranged and adapted to confine said drill-bit to said sleeve against inoperative displacement out of striking distance of said piston, substantially as described.

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

JOHN GEORGE LEYNER.

Witnesses:
CLARENCE A. LAWSON,
HARRISON G. THOMAS.