2 Sheets--Sheet 1.

G. H. REYNOLDS.

Rock-Drill.

No. 162,419. Patented April 20, 1875.

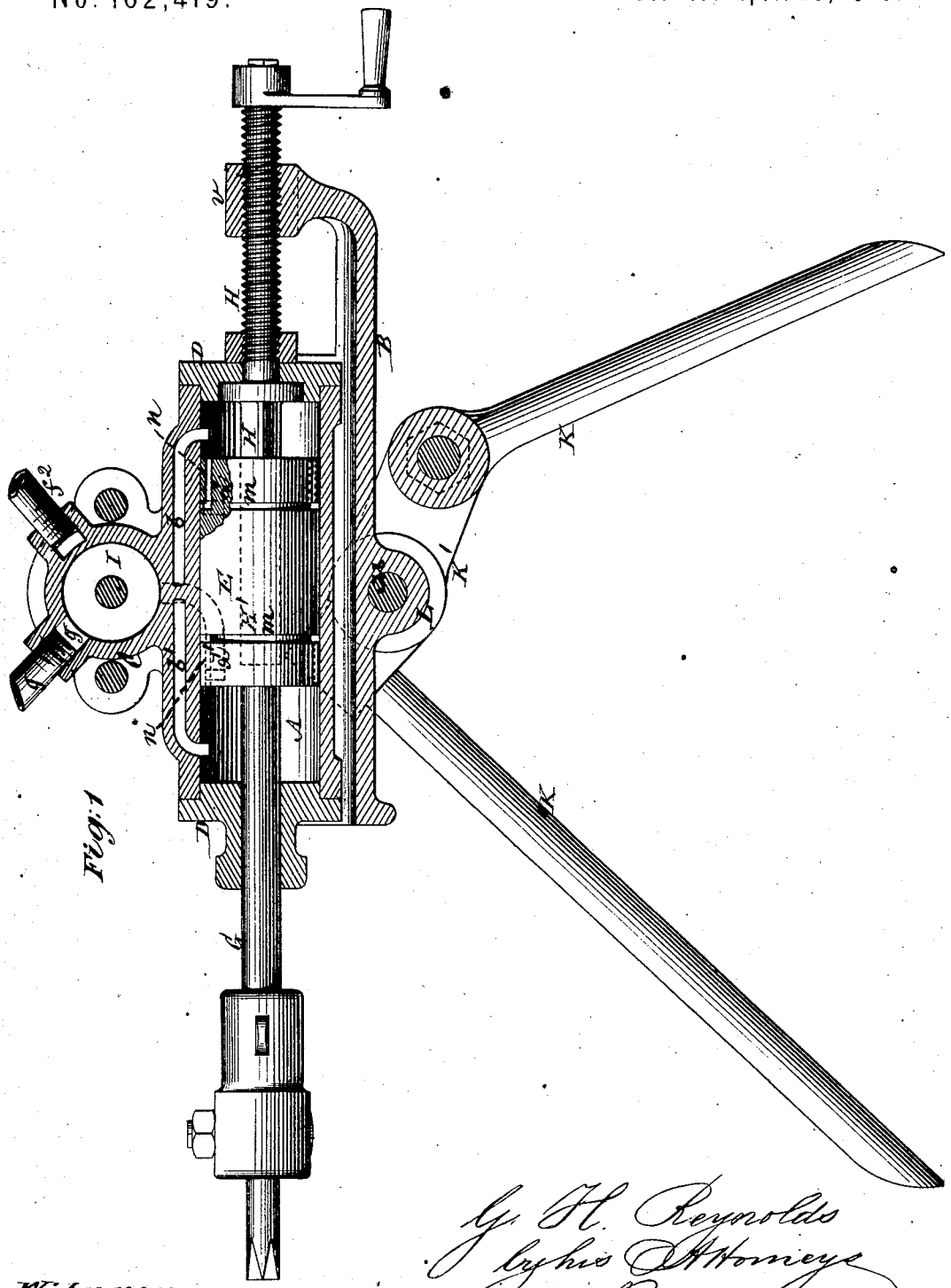

Fig. 1

Witnesses:
Michael Ryan
Fred Haynes

G. H. Reynolds
by his Attorneys
Brown & Allen

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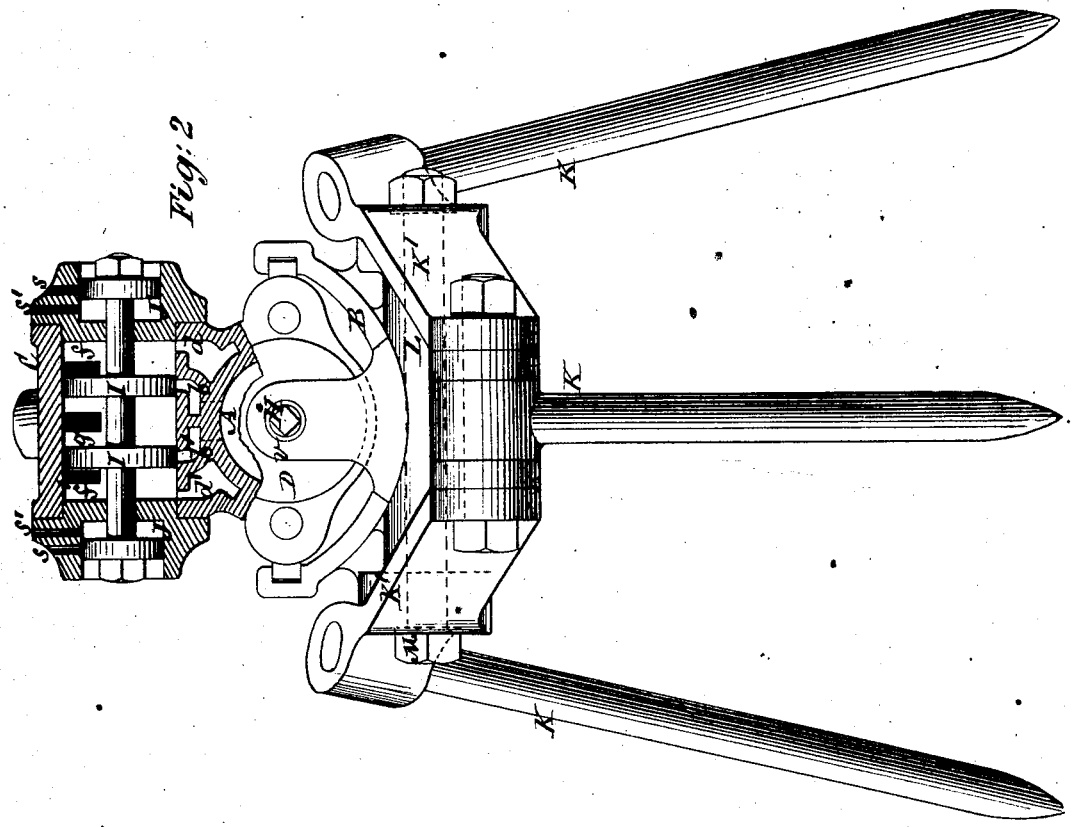
2 Sheets--Sheet 2.

G. H. REYNOLDS.

Rock-Drill.

No. 162,419. Patented April 20, 1875.

Fig: 2



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THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND CORNELIUS H. DELAMATER, OF SAME PLACE.

IMPROVEMENT IN ROCK-DRILLS.

Specification forming part of Letters Patent No. **162,419**, dated April 20, 1875; application filed January 29, 1875.

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of the city, county, and State of New York, have invented certain new and useful Improvements in Rock-Drills; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming part of this specification.

This invention more particularly relates to machines for drilling rock, although the valve which I employ in the machine, and which is of the kind that uses the propelling fluid from the main cylinder to throw it, is also applicable to direct-acting engines for other purposes.

The main object of the invention is to construct a rock-drill which shall be so simple that it can be produced at a reduced cost, and at the same time be more durable than other rock-drills now in use.

The invention consists in certain novel and advantageous constructions and combinations of parts relating to the ports or passages and valve used to operate the piston of the drill-cylinder, and the devices used to feed the latter, together with the drill-piston working therein. It likewise consists in a novel construction of the drill-piston, in connection with the inlet-ports in its cylinder, and an extension of the latter beyond the piston's stroke, whereby, while the piston is prevented from striking the cylinder-heads, provision is made for starting it when stopping at the end of its full stroke.

Either steam or compressed air may be used as the propelling fluid, but it will suffice in the subsequent description to refer only to steam, and to describe the piston-valve as a steam-thrown one.

Figure 1 represents a longitudinal sectional elevation of a rock-drill as carried by a tripod, and constructed in accordance with my invention. Fig. 2 is a partly sectional rear view of the same.

A is the main or drill cylinder, constructed to be capable of adjustment along and within a cradle, B, and having a cylindrical steam or valve chest, C, mounted on it in transverse relation with the drill-cylinder, the object of which arrangement will be hereinafter explained. D D are the heads of the drill-cylinder, and E its piston. This cylinder A and valve-chest C are provided with ports or passages b b', d d', and f f^1. The ports b b' are inlets to the main cylinder, and separately connect, at suitable distances apart, the central portion of the valve-cylinder with the opposite ends of the main cylinder; but the latter is extended a sufficient distance beyond these ports to provide for the piston E cushioning itself by steam contained within the cylinder, and so prevent the piston from striking the cylinder-heads. The ports d d' are outlets from the intermediate or body portion of the main cylinder A to the ends of the valve-cylinder C, and the ports f f^1 are exhaust-ports from the ends of the valve-cylinder, communicating with a general outlet, f^2. The steam is admitted to the central portion of the valve-chest by a port and pipe, g. Attached to the one end of the piston E is the drill-bar G, while through and within the opposite end of the cylinder A a shaft, H, is fitted to turn. This shaft is of angular or other equivalent construction where it projects within the cylinder, and enters a correspondingly-shaped socket, H′, in and throughout the greater portion of the length of the piston E, so that said shaft, when turning in the cylinder-head, also rotates the piston with its attached drill, without, however, restricting the reciprocating movement of the piston. This shaft H is also constructed, outside of the cylinder A, to form a screw, which works through a nut or screw-box, v, in the end of the cradle B, for the purpose of feeding the drill. In this way I make the same shaft or screw H feed the drill forward and rotate it, the drill being fed forward or downward as fast as the drill-bit enters the rock, and at the same time being rotated so as to cut over the whole surface of the bottom of the hole drilled, thus keeping the hole round, and preventing the bit from sticking.

I is the valve, arranged to freely reciprocate within its cylinder C, and having air dash-pots at either end to cushion it, as hereinaf-

ter described. This valve, which is provided with double heads or pistons, controls the ports *b b'*.

The operation of the valve as controlling the piston is as follows: Steam is admitted to the valve-chest between the heads or pistons of the valve I. Supposing said valve to be in position to pass steam by the port *b* to the back of the piston E, the latter is urged forward until the port *d* is uncovered, when steam passes from the cylinder by the port *d* to the one outer surface of the piston-valve I, and so reverses the latter or opens the port *b'* to the steam, while it opens the port *b* and port *d'* to the exhaust *f*. The piston E being reversed, a like action takes place in due course as regards the steam passing from the cylinder by the port *d'*, to again throw or change the positions of the valve, and to exhaust from the ports *b'* and *d'* through the outlet *f'*. In this way a continuous reciprocating action is kept up, for, so long as there is sufficient pressure to move the piston E, the same pressure is more than sufficient to actuate the valve I.

As hereinbefore described, the extension of the cylinder A beyond the ports *b b'* provides for the cushioning of the piston E, or prevents the latter from knocking out the heads D D of the cylinder. Whenever, however, the piston shall have overshot the ports *b b'*, and stops at the end of its full stroke, then a difficulty would arise in starting it again. To obviate this I form grooves *m m* in the piston E, near its ends, and provide perforations *n n* from said grooves to or through the outer ends of the piston, so that, on said grooves coming into line with the ports *b b'*, steam will be passed, as required, to start the piston again.

By the arrangement of the valve I with its cylinder C in transverse relation with the cylinder A, the drill-cylinder may be rocked or inclined, to work the drill at different angles, without endangering the shifting of the valve by gravity, or causing it to move out of a horizontal position.

The air dash-pots applied to effect the cushioning of the valve I are shown at J J in Fig. 2, the same being constructed on the exterior of the heads of the valve-cylinder C, and open to the atmosphere on the exterior of the cushioning-pistons, which operate inwardly to effect compression or cushioning, whereby not only may the valve be operated more readily by hand when required, but a stuffing-box in either cylinder-head is dispensed with. These dash-pots are perforated with one or more air holes or ports, *s s'*, extending laterally through them, the object of which will here be explained.

When the pistons on the ends of the valve-rod are alternately thrown to their full extent in an outward direction, the dash-pots are filled with air on the inner faces of said pistons through the ports *s s'*, and upon the pistons working inward they pass freely till the ports *s'* are covered; then, there being no more escape for the air through the ports, the pistons are cushioned by the air within the inner ends of the dash-pots, to prevent injury or breakage in the rapid working of the drill.

It is preferred to mount the rock-drill upon a tripod, K, except when using the drill for tunneling, when it may be mounted upon a column, and to do which it is removed from the tripod by simply drawing a bolt, M, and lifting out the cradle B, bringing with it the drill-cylinder and its accompanying parts.

The attachment of the machine to the tripod is exceedingly simple. Thus, the one bolt M serves to attach the tripod by its straps K' to the cradle B, with every facility for the adjustment of the latter by rocking it, and the cradle is prevented from spreading by a thimble or fast socket, L, bearing at its ends against the straps K', and which is free to turn upon the bolt, or the latter within it. This mode of attaching the machine to the tripod does not, however, constitute part of the present invention.

I claim—

1. The air dash-pots J J, constructed on the exterior of the heads of the valve-cylinder C, and with their cushioning pistons operating inwardly to effect compression, whereby a stuffing-box for the valve-stem in either cylinder-head is dispensed with, and said stem may readily be operated by hand when required, substantially as specified.

2. The combination of the ports or passages *b b'*, *d d'*, and *f f*[1], the rocking drill-cylinder A, the drill-piston E, the piston-valve I, and the cylinder C, essentially as shown and described.

3. The combination of the screw feeding and rotating shaft H, connected with and feeding the cylinder A, and leaving the piston E free to turn with, but sliding on, said shaft, and the nut or screw box *v*, substantially as specified.

4. The combination, with the cylinder A, having its ends extended beyond the ports *b b'*, of the grooves *m* and perforations *n* in the ends of the piston E, essentially as and for the purposes herein set forth.

GEO. H. REYNOLDS.

Witnesses:
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