(No Model.) 2 Sheets—Sheet 1.

G. D. WHITCOMB.

ROTARY MINING DRILL.

No. 249,130. Patented Nov. 1, 1881.

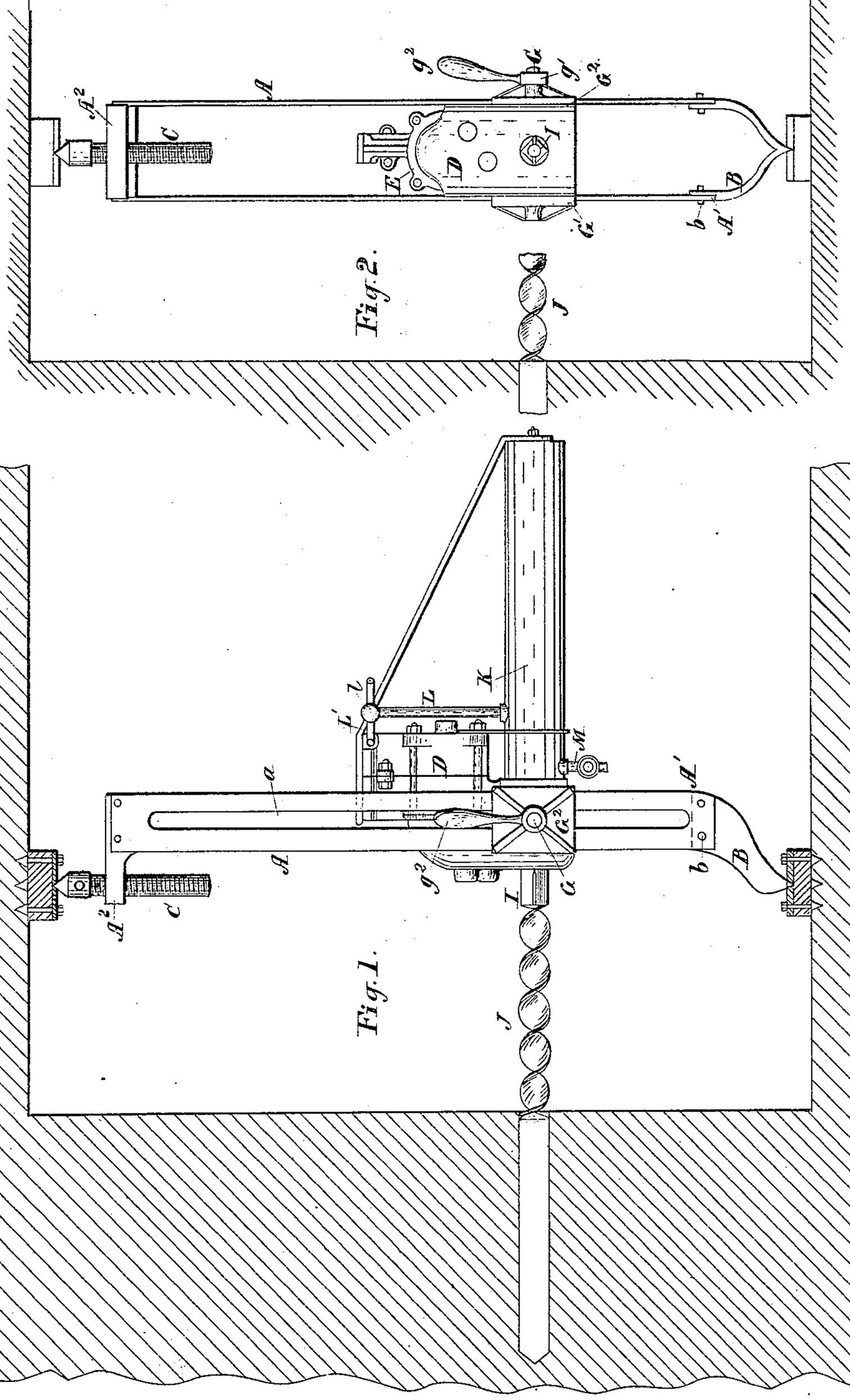

Fig. 1.

Fig. 2.

Witnesses
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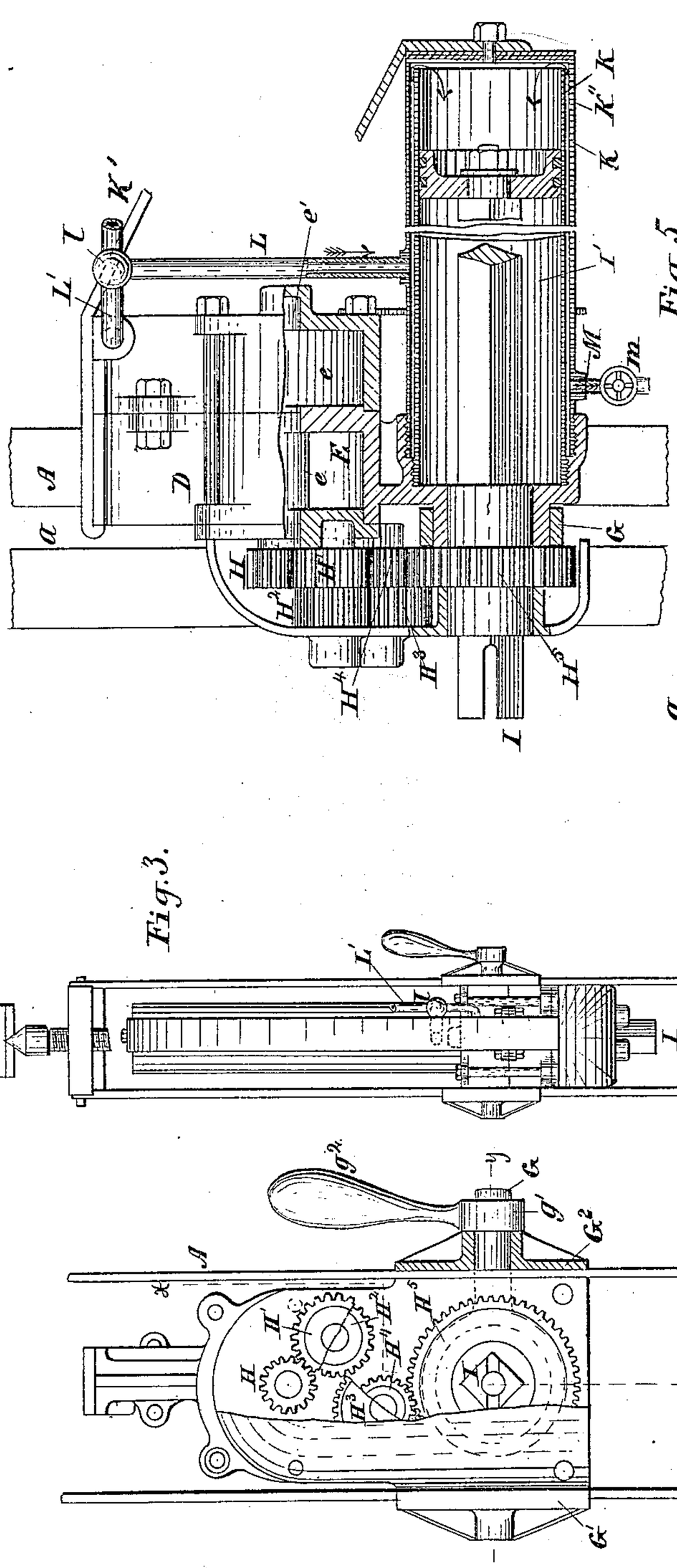

Fig. 3.

Fig. 4.

Fig. 5.

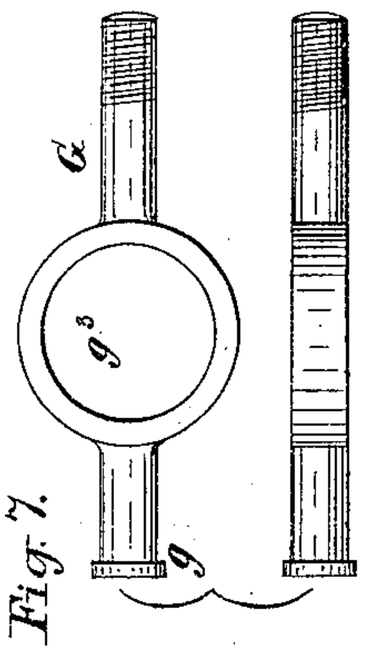

Fig. 7.

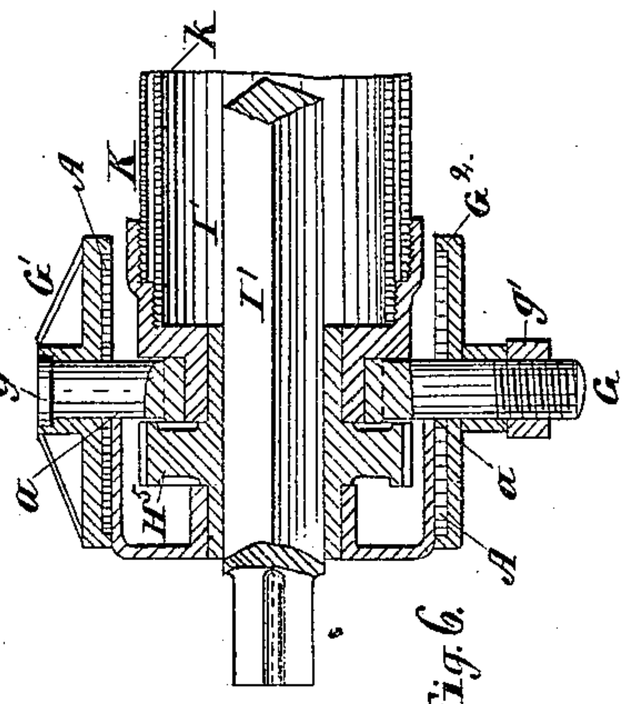

Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE D. WHITCOMB, OF CHICAGO, ILLINOIS.

ROTARY MINING-DRILL.

SPECIFICATION forming part of Letters Patent No. 249,130, dated November 1, 1881.

Application filed March 7, 1881. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. WHITCOMB, of the city of Chicago, in the county of Cook, in the State of Illinois, have invented certain new and useful Improvements in Rotary Mining-Drills, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved rotary drill in position for work. Fig. 2 is a front elevation of the drill, the point of view being the same, but the drill having been turned on its pivots in order to the insertion of a longer drilling-tool, the tool, partly broken away at its outer end, being inserted in the wall of the chamber. Fig. 3 is a front elevation of the drill folded up for convenience in moving from chamber to chamber in the mine. Fig. 4 is a detailed and enlarged front elevation of the operative part of the drill (without the drilling-tool) in position for work, the front plate of the casing or frame being partly broken away. Fig. 5 is a partial section on the line *x x* in Fig. 4, the piston-rod or drill-stem and the gear-wheels being left undivided. Part of the length of the feed-cylinder is also broken out. Fig. 6 is a section on the line *y y* in Fig. 4, the piston-rod or drill-stem being undivided, except at the forward end. Fig. 7 is a front elevation of the eyebolt, which holds the operative parts of the drill in the column. It is shown above in position for the drill to operate, below in position for the drill to be folded up.

The same letters denote the same parts in all the figures.

My invention relates to portable drills for mining, and the object of it is to provide a drill of ample power which can be carried, set up, and operated by one man.

A further object is to provide a rotary drill with a uniform forward pressure, and a still further object is to provide for replacing a drilling-tool which has gone its full length into the coal or other strata by a longer one without having to change the position of the drilling-machinery on the column.

My invention consists in the application of steam or atmospheric pressure to accomplish the second of these objects; and it also consists in the several devices and combinations of devices promotive of this and the other objects, which will be fully described hereinafter, and definitely pointed out in the claims.

In the drawings, A denotes a pair of upright parallel bars which constitute the supports of the drill. A slot, *a*, running nearly the whole length of each bar, makes it practicable to adjust the drill at any desired height. Each bar is rigidly affixed at its lower end to one of the two ears of a foot, A′, which narrows downward, and at the same time bends forward, so as to terminate in an inverted cone some distance in front of the front edges of the bars A. This cone rests in a socket sunk in the cap-plate of a block, B, set in the floor of the chamber in which the drill is to operate. The bolts *b*, which secure the cap-plate to the block, being pointed at their farther ends and made long enough to project a little beyond the under side of the block, serve to hold the block firm on the floor.

The socket in which the lower end of the foot A′ rests is shaped to fit it closely, not so closely, however, but that by the application of a little pressure the foot carrying the bars with it will turn pivotally in the socket.

To the upper ends of the bars A is affixed a bracket, A^2, which projects in front of the bars somewhat farther than the foot A′, and contains a threaded circular perforation, whose center is perpendicularly above the pivotal point of the foot. A screw-bolt, C, fits in this perforation, and the thickness of the bracket A^2 is sufficient to give it a firm support. The bolt terminates at its upper end in a cone similar to that at the lower end of the foot A′, and resting in a similar socket in another block, B, which is secured in the roof of the chamber against lateral motion in the same way as the first-mentioned block is in the floor. By tightening the screw the block is held up by the stiffness of the bars A. In this way I obtain a firm stand for the drill, which at the same time can be easily removed by loosening the screw-bolt.

A box-like case or frame, D, incloses and supports a rotary engine, E, and the forward part of a feed-cylinder, K. Its breadth is such as to fit between the bars A, not so closely, however, but that it can have an upward and downward or rotary motion between them. A bolt, G, passes through this frame and is rigidly set in its side plates. It projects through

each of the slots *a*, and at one end through a plate, G′, without the slot which is held by the head *g* of the bolt close against the outer side of the nearest bar, but so that the bolt may have a rotary motion in the plate. The bolt passes at its other end through a similar plate, G^2, which is held on the bolt by the nut *g′*, which is of the kind known as a "tail-board" nut, being provided with a lever-handle, g^2, by means of which it can be readily tightened or loosened. The corresponding end of the bolt is threaded to receive the nut, by tightening which the plate G^2 may be pressed so closely against the outer side of the corresponding bar A as to prevent any upward or downward motion of the plates and any turning of the bolt G within them, so that the engine and cylinder are held firmly between the bars at that angle with the plane of the horizon which they made when the nut was tightened. By loosening the nut so that the plate G^2 no longer presses against the bar A the engine and cylinder may be moved up or down between the bars by means of the plates G′ and G^2, so as to be adjusted at any desired height, and by means of the rotation of the bolt G in the plates G′ and G^2 the cylinder may be set at any desired angle to the plane of the horizon, so that the drill may be aimed either upward or downward or horizontally forward. When the engine and feed-cylinder have been set at the desired height and angle they can be firmly held there by tightening the nut.

The engine E is a rotary engine of a familiar construction, with two alternating eccentric cams, *e*. Its shaft *e′* turns the toothed wheel H, whose teeth engage with those of the larger wheel H′ immediately below it. The wheel H′ carries in front of it the pinion H^2, whose teeth engage with those of the wheel H^3 next below it. H^3 carries behind it the pinion H^4, whose teeth engage with those of the great wheel H^5, in whose center is rigidly set the piston-rod or drill-stem I, in whose front end the drilling-tool J is set. The precise number and proportion of the gear-wheels may be considerably varied without affecting the main principle of the arrangement, which is obviously to turn the piston-rod which carries the drilling-tool at a rate many times slower than that of the engine-shaft *e′*. In this way, by driving the engine at a high rate of speed, I am enabled, with a very small and light engine and proportionately slight expenditure of driving-power, to give a very great momentum to the wheel H^5. The bolt G passes through the engine just behind the wheel H^5, and is formed with an eye, g^3, midway of its length, as shown in Fig. 7, so as to allow the nave of the wheel to pass through it.

In the frame D, immediately below the engine and behind the bolt G, is set the double-walled feed-cylinder K. In the inner wall, *k*, of this cylinder is fitted the piston, through which the requisite forward motion is communicated to the piston-rod I at the same time that the latter receives a rotary motion through the wheel H^5. The inner wall, *k*, terminates a little in front of the head of the cylinder, so as to allow free communication between the interior of the cylinder and the space between the two walls. A steam or air pipe, L, passing through the outer wall, *k′*, on its upper side, admits steam or air between the two walls, and thus at the back of the piston. This pipe, as represented in the drawings, is upright, and a branch, L′, at its upper end, communicates at one end with the interior of the engine E, and at the other with the pipe or hose which supplies air from the compressor or steam from the boiler. A valve, *l*, at the junction of the upright pipe with the branch, admits the steam or air to both engine and feed-cylinder at once or shuts it off from both. An exhaust-tube, M, in the lower part of the outer wall, *k′*, of the cylinder is provided with a valve, *m*, which is closed while the piston is moving forward through the cylinder, and is opened to let out the air or steam when the piston has reached the limit of its stroke, so that the piston may easily be drawn back to the head of the cylinder to begin a new stroke. Air or steam may be applied for the backward movement of the piston, if desired.

A brace, K′, connecting the head of the cylinder with the frame D, aids to support the cylinder in any position to which it may be adjusted. A single-walled cylinder might be used, if preferred, the air or steam being in that case conducted to the back of the cylinder through a pipe, instead of passing between the walls.

By using steam or compressed air to drive the drilling-tool forward I secure uniformity of pressure, and thus get rid of the liability to an unduly increased pressure when some substance harder than the coal is encountered, which is incident to the use of a screw or other uniform mechanical movement, and which often causes serious damage to the machinery, or a displacement of the column and consequent loss of time.

When the drilling-tool J has penetrated the vein to its full length it may be withdrawn and one as much longer as the depth of the bore may be substituted for it. Obviously the longer tool cannot be attached while the drill stands in the line of the bore. With the ordinary constructions therefor it is necessary to take up and remove the entire machine or change the position of the cylinder on the column, and then set it in its former place again, the process involving serious loss of time. By pivoting the upright supports of the drill on the blocks B at points in front of those supports in the way already described, I make it possible to turn the machine out of the line of bore by a moderate application of force, and thus obtain room to insert in the bore a tool of any desired length. This done, the drill may be again turned on its pivots into line with the bore, the new tool attached to the end of the piston rod or stem,

and the engine and piston again set in motion, the drill having all the time remained undisturbed in its seat. By means of this pivoting of the supports of the drill, in combination with the pivoting of the engine and cylinder between the supports in the way already described, it is evident that the walls, roof, and floor of the chamber may be bored into in every direction—upward, downward, backward, and forward—without once taking up the machine from its place. When, however, it becomes desirable to remove it to a new place, the engine or cylinder may be swung into such a position that the cylinder will be upright between the bars A, the engine projecting a very little in front of them, and may be clamped in this position (which is shown in Fig. 3 of the drawings) by means of the plates G′ and G² and the nut *g′*. Then by turning the screw-bolt C in the bracket A², so as to bring its conical upper end out of the socket in the upper block, B, the whole machine can be readily lifted out of the lower socket in which the foot A′ rests. The lightness of the engine which I am enabled to use my means of the described system of gear-wheels makes it practicable to keep the weight of the whole machine within limits which are far from transcending the power of one man to carry and adjust.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a drill, a supporting-column pivoted on points aside from the column itself for the purpose of turning the column out of line with the bore, substantially as described.

2. In a rotary drill, a feed-cylinder, in combination with a piston and a piston-rod in which the drilling-tool is set, and with mechanism for supplying steam or compressed air to the cylinder and releasing it therefrom for the purpose of maintaining uniformity of feed-pressure, substantially as described.

3. In a power drill, a column, open front and rear, in combination with an engine and feed-cylinder supported by a common pivot in the sides of the column, substantially as and for the purposes described.

4. The side bars, A, in combination with the projecting cone-tipped foot A′, perforated and threaded bracket A², cone-tipped screw-bolt C, and conically-socketed blocks B, substantially as and for the purposes described.

5. In a rotary-drill, a rotary-engine, in combination with a drill-stem and with a system of gearing for the purpose of communicating a slow motion to the drill-stem from a rapid motion of the engine, substantially as described.

6. The engine E, feed-cylinder K, piston I′, drill-stem I, set in the piston, toothed wheels connecting the engine with the drill-stem, supply-pipes L and L′, exhaust-tube M, and valves *l′* and *m*, all in combination, substantially as and for the purpose described.

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Witnesses:

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