R. MAGILL.
Rock-Drilling Machine.

No. 227,908. Patented May 25, 1880.

Fig. 1.

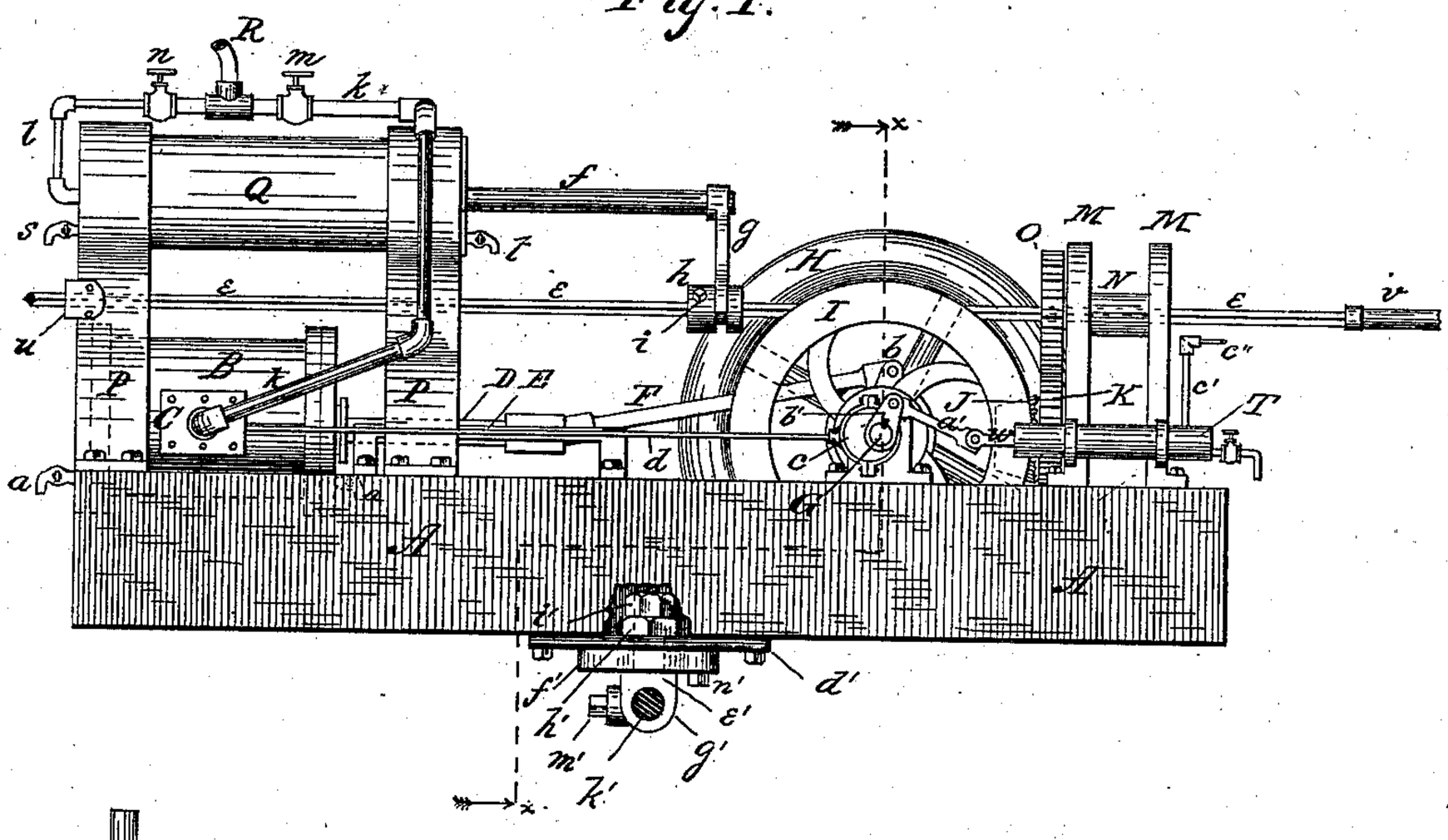


Fig. 4.

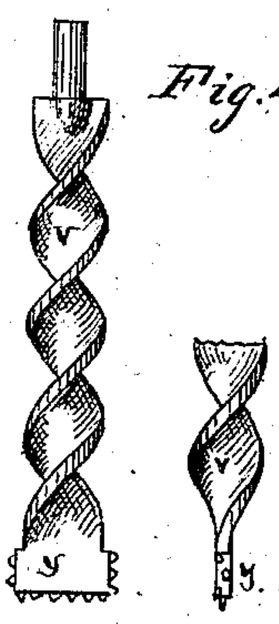


Fig. 2.

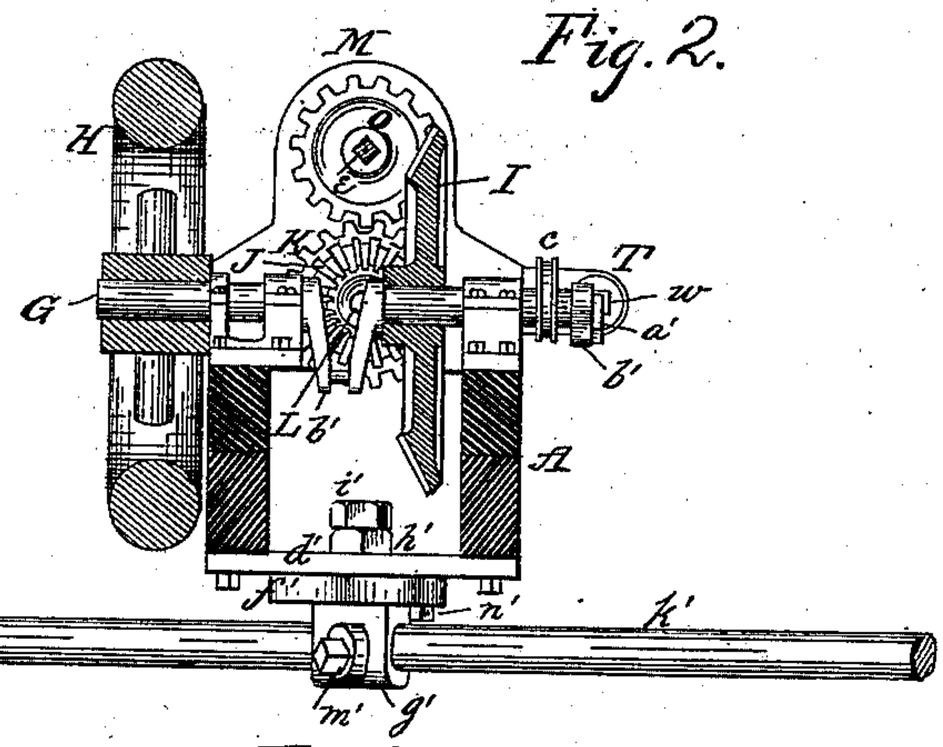
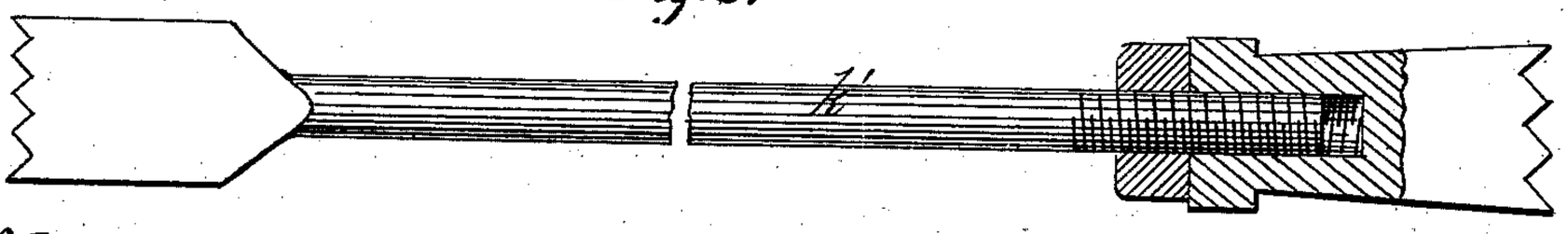


Fig. 3.



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UNITED STATES PATENT OFFICE.

ROBERT MAGILL, OF PITTSBURG, PA., ASSIGNOR TO J. E. UMBSTAETTER, EDWARD J. WARING, BENJAMIN F. ASPER, AND WILLIAM J. PATTERSON, OF SAME PLACE.

ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 227,908, dated May 25, 1880.

Application filed February 21, 1880.

To all whom it may concern:

Be it known that I, ROBERT MAGILL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Rock-Drilling Machines; and I do hereby 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a side elevation of my machine. Fig. 2 is a section on line *x x* of Fig. 1. Fig. 3 shows the supporting-bar. Fig. 4 is a representation of the spiral drill, shown in two positions.

This invention relates to improvements in rock-drilling machines of that class which is generally used in tunneling, mining, blasting, and drifting, which are more or less portable; and the invention consists in the various arrangements and combinations of parts, as hereinafter fully described and claimed.

In accordance with my invention, the drill is rotary, and of any of the styles which are found to be available for rock-cutting; in some cases steel bits, and in others diamond bits, being required to penetrate the rock. The drill is rotated by the expansive power of steam or compressed air derived from the reciprocation of a piston, and the feed of the drill is effected by the forward movement of an independent piston acting, through an adjustable cross-head, upon the drill-rod, the movement of the independent piston being separately effected by the power of steam or air acting expansively. By this arrangement the rotation of the drill and its feed are utterly independent of each other. By a pumping attachment the drill is freely supplied with water under pressure, which clears away the detritus and keeps the drill cool.

Referring to the drawings, my invention more particularly is as follows: A is the bed-plate or frame, which may be of any suitable form and of any material found adequate to the purpose. I prefer, however, wrought iron or steel. At one end of frame A an ordinary cylinder, B, is bolted or fixed, as shown. This cylinder has its steam or air chest C located at the side, and the drain-cocks *a a* in the ends. Inside of cylinder B a piston reciprocates, and from this the piston-rod D projects toward the other end of the frame, having the usual cross-head moving in the slides E. Rod D is coupled to the pitman F, which is attached to crank *b* of shaft G, provided at one end with the fly-wheel H. An eccentric, *c*, on shaft G, and its rod *d*, serve to operate the slide-valve in chest C. Thus the above-described parts B, C, D, E, F, G, H, *a*, *b*, *c*, and *d* constitute an engine of the ordinary type, and need not be further described.

On shaft G, at a point a little to one side of the axis of the frame, is keyed a beveled-gear wheel, I, which meshes with a beveled pinion, J, which, along with a spur-wheel, K, is keyed on a shaft, L. This shaft L is journaled at two points in boxes set in the housings M M, which rise from the bed-plate A, shaft L being thus exactly in line with the axis of cylinder B.

When the piston in cylinder B reciprocates shaft G rotates, and by means of the beveled gearing I J the rotation is communicated to pinion K.

At the upper part of housings M is journaled a hollow shaft, N, parallel with shaft L, and to this is keyed a pinion, O, meshing with pinion K, as shown. Shaft N has a square or equivalent at its axis, through which slides the drill-rod *e*, corresponding in section with the hole in shaft N, so that while the drill-rod is rotated by the rotation of shaft N it may at the same time be fed forward to work.

In suitable supports P P, an auxiliary cylinder, Q, is secured parallel with rod *e* and above it. This cylinder I prefer to make longer than cylinder B, and of smaller diameter. Its piston-rod *f* projects similarly to that of the lower cylinder. Cylinder Q has no slide-valve and no inlets or outlets of any kind except those to be described. An arm, *g*, is firmly attached at right angles to the piston-rod *f* at its outer end, projecting down to and saddling between its forked ends a grooved sleeve, *h*, which is adjustably attached to the drill-rod *e* by means

of the binding-screw *i*. Thus the rod *e* and its sleeve *h* (which has a square hole in it fitting the drill-rod *e*, which passes through it) are free to rotate in the forks of arm *g*, while any motion longitudinally of rod *f* will, by means of arm *g* and nut *h*, force the drill-rod *e* forward or backward while it is rotating.

R is the steam or air pipe, dividing at the machine into two branches, *k* and *l*, which are respectively provided with the valves *m* and *n* after leaving the main pipe R. Branch *k* passes down into the chest C, and by leaving the valve *m* open the rotation of the drill will proceed regularly. Branch *l* passes into the rear end of cylinder Q, and by opening the valve *n* the steam or air enters behind the piston therein and forces it forward at a rate proportionate to the area of valve left open and the pressure of steam or air supplied. Thus, while the lower cylinder effects the rotation of the drill, the upper one causes it to be fed forward at any desired rate of speed, the rate being governed by the valve *n* to suit the character of the rock being penetrated. The rear end of cylinder Q has a drain-cock, *s*, provided, as shown. When the piston of cylinder Q has fed the drill-rod the length of its own stroke, and it is desired to penetrate farther, the valves *m* and *n* are closed, cock *s* opened, and screw *i* loosened, after which the piston, piston-rod *f*, arm *g*, and sleeve *h* are pushed back till the piston reaches its backward limit, when screw *i* is tightened down at the new point on the drill-rod *e* thus reached. Valves *m* and *n* being now opened, drilling and feeding proceed as before. Cylinder Q has also a cock, *t*, or opening, so that no resistance will arise to the movement of piston from that side.

A suitable guide, *u*, at the rear of the machine keeps the drill-rod guided. The latter will be of a length varying with the work to be done.

The drill-bit consists of a twisted or otherwise spirally-channeled bar, *v*, having the end enlarged, as in Fig. 4, and armed with diamonds *x'* on its three edges, thus not only boring the hole, but enlarging it to prevent wear on the twisted stem. The enlarged end *y* may be, as shown, integral with the stem *v*, or it may be adjustably attached thereto.

A water-pump, T, is attached to the frame, as shown, its plunger *w* being operated by the pitman *a'* and the crank *b'* on the end of shaft G. A pipe, *c'*, from the pump carries the water from the pump to a nozzle, *c''*, pointing along the drill, so that the water is forced violently into the hole beside the drill to remove the detritus and cool the drill.

The machine is set for work as follows: A plate, *d'*, is bolted to the frame A underneath, and through this passes from below the king-bolt *e'*, formed at its lower end into the flange *f'* and perforated head *g'*. Nut *h'* holds bolt *e'*, and jam-nut *i'* is used to prevent loosening. Head *g'* is, as stated, perforated for the passage of the sustaining-bar *k'*. When set to the proper angle on bar *k'*, which is adjustable and has crow-foot ends, as shown in Fig. 3, the binding-screw *m'*, firmly tightened, holds the apparatus from revolving about the bar *k'*, and a binding-screw, *n'*, through the flange *f'*, against plate *d'*, prevents its revolution around the king-bolt, so that in this manner the apparatus may be readily adjusted to drill at any angle vertically or horizontally.

I am aware that the state of the art shows lack of novelty in the broad idea of a rotating drill operated under constant forward pressure while a stream of water is at the same time supplied to the point of the boring-tool. I therefore disclaim such invention, and base my claims on the special construction, combination, and arrangement which I have described in an apparatus in which I employ steam, air, or other elastic fluid as the medium of power and for cushioning the drill under great resistance.

I claim as my invention—

1. In a rock-drilling apparatus, the combination of the engine B C D E F G H *a b c d* with the gearing I J K O and drill-rod *e*, substantially as described.

2. In a rock-drilling apparatus, the combination, with the main cylinder B and its operative parts, and the drill-rod *e*, rotated thereby, of an auxiliary cylinder, Q, having its piston-rod adjustably connected to said drill-rod, substantially as described.

3. In combination with the air or steam cylinders B and Q, having separate and independent connections for rotating and feeding the drill, respectively, the main pipe R, having branches *k* and *l*, leading to said cylinders, respectively, and provided with valves *m* and *n*, substantially as specified.

4. The combination, with the prismatic drill-rod *e*, of the adjustable sleeve *h*, grooved, as described, forked arm *g*, and piston-rod *f*, substantially as set forth.

5. In combination with drill-rod *e*, the shaft G, crank *b'*, pitman *a'*, plunger *w*, pump T, pipe *c'*, and nozzle *c''*, substantially as described.

6. The combination, with a rock-drilling machine, of the plate *d'*, bolted to the frame thereof, king-bolt *g'*, having collar or flange *f'*, binding-screws *m'* and *n'*, and adjustable supporting-bar *k'*, substantially as set forth.

7. A rock-drilling machine comprising, in combination, an engine of the ordinary form to rotate the drill, an auxiliary engine to feed the drill, and a water-pump to force water into the hole, substantially as described.

8. The drill-bit consisting of the spirally-grooved stem *v*, having the enlarged end *y*, armed on its lower and side edges with diamonds, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand.

ROBERT MAGILL.

Witnesses:

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J. P. TREACY.