(No Model.)

H. S. GRACE.

ROCK DRILL.

No. 464,340. Patented Dec. 1, 1891.

Fig. 1.

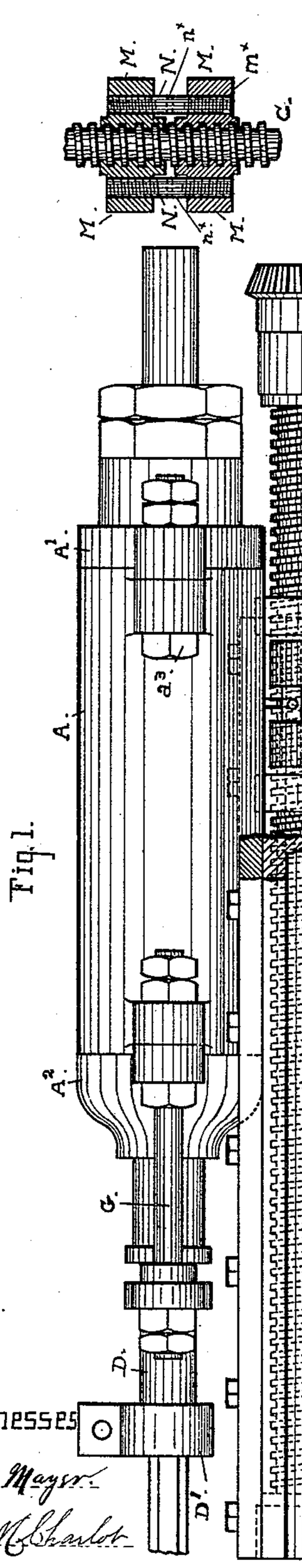


Fig. 6.

Fig. 3.

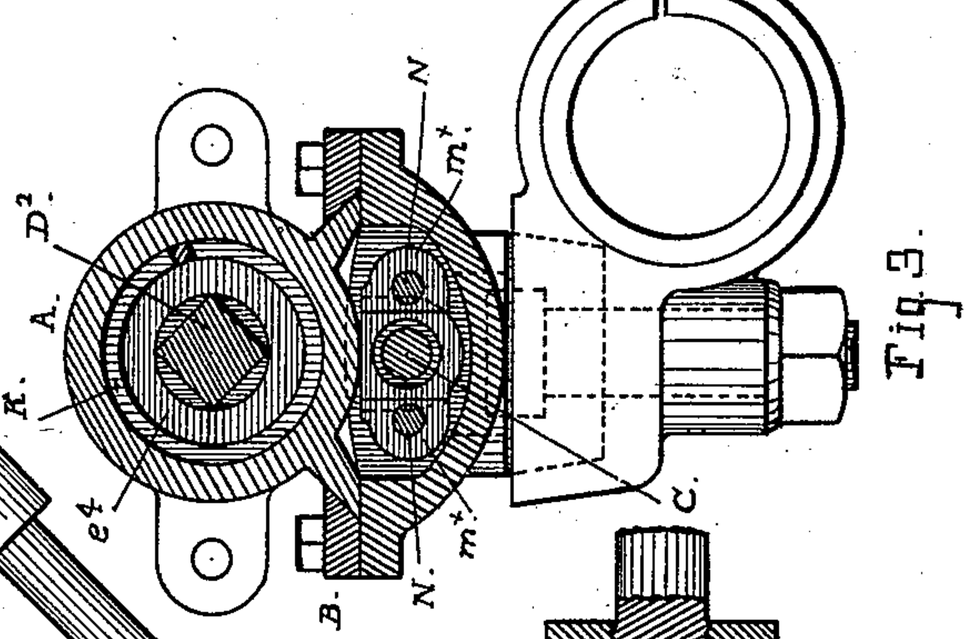


Fig. 5.

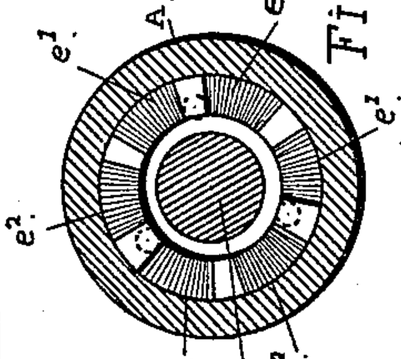


Fig. 2.

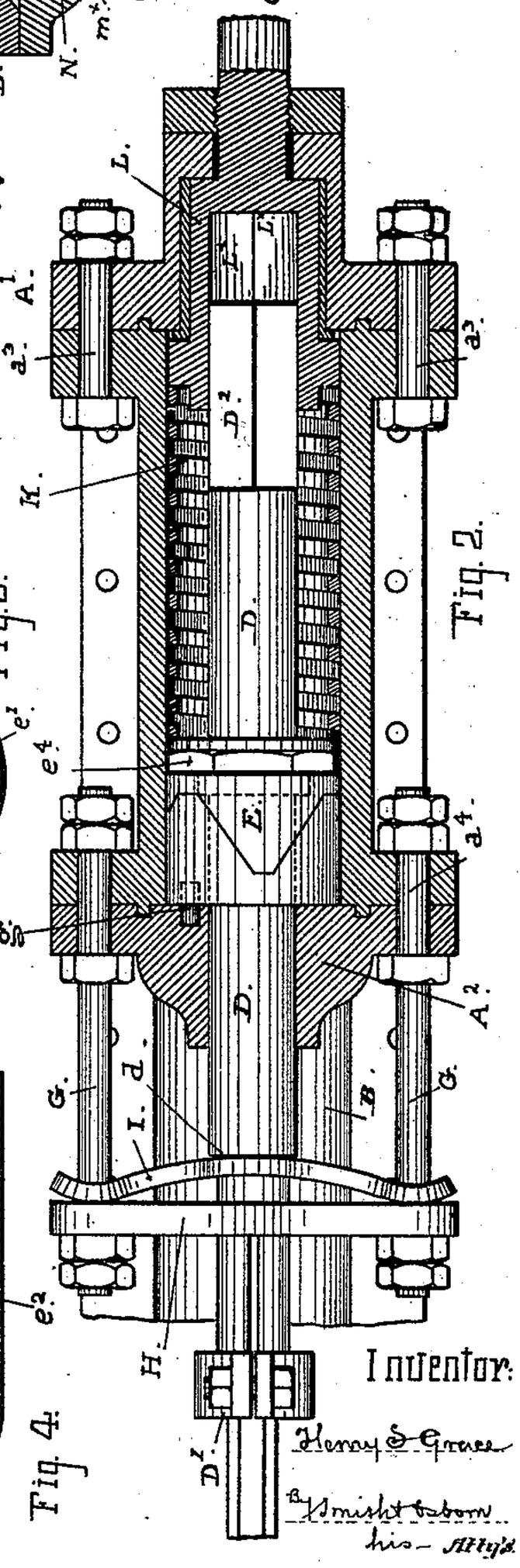
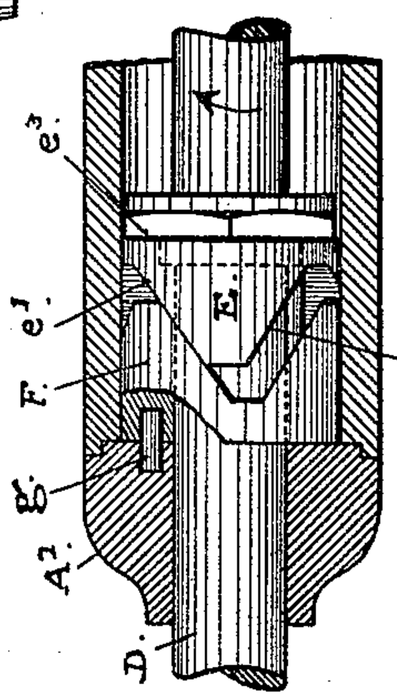


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

HENRY S. GRACE, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO JACOB A. FISCHER, OF SAME PLACE.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 464,340, dated December 1, 1891.

Application filed February 13, 1891. Serial No. 381,269. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. GRACE, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification.

My invention relates to improvements in rock-drills to be worked by power from a rotary shaft; and it embraces certain novel construction and combination of parts, as hereinafter particularly described, producing a drill or tool having several advantages both in point of construction and in adjustment and operation over other tools of the kind heretofore produced.

Figure 1 of the drawings represents in side elevation the body of the drill and the bed and feed mechanism, a portion of the bed being broken away to expose the feed-nut. Fig. 2 is a top view with the barrel or body in longitudinal section. Fig. 3 is a transverse section through the drill-body and the bed. This view is taken from the left-hand side of the section-line *x x*, Fig. 1. Fig. 4 is a detail view of the lifting and driving cam, showing the drill-rod drawn partly back and the casing in section. Fig. 5 is a cross-section through the case at the line *x y*, Fig. 4. Fig. 6 is a detail view, in longitudinal section, of the feed-nut.

This drill is of that class or construction in which the blows of the tool are produced by the reaction of a spiral spring. A tool-holding rod with a clamp in the outer end to take the drill-point is connected with a rotating shaft or other part by means of a flexible shaft or a hog-chain, and under its rotation a reciprocating movement is produced through the medium of a cam fixed on and turned by the tool-holder within the barrel. One part or feature of the present improvements relates to the construction and arrangement of this reciprocating mechanism. A stationary block fixed in the barrel at the bottom of the spring-containing chamber has double-inclined faces and a central bore or passage for the tool-holding rod to slide through. The inclines correspond in number with the inclined faces of a cam that is secured on the rod and has its inclines setting against those of the stationary block. Above this cam a spiral spring is set around the rod between the back of the cam and the head or end of the case. The upper end portion of the tool-holding rod is finished square, and is fitted to slide smoothly within a recess of corresponding form in cross-section in a rotating head that is fitted into the upper part of the barrel, which constitutes the end of or is secured to the end of a short shaft or rod that extends through the head of the barrel to the outside. That end outside is coupled to a power-transmitting shaft, and by rotation of that part the tool-carrying rod is also rotated. Such movement of the rod causes the cam to rise on the stationary block and move backward in the spring-chamber a distance equal to the height of the inclines, by virtue of which the spring is compressed and the drill-holder is driven forward as soon as the points of the cam have passed over the elevated points of the stationary block. The square recess in the rotating head of the driver is of sufficient depth to accommodate the length of the reciprocating movement given to the tool-carrier and to remain coupled to it.

Provision is made for operating a diamond drill or a boring-tool that requires rotation without blows or reciprocating movement, so that the machine can be readily adjusted at any time for special work, as in boring through a bowlder or a part where the ordinary reciprocating drill fails to make headway. This adjustment is made by simply loosening the stationary block in the barrel, so that it will rotate with instead of resisting the rotary cam or by drawing the block away from the cam, and for that purpose the lower movable head or end of the drill-case to which the block is fastened can be detached and drawn back. These parts and their peculiar construction and arrangement will be understood from the several figures of the drawings, where A is the case or barrel of the tool, B the slide or bed on which it is mounted in a similar manner to other tools of this class, and C is the feed-screw to advance the tool or hold the drill to the work.

A′ A^2 are removable heads or ends having flanges with holes for bolts a^3 a^4, that fasten them to the body.

D is a drill-carrying rod having a clamp D' on the outer end to take the drill-point and

extending through the lower head A^2 into the spring-containing chamber.

E is a cam fixed on the rod within the chamber and having on the lower side or face several projecting points with double inclines e' e^2; but the opposite face e^3 is flat.

F is a stationary block with that face or side which is opposite to the cam having inclines and projections corresponding to those of the cam, and the oposite side is flat to set against the removable head A^2. The block is held from rotating in the chamber by means of dowel-pins g in one of the parts taking into holes provided in the other part, as seen in Figs. 2 and 4. When the head is drawn up against the end of the body A by the bolts and nuts, the block is fixed and cannot turn; but by drawing the head back and releasing the block and taking out the pins no rise or longitudinal movement of the cam will take place, as the block will cease to act on the cam. The long bolts G G are substituted for short bolts on the head at the lower end of the body at points diametrically opposite to each other as guide-rods for the head on which to set it up to the body or away from it in adjusting the stationary block. These bolts also serve to carry on the outer ends a bridge-piece H, which is set to act as a guide for the drill-carrying rod and to support a buffer-spring I. The office of this spring is to soften the shock or impact of the blow of the cam against the stationary block. It is a curved spring-plate with a central opening for the rod and with slotted ends to take around the bolts. The lower portion that passes through the spring is reduced in diameter, and the shoulder d formed by it sets against the spring when the cam rests in the block. The side or face e^2 of the cam E, which gives the drop, is inclined in order to give a rotative movement to the tool in its descent, and by varying the pitch of this face in laying out the cam a greater or less amount of twist or rotation can be given to the tool at the time of the blow. A cam with a straight drop to produce a blow without rotary movement can also be substituted for the cam herein shown. In the present construction the lifting-faces of the cam and the drop-faces have corresponding degrees of pitch. The number of lifts is adapted to produce three blows of the tool to every revolution of the rod; but these can be varied by changing the cam and stationary block accordingly.

The spiral spring K is confined between the back of the cam and the end of the recessed head. The cam is slipped on the rod from the upper end against a fixed collar e^4, and has a screw-threaded bore working in a threaded portion of the rod by which it is screwed down to a seat against the collar. This part is indicated in dotted lines in Figs. 2 and 4.

The drill is fed by a screw and traveling nut in the usual manner; but in place of the ordinary nut that is used in hand-feed drills I substitute a nut of novel construction, by which lost motion arising from wear of nut or screw-thread is taken up as occasion requires and the parts are kept in close-working fit. This nut is composed of two separate parts M M, united by two right and left hand screw-threaded rods N N, working in threaded bearings in ears or extensions $m^\times$ $m^\times$ on the sides of the nuts and having center portions $n^\times$ $n^\times$ to take a wrench for turning the rods. The nut sets on the feed-screw between the ears or lugs on the bottom of the barrel that travel in the groove of the bed, and being confined between them it gives motion to the drill in the usual way as the feed-screw is turned.

Sufficient room is afforded between the lugs to permit longitudinal movement of the two parts of the nut, so that they may be spread apart or drawn toward each other, and thus as the screw-rods are turned such adjustment of the nut upon the feed-screw takes place, the effect of which is to take up whatever play between the nuts and the threads of the screw arises from wear. This construction and arrangement is seen in Figs. 1 and 6. It is well adapted for taking up lost movement and keeping a traveling nut tight on a feed screw or shaft.

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

1. In a rock-drill, the combination of a closed case or barrel A, having removable ends or heads A' A^2, a stationary block F, fixed to head A^2 and lying inside of the barrel and having elevations and depressions with inclined faces, a spring-actuated tool-holding rod D, having a non-circular end D^2, a cam E, mounted on said rod and having elevations and depressions corresponding to and adapted to work on those of the block F, and the rotatable head L at the opposite end of the barrel, having a recess shaped to correspond to and receive the end D', substantially as and for the purpose set forth.

2. In a rock-drill, the combination of a spring-impelled tool-holding rod having rotation and longitudinal movement, a cam fixed on said rod, having elevations and depressions with inclined faces between them, a stationary block provided with corresponding faces to engage those of the cam, and means whereby said block can be locked in fixed position to produce longitudinal movement of the tool-holder through the rotation of the cam, or it can be adjusted to permit rotation of the cam without producing a lift and drop, substantially as hereinbefore described.

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

HENRY S. GRACE. [L. S.]

Witnesses:
E. M. MORGAN,
E. LAUTERBARS.