(No Model.) 8 Sheets—Sheet 1.

J. McCULLOCH.

ROCK DRILLING MACHINE.

No. 493,175. Patented Mar. 7, 1893.

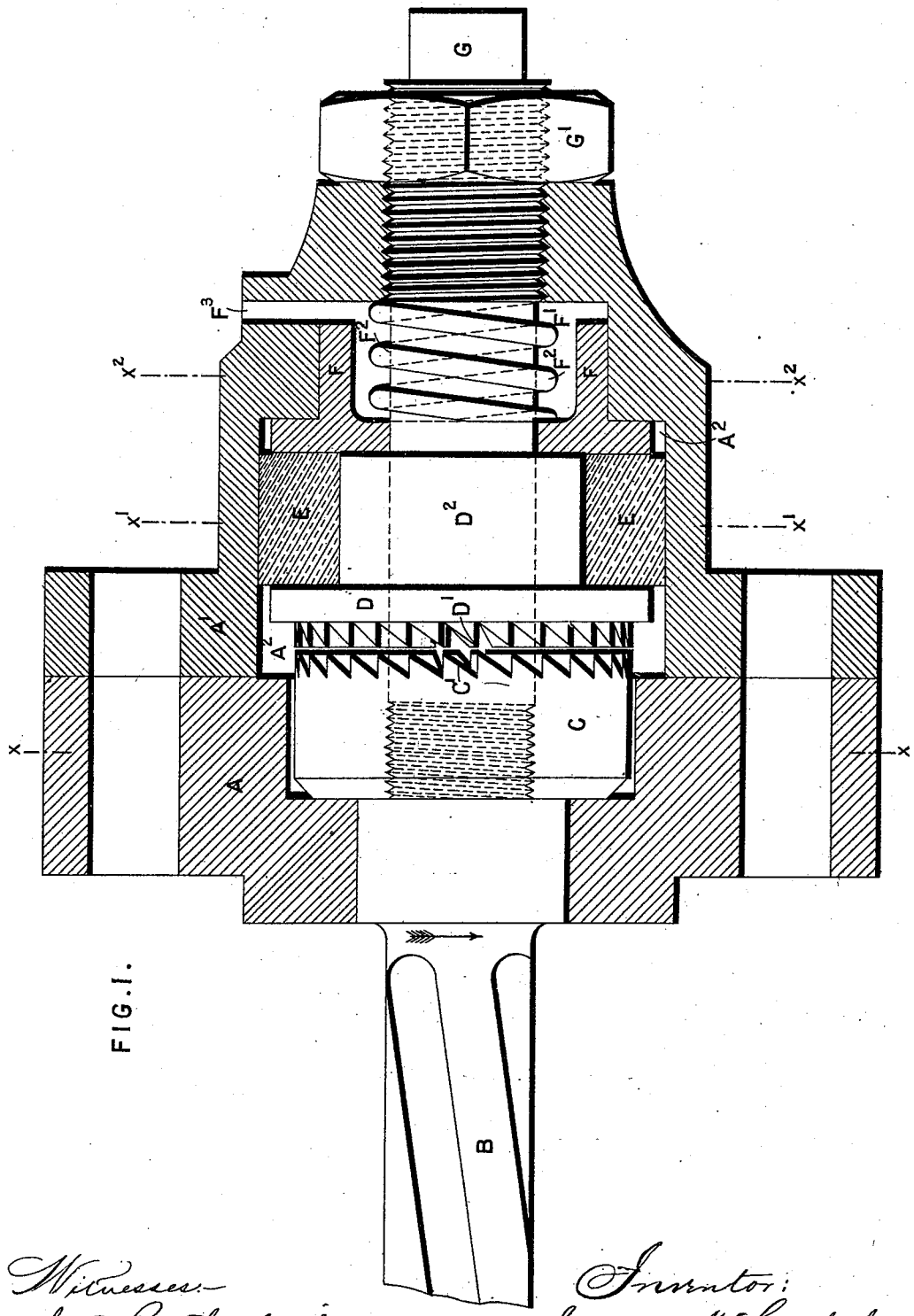

FIG. I.

Witnesses—
J. A. Rutherford.
Robt. Everett.

Inventor:
James McCulloch.
By Francis T. Morris.
Attorney.

(No Model.)

8 Sheets—Sheet 2.

J. McCULLOCH.

ROCK DRILLING MACHINE.

No. 493,175. Patented Mar. 7, 1893.

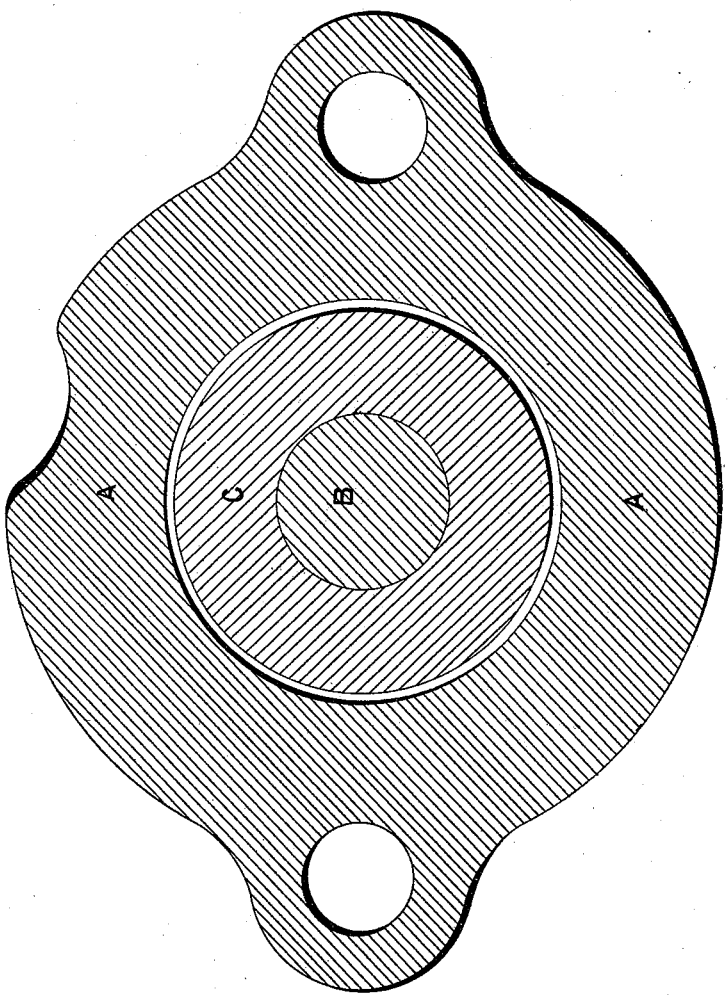

FIG. 2.

Witnesses:—
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Robt. Everett.

Inventor:
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Attorney.

(No Model.) 8 Sheets—Sheet 3.

J. McCULLOCH.

ROCK DRILLING MACHINE.

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FIG. 4.

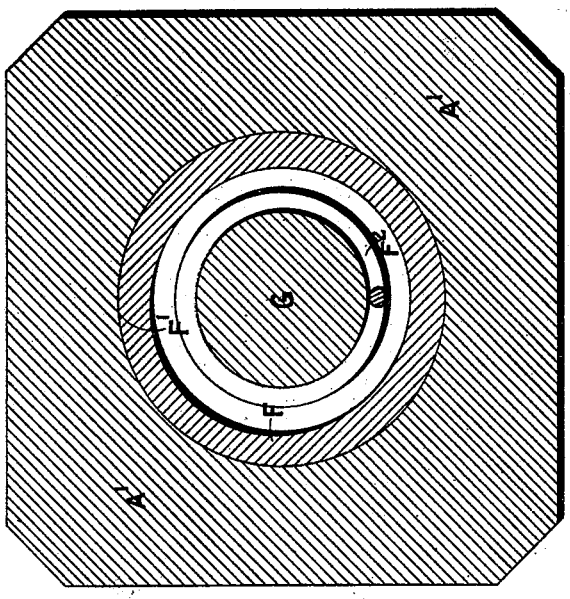
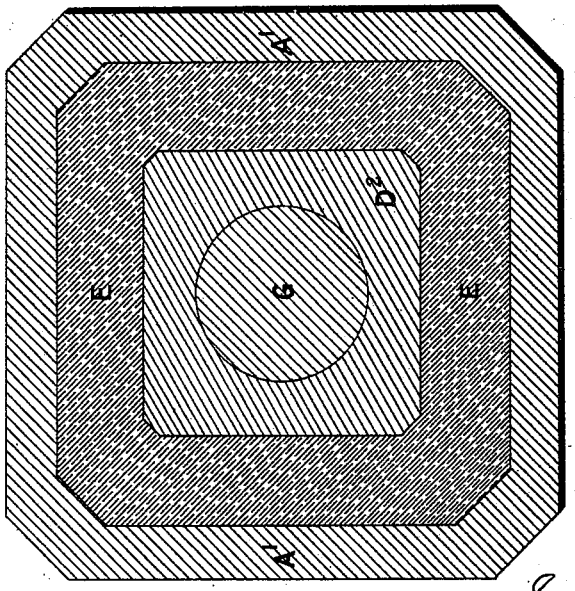


FIG. 3.



Witnesses:
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(No Model.) 8 Sheets—Sheet 4.

J. McCULLOCH.

ROCK DRILLING MACHINE.

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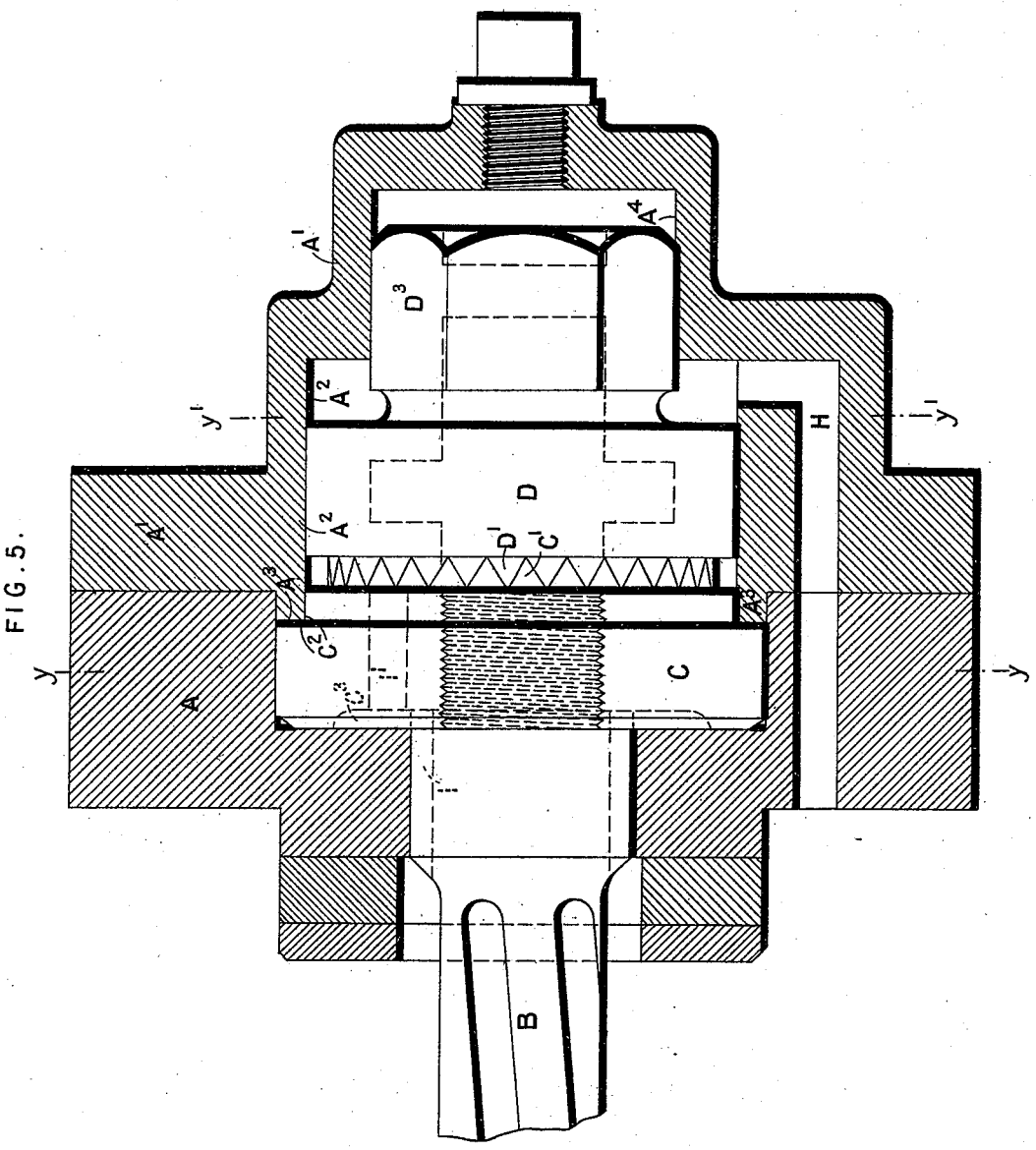
FIG. 5.



Witnesses:—
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Robert Everett.

Inventor:
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(No Model.) 8 Sheets—Sheet 5.

J. McCULLOCH.

ROCK DRILLING MACHINE.

No. 493,175. Patented Mar. 7, 1893.

FIG. 7.

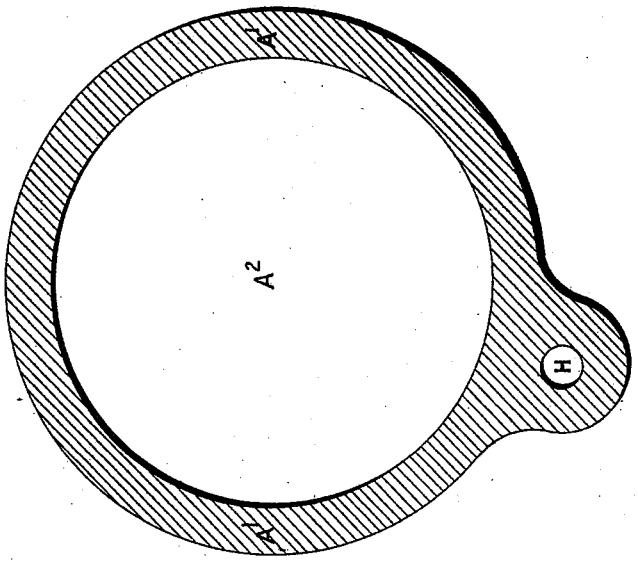
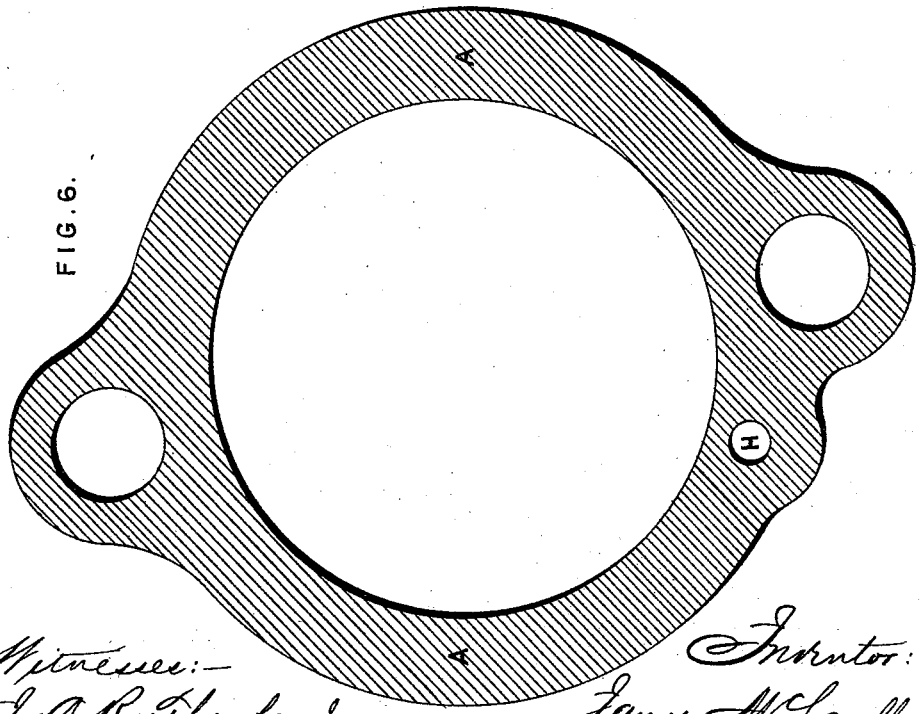


FIG. 6.



Witnesses:—
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Inventor:
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Attorney

(No Model.) 8 Sheets—Sheet 6.

J. McCULLOCH.

ROCK DRILLING MACHINE.

No. 493,175. Patented Mar. 7, 1893.

FIG. 9.

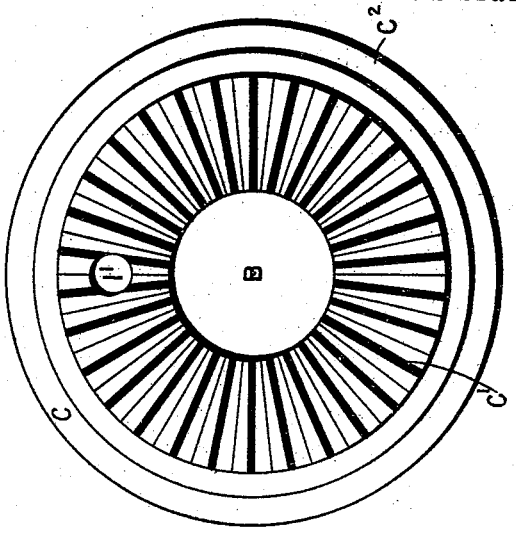


FIG. 8.

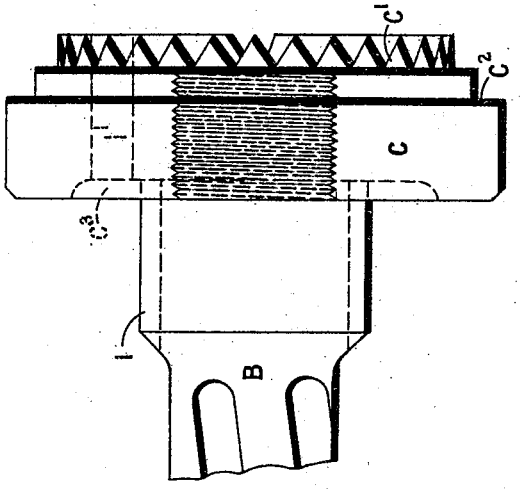
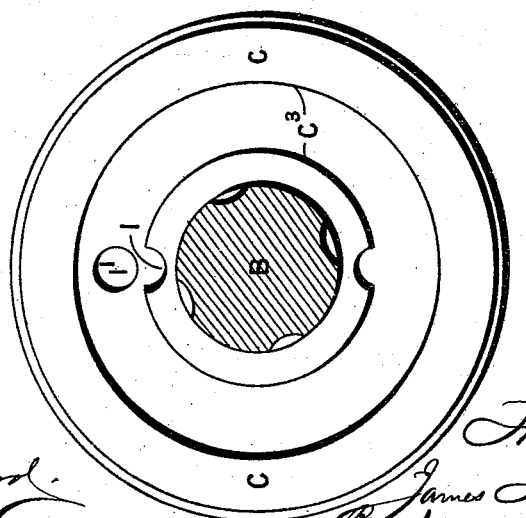


FIG. 10.



Witnesses:—
J. A. Rutherford.
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Attorney.

(No Model.) 8 Sheets—Sheet 7.

J. McCULLOCH.

ROCK DRILLING MACHINE.

No. 493,175. Patented Mar. 7, 1893.

FIG. 12.

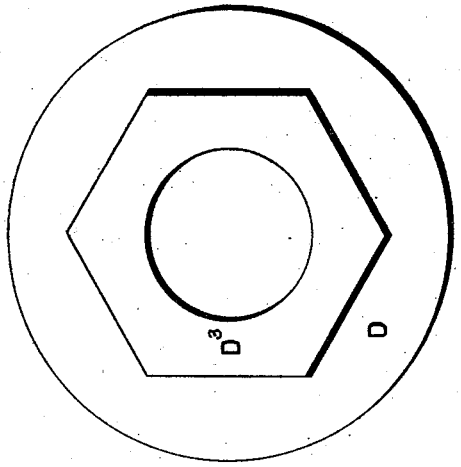


FIG. 11.

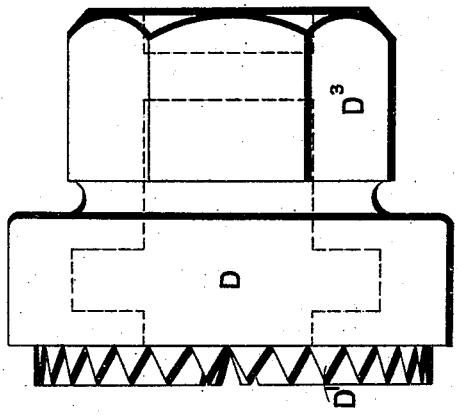


FIG. 13.

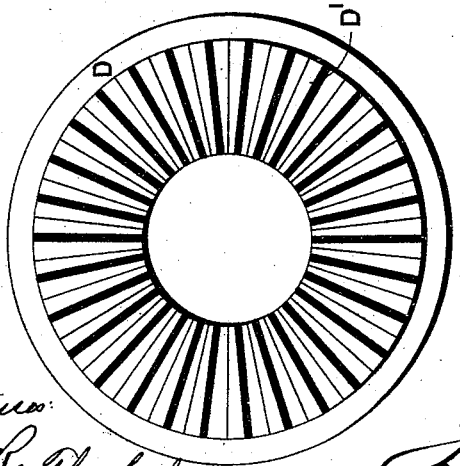
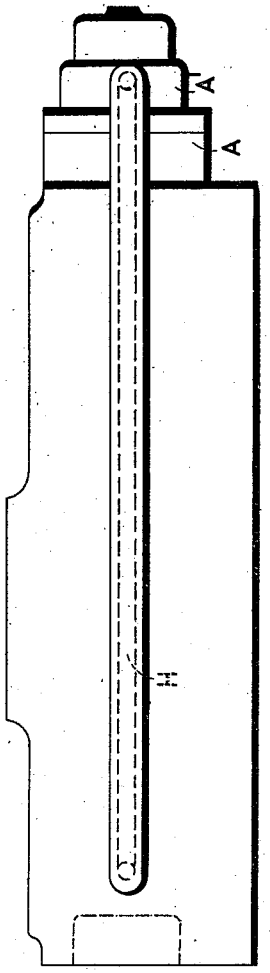


FIG. 14.



Witnesses:
J. A. Rutherford
Robt. Ewald

Inventor:
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(No Model.) 8 Sheets—Sheet 8.

J. McCULLOCH.

ROCK DRILLING MACHINE.

No. 493,175. Patented Mar. 7, 1893.

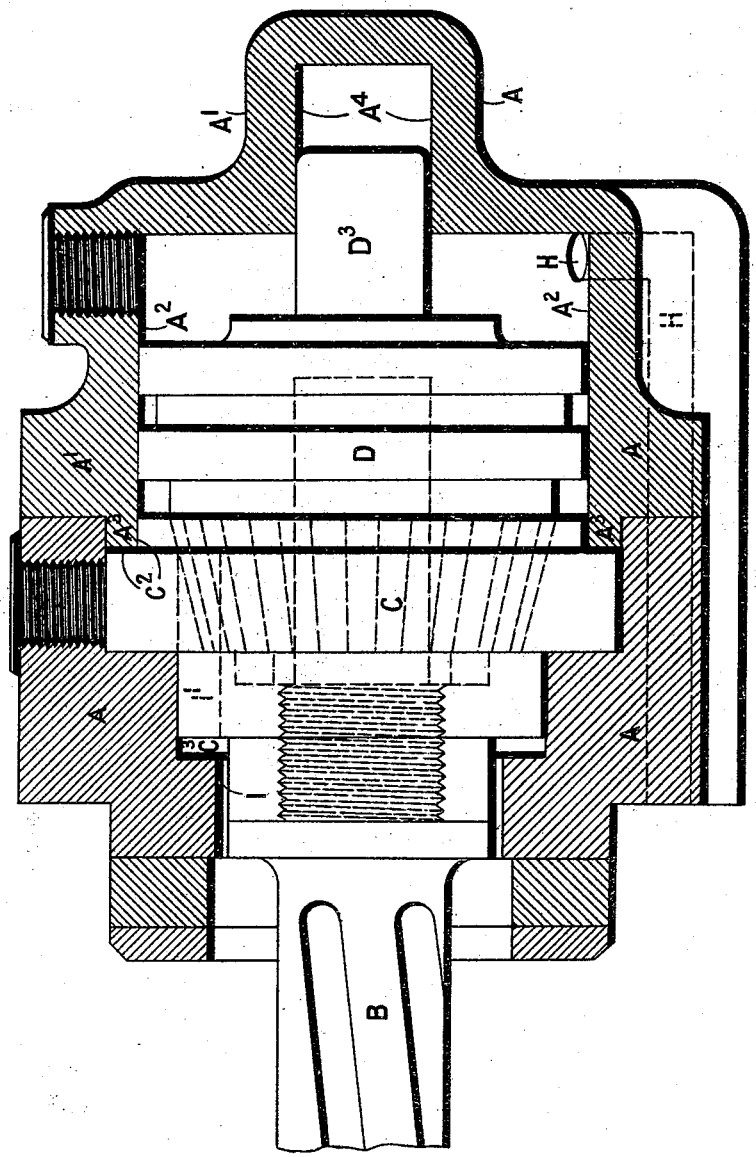

FIG. 15.

Witnesses:—
J. A. Rutherford.
Robt. Burnett.

Inventor:
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By James L. Norris.
Attorney.

UNITED STATES PATENT OFFICE.

JAMES McCULLOCH, OF MINAS RIOTINTO, SPAIN.

ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 493,175, dated March 7, 1893.

Application filed June 20, 1892. Serial No. 437,319. (No model.)

To all whom it may concern:

Be it known that I, JAMES McCULLOCH, engineer, a subject of the Queen of Great Britain, and a resident of Minas Riotinto, Huelva, in the Kingdom of Spain, have invented certain new and useful Improvements Relating to Rock-Drilling Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to rock drilling machines and is designed to provide improved means for holding or preventing the rotation of the twist bar during the backward or return stroke or movement of the drill, and for releasing the said bar during the forward or operative stroke of the drill or vice versa if desired, the object being as is well known to cause the drill to partially rotate about its axis during either its forward or backward stroke. I prefer that the drill be thus partially rotated during its backward stroke and not during its forward stroke as then it is more likely to give a much more effective blow. The devices hitherto employed for this purpose are liable to injury, (such as the breakage of ratchet teeth or of the twist bar) when subjected to certain stresses which are apt to be brought upon them in the working of the machine. By my improvements, however, although I employ two toothed or ratchet disks I obviate the liability to breakage of the teeth thereof or of the twist-bar under any stresses to which the rotating-gear may be subject in the ordinary working of the machine.

In the accompanying drawings, Figure 1 is a longitudinal central section of so much of a rock drilling machine having one form of my improvement applied thereto, as is necessary to illustrate my invention. Figs. 2. 3. and 4 are transverse sections of Fig. 1 taken respectively on the lines X X X′ X′ and X^2 X^2 of the said figure. Fig. 5. is a longitudinal central section of a portion of a rock drill showing a modification of my invention hereinafter described. Figs. 6 and 7 are transverse sections of Fig. 5 taken respectively on the lines *y y y′ y′* of the said figure the internal parts being removed. Fig. 8 is a side elevation of one of the retaining disks and a part of the twist bar shown in Fig. 5. Fig. 9 is an end elevation of the same looking from the right of Fig. 8. Fig. 10 is an end elevation looking from the left of Fig. 8. Fig. 11 is a side elevation of another of the retaining disks shown in Fig. 5. Figs. 12 and 13 are end elevations of the same looking from the right and left respectively of Fig. 11. Fig. 14 is an elevation of the cylinder of the rock drill on a reduced scale showing a passage for air leading from the front end of the cylinder to the rear of the twist bar retaining device. Fig. 15 is a longitudinal central section of a portion of a rock drill showing another modification of my invention.

Like letters of reference indicate corresponding parts throughout the drawings.

A is the cylinder cover in which is mounted so as to be free to rotate about its axis the twist bar B.

C is a disk screwed or otherwise fixed on the end of the twist bar. The said disk C is provided with teeth C′ on its outer face for a purpose hereinafter specified. On the cover A I mount another cover or casing A′ and within a recess A^2 in the said cover or casing I arrange a second toothed disk D in such a manner that while the said disk D is free to move longitudinally or axially for a short distance within the cover A′ it cannot rotate therein. The axial movement of the disk D is for the purpose of allowing its teeth D′ to engage and disengage with the teeth C′ of the disk C.

In the construction shown in Fig. 1 the disk D is made with a square boss or hub D^2 fitting into a correspondingly shaped hole in a block or piece of india-rubber E or other suitable elastic or spring material which block or piece E is fitted to slide but is restrained from rotation in the said cover or casing A′. This is conveniently effected by making the interior of the casing A square in cross section and forming the elastic block E to fit the same. I have shown the disks C. D. in Fig. 1 as having ratchet teeth, so that in this construction the disk C will only be prevented from rotating in one direction, and will be free to rotate in the other direction by sliding over the ratchet teeth and forcing back the disk D within the cover or casing A. The elastic material E around the boss or hub of the non-rotating disk D will yield

when any undue stress comes upon the disks C. D. and will thus obviate the liability to breakage of the teeth of the said disks.

To provide for keeping the ratchet disks in gear with each other, I provide as follows that is to say behind the disk D I arrange a piston F which works in a cylindrical chamber F′ formed in the cover or casing A′ and is acted upon by a spring F^2 or by compressed air, steam or other fluid admitted through a suitable aperture or port F^3, or both by the spring and by the fluid under pressure.

The operation of this device is as follows. The disk D is forced into gear with the disk C by the pressure of the spring F^2 or of the fluid entering by the said aperture F^3 or both acting upon the piston F and through the said piston on the elastic material E. By this means the twist-bar will during the return or non-operative stroke of the drill be restrained from rotation. In the forward or operative stroke of the drill, however, the ratchet-disk C on the twist-bar B will push the non-rotating ratchet disk D backward and the said bar will turn about its axis, the non-rotating disk D working in and out of gear with the other disk.

I prefer to arrange the ratchet teeth as shown so that the disks will be locked together as above described and prevented from rotation during the return or non operative stroke of the drill, if desired however I may employ disks having teeth pointed in the reverse direction so as to lock the twist bar when the drill is performing its forward or operative stroke.

In order to maintain the twist bar in its proper place and to prevent the subjection of the piston F and its spring F^2 to undue stresses, I fix in the cover or casing A′ a rod or spindle G which extends through the piston F and through the non-rotating ratchet disk D and which bears against the rear end of the twist-bar. I have shown the said rod or spindle G as being screwed into the cover A′ and further secured by a lock nut G′. This method of fixing permits of adjustment. I have also shown the rod G partly extended into the ratchet disk C on the twist-bar to give additional lateral support to the said rod.

According to a modification of my invention I provide for the automatic movement of the non-rotating toothed disk relatively to the toothed disk on the twist bar, for the purpose of putting it into and out of gear therewith as required. I have shown such a modification in Fig. 5 the various details of the same being illustrated in Figs. 6 to 14. In this modification the disks C, D are not provided with ratchet teeth as in Fig. 1 but with ordinary V shaped teeth. I have also dispensed with the elastic material inclosing the outer disk, and with the central rod or spindle for preventing longitudinal movement of the twist bar. Instead of the said central rod I utilize the cover A′ directly for supporting the twist-bar that is to say I construct the cover so that it will bear against the end of the disk C and prevent axial movement of the latter.

In the drawings the disk C is shown provided with a circular recess C^2 in which is constructed to fit an annular projection A^3 formed on the cover A′. The said projection abuts against the disk and serves the same purpose as the rod G in Fig. 1. The disk D accurately fits the cylindrical chamber A^2 of the casing A′. It is prevented from rotating therein by reason of its being formed with a hexagonal or other prismatic shaped head or hub D^3 of smaller diameter than the disk D which said head fits in a correspondingly shaped chamber A^4 in the cover A′. The chambers A^2 and A^4 are of such length as to allow the disk D to move axially until its teeth are out of engagement with those of the disk C. I provide for moving the said disk D into and out of engagement with the disk C automatically as follows, that is to say H is a passage formed in the covers A A′ and leading into the chamber A^2 behind the disk D. The said passage is continued through the metal of the cylinder as shown in Fig. 14 and eventually opens into the cylinder at a point near the lower or outer end thereof. I is a groove in the twist bar forming a passage leading from the upper or inner end of the cylinder to a cavity C^3 formed in the disk C, whence another passage I′ leads through the disk C to the space between the said disk C and the disk D. The action of this modified device is as follows. During the forward stroke of the drill the motive fluid under pressure that operates the drill enters through the passages I, I′ and acts upon the face of the disk D driving the said disk backward and disengaging its teeth from those of the disk C. The twist-bar is thus freed from restraint and is consequently free to rotate so that no rotary movement is imparted to the drill during its forward or operative stroke. When the compressed air or other motive fluid enters the lower or outer end of the cylinder to cause the drill to make its return stroke, the said fluid also enters the passage H and is conducted thereby to the back of the toothed disk D forcing the said disk forward into engagement with the toothed disk C. The latter disk is thus locked and prevented from rotation during the return stroke of the drill, and the drill is consequently partially rotated by the twist bar. The arrangement herein shown and described is very advantageous, as the toothed disks are out of gear when the drill is striking its blow thereby avoiding excessive stresses on the said disks and also undue friction upon the twist bar, thus obviating breakages. If in any case it should be desired to rotate the drill during the forward stroke instead of during the return stroke this can be done by reversing the arrangements of the passages H, I.

In some cases I dispense with the passage H

and substitute therefor a spring for putting the disks in gear. Or I sometimes employ a spring for disengaging the disks and use the fluid pressure for forcing them into engagement.

In another slight modification of my invention shown in Fig. 15 I use for preventing the rotation of the twist bar a pair of toothed cones instead of the toothed flat disks. I prevent rotation of the disk D by means of a transverse bar D^3 the ends of which fit into a corresponding recess A^4 in the cover A'. The device may be actuated and the remaining portions of the machine constructed substantially as hereinabove described with reference to the other figures of the drawings.

What I claim is—

1. In a rock drill the combination with the twist-bar of a toothed gear fixed on the said bar, another toothed gear adapted to engage therewith and to slide but not rotate in the drill casing a spring adapted to move the sliding gear in one direction and a thoroughfare forming a communication between one end of the cylinder and one side of the sliding gear to allow the working fluid to act upon and move the said sliding gear against the pressure of the spring for the purpose of controlling the twist bar, substantially as set forth.

2. In a rock-drill the combination with the twist-bar of a toothed gear fixed on the said bar, another toothed gear adapted to slide but not rotate in the drill casing and means comprising two thoroughfares one of which forms a communication between the back of the sliding gear and one end of the cylinder and the other of which forms a communication between the front of the said gear and the other end of the cylinder, whereby the said sliding gear is automatically actuated by the fluid pressure in the cylinder and brought into engagement with and disengaged from the gear fixed on the twist bar to control the twist bar, substantially as set forth.

3. In a rock drill, the combination with the twist-bar of a toothed gear fixed on said twist bar and another toothed gear adapted to engage therewith and to slide but not rotate in the drill casing, and a rubber bearing for supporting the said sliding gear, substantially as described for the purpose specified.

4. In a rock drill, the combination with the twist-bar of a toothed gear fixed on the said twist-bar another toothed gear adapted to engage therewith and to slide but not rotate in the drill casing and a rod adjustably fixed to the casing and abutting against the end of the twist bar, substantially as described for the purpose specified.

5. In a rock-drill the combination with the twist-bar, of a toothed gear fixed on the said twist-bar, another toothed gear adapted to engage therewith and to slide but not rotate in the drill casing and a thoroughfare leading from the cylinder to the front of the said sliding gear whereby the pressure of the fluid in the cylinder is utilized to automatically disengage the said gears when the drill is giving its blow for the purpose specified.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES McCULLOCH.

Witnesses:
HECTOR C. MACLEAN,
J. H. DONNAL.