(No Model.) 2 Sheets—Sheet 1.

C. E. DAVIS.

ELECTRIC DRILL.

No. 583,407. Patented May 25, 1897.

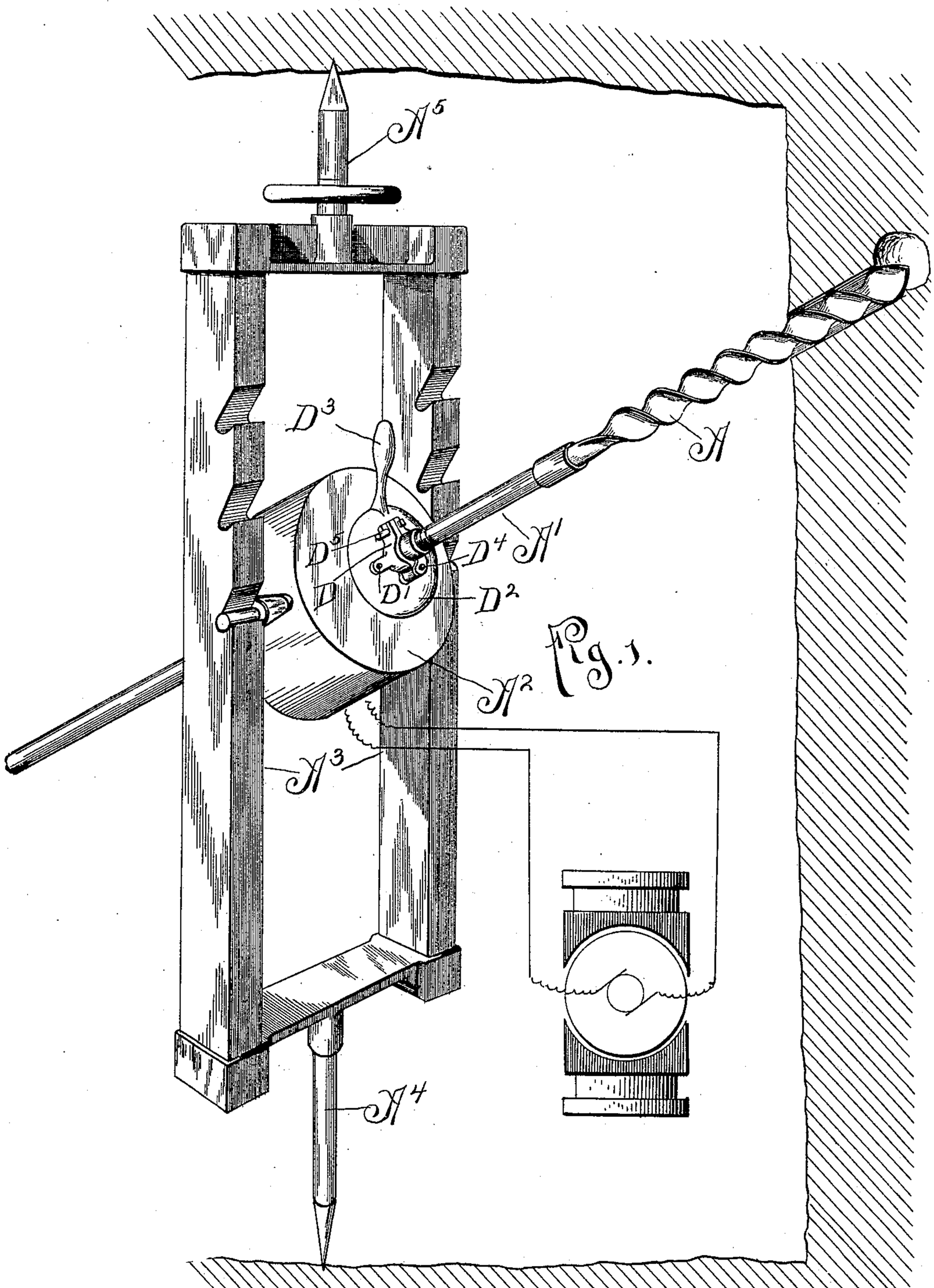


Fig. 1.

Witnesses:
Walter
Donald M. Carter.

Inventor
Charles E. Davis.
by Lucius W. Parker
Atty

(No Model.) 2 Sheets—Sheet 2.

C. E. DAVIS.

ELECTRIC DRILL.

No. 583,407. Patented May 25, 1897.

Fig. 2.

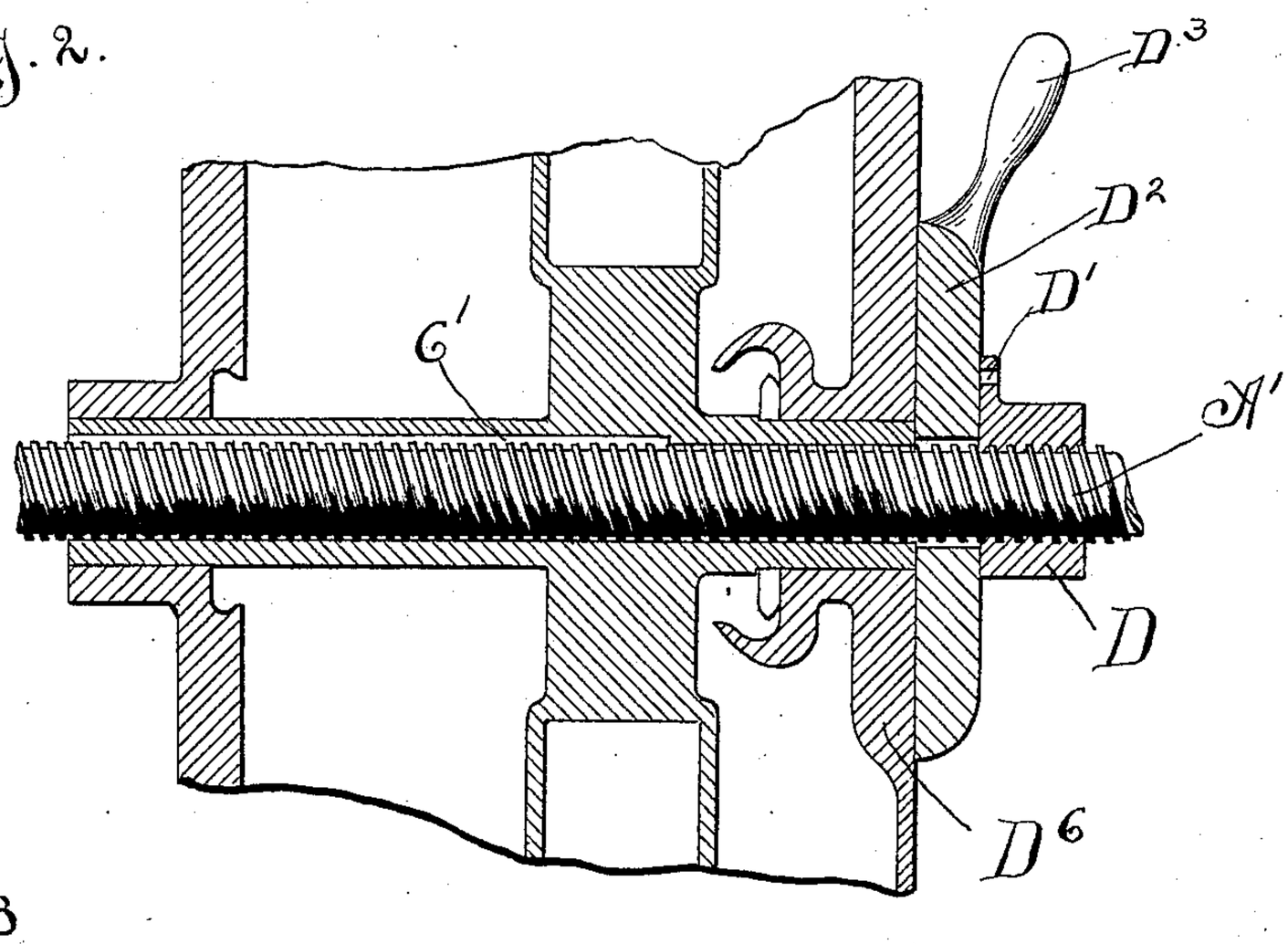


Fig. 3

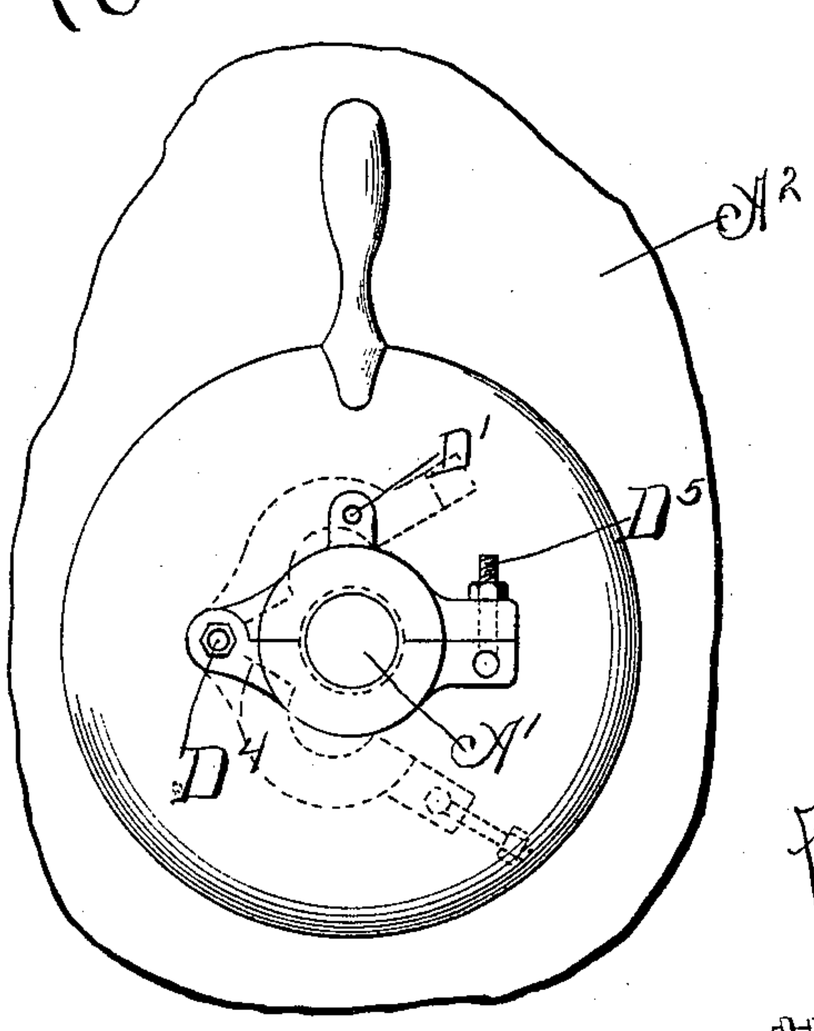


Fig. 4.

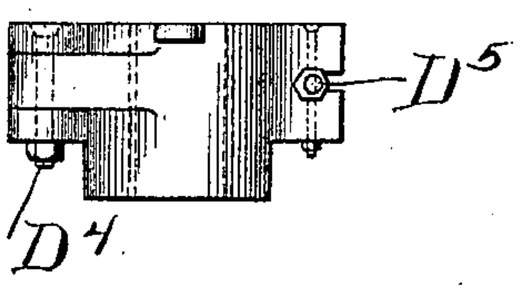
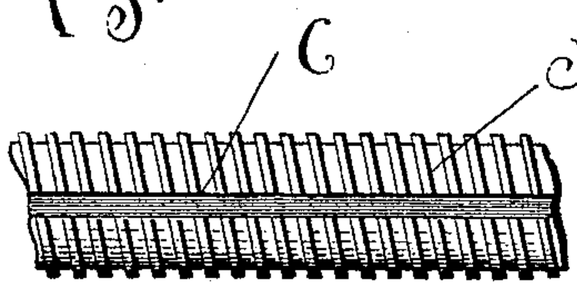


Fig. 5.



Witnesses:
J. B. Weir.
Donald McCarter

Charles E. Davis, Inventor
By Francis W. Parker, Atty

UNITED STATES PATENT OFFICE.

CHARLES E. DAVIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO ARTHUR D. DANA, TRUSTEE, OF SAME PLACE.

ELECTRIC DRILL.

SPECIFICATION forming part of Letters Patent No. 583,407, dated May 25, 1897.

Application filed April 27, 1896. Serial No. 589,247. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. DAVIS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Drills, of which the following is a specification.

My invention relates to drills to be used in drilling holes in coal or other material, and has for its object to provide a new and improved drill, of which the following is a description.

My device is illustrated in the accompanying drawings, wherein—

Figure 1 is a perspective view of a drill operated by an electric motor, the motor being in place upon its supporting-frame. Fig. 2 is a section through the armature-shaft, into which the drill is received. Fig. 3 is a front end view of the drill and associated mechanism with parts broken away. Fig. 4 is a plan view of the feed-nut. Fig. 5 is a view of a portion of the drill-shaft, showing the keyway cut therein.

Like letters refer to like parts throughout the several figures.

In mining coal it is customary to cut away a portion of the coal at the bottom of the vein and then to bore holes at the top of the vein for the reception of powder or some similar explosive, the coal being thrown down by the explosion of the material in such holes. The object of my invention is to provide a new and improved drill which is particularly adapted to be used for boring these holes in which the explosive material is placed. I have shown in the drawings a drill A, connected with the drill-shaft A′, said drill being operated by an electric motor A^2. It is of course evident that the drill may be operated by any other power, if desired. The electric motor A^2 is suspended in a frame A^3 in any desirable manner. The drill-shaft A′ projects through the armature-shaft B of the motor, (see Fig. 2,) said armature-shaft being hollow, so as to receive the drill-shaft. I have not illustrated the mechanism of the electric motor, as such mechanism is no part of my invention and as the construction of such motor is immaterial. The drill-shaft A′ is preferably threaded along a portion of its length, the length of the threaded portion being at least equal to the longitudinal movement given the drill. The drill-shaft and the armature-shaft are connected together so as to rotate as one piece, the connection being such that the drill-shaft is free to move longitudinally with relation to the armature-shaft. I prefer to connect said drill-shaft and armature-shaft by providing a keyway C in the drill-shaft, which engages a key C′, seated in the armature-shaft. A feed-nut D surrounds the drill-shaft and is connected in any convenient manner—as, for example, by means of the pin D′—with the friction-disk D^2, said friction-disk being provided with a handle D^3. The friction-disk is provided with a hole for the drill-shaft, said hole being preferably large enough to allow the shaft to move freely with relation thereto. I prefer to construct the feed-nut so that it may be easily disengaged from the drill-shaft. This may be done by making a split nut, as shown, the two parts of which are pivoted together at D^4, the ends being held in place by the bolt D^5 when the feed-nut is operatively connected with the drill-shaft. The friction-disk D^2 normally bears loosely against the case D^6 of the motor, so that the friction-disk is free to revolve with relation to said motor. The frame A^3 is provided at its lower end with the projecting piece A^4, which engages the floor of the mine, and at its upper end with the adjustable jack-screw A^5, which is adapted to be brought into contact with the roof. It will be seen that by this means the frame may be rigidly held in any desired position. I have described these several parts in detail, but it is evident that they may be varied in form, construction, and arrangement without departing from the spirit of my invention, and I therefore do not wish to be limited to the construction herein shown and described.

I do not, of course, wish to be limited to the form and construction of the several parts which constitute the device for feeding the drill forward and the means for releasing the hold of such feed device on the drill. I have shown a convenient arrangement of devices for this purpose, but they may be greatly altered and arranged so as to operate in a very different manner. The essential feature is

that there should be a device which will under suitable conditions cause the drill-shaft to be fed forward in its work and which also can be manipulated or is associated with parts which control it so that when the drill is stuck the hold of the feed device on the drill can be broken, or the feed device can be prevented from holding the drill, so that the drill can be simply pulled out of engagement with the material upon which it is stuck. Doubtless greatly-modified forms of this device could be easily gotten up for the purpose of bringing about this result. In the particular form of this device which I have shown the entire motor is mounted on the frame, but of course this is not essential in all cases. The frame upon which, either with or without the motor, the drill-shaft is supported is put into a fixed position, and the drill-shaft is then projected forward with reference to such fixed position of the supporting-frame, which may or may not include the motor. When the drill is stuck, it is essential to release the hold which the feed mechanism has on the drill either directly or indirectly, so as to relieve the tension or the back pressure of the drill on the frame, and this pressure may be exerted directly on the frame or, as in the case illustrated, through the motor. In any event when this pressure between the drill and the supporting-frame is so released by breaking the hold of the feed on the drill the drill can be drawn out more or less, as occasion may require.

The use and operation of my invention are as follows: When it is desired to bore holes in the coal or other material, the drill is placed in position with its end against the coal or other material and the motor started. The backward pressure of the drill due to its engagement with the coal presses the friction-disk D^2 against the motor-case, and the friction due to this pressure prevents the disk from rotating. As the motor-shaft revolves it will be seen that the drill will be fed forward by the threads on the drill-shaft working in the feed-nut D. It is found in drilling these holes in coal, for example, that the drill often comes in contact with some hard substance which causes it to bind, thus stopping the motor. This is often done, for example, by balls of sulfur or other hard material. When the drill comes in contact with such material, it will be stopped, and the only thing that can be done is to back up the drill and give it another start. It will be seen that if the drill-shaft is rigidly connected with the motor-shaft it will be a very difficult matter to do this, for since the drill is stopped in its forward movement the motor cannot be started, so as to rotate it in the opposite direction. One of the objects of my invention is to allow the drill to be easily removed under these conditions. If the drill, when constructed as herein described, is stopped by any obstacle, the disk D^2 is rotated by means of the handle D^3, carrying with it the feed-nut D. The drill-shaft is held stationary under these conditions by the armature. When the drill is working, the pressure of the drill-point against the coal causes the motor-frame to spring backward, and a pressure is thereby produced tending to move the drill forward. When the disk and nut are rotated, this pressure is released, and the drill may be easily disengaged and moved to a position where it can be again started. If the drill is again stopped, the above operation may be repeated, and if the obstruction is such as to prevent the hole from being made the drill may be easily removed and a new hole started. When it is desired to remove the drill from the hole, the split nut is opened, and the drill, being then out of engagement with the threads in the nut, may be quickly moved backward until it reaches the starting position. The disk D^2 and nut D are also used when there is no obstruction to the drill, for, as before remarked, the backward pressure of the drill causes the frame to spring out of line and press the drill forcibly against the coal. Under these conditions it is difficult to remove the split nut until this pressure is released. A movement of the disk and nut in the manner described will remove this pressure, and the nut may then be opened and the drill moved to the starting position. It will therefore be seen that I have here a construction in which the drill-shaft has no direct feeding connection with the motor-shaft, the feeding mechanism being operated by the pressure of the drill against the face of the coal.

I claim—

1. A drill comprising a moving part by which power is conveyed to the drill-shaft, said drill-shaft being movable longitudinally with relation to said part and being threaded a portion of its length, a feed-nut engaging said drill-shaft and free to rotate therewith, when there is no longitudinal pressure exerted on said drill-shaft, said feed-nut provided with a part adapted to be forced against an opposed surface by the pressure produced by the engagement of said drill with the material upon which it operates, the pressure between the parts holding the nut in position to feed the drill forward.

2. A drill comprising a moving part by which power is conveyed to the drill-shaft, said drill-shaft free to move longitudinally with relation to said part and threaded a portion of its length, a friction-plate mounted upon said drill-shaft and free to move with relation thereto, said friction-plate having a feed-nut connected therewith which engages the thread on said drill-shaft, said feed-nut being inoperative when the drill-shaft is free from longitudinal pressure and adapted to be made operative by the contact of said friction-plate with its opposed surface.

3. A drill comprising an electric motor provided with a hollow armature-shaft, a threaded drill-shaft passing through said armature-shaft and feathered thereto so that the drill-

shaft and armature-shaft rotate together, said drill-shaft being free to move longitudinally with relation to said armature-shaft, a friction-plate mounted upon said drill-shaft and adapted to bear against the case of the motor, a normally-inoperative feed-nut connected with said friction-plate and in engagement with said drill-shaft, the whole so arranged that the feed-nut is only made operative so as to feed the drill-shaft forward when said drill is in engagement with the material operated upon.

4. A drill comprising an electric motor provided with a hollow armature-shaft, a screw-threaded drill-shaft surrounded by said armature-shaft and feathered thereto so as to rotate therewith, said drill being free to move longitudinally, a friction-plate mounted upon said drill-shaft, and adapted to bear against a stationary opposed surface, said friction-plate normally free from its opposed surface when the drill-shaft is free from longitudinal pressure so as to rotate with said drill-shaft, said plate adapted to be brought into contact with its opposed surface by the engagement of the drill with the material to be operated on, a normally-inoperative split feed-nut connected with said friction-plate, and in engagement with the threads upon said drill-shaft, whereby when the drill is stopped by some obstacle the feed-nut and a friction-plate may be moved relative to said armature-shaft so as to release the drill.

5. A drill comprising an electric motor provided with a hollow armature-shaft, a screw-threaded drill-shaft surrounded by said armature-shaft and feathered thereto so as to rotate therewith, said drill-shaft being free to move longitudinally, a split feed-nut associated with said drill-shaft, whereby it is fed forward and a releasing device associated with said mechanism and adapted to release the pressure with which the drill is forced against the material operated upon when the motor is stationary so as to allow the feed-nut to be opened.

6. A drilling-machine comprising a screw-threaded drill-shaft, a driving-motor connected therewith, a normally-inoperative feed-nut associated with said drill-shaft, a holder for said feed-nut, an engaging surface on the opposite side of the holder from the working end of the drill-shaft against which the holder bears when the shaft contacts with the material to be operated upon.

7. A drilling-machine comprising an operating-motor, a drill-shaft A′, a feed-nut D, a friction-disk D^2 connected with said feed-nut, said friction-disk and nut free to rotate with the shaft except when the drill is in contact with the material to be operated upon, substantially as described.

CHARLES E. DAVIS.

Witnesses:
DONALD M. CARTER,
BERTHA C. SIMS.