

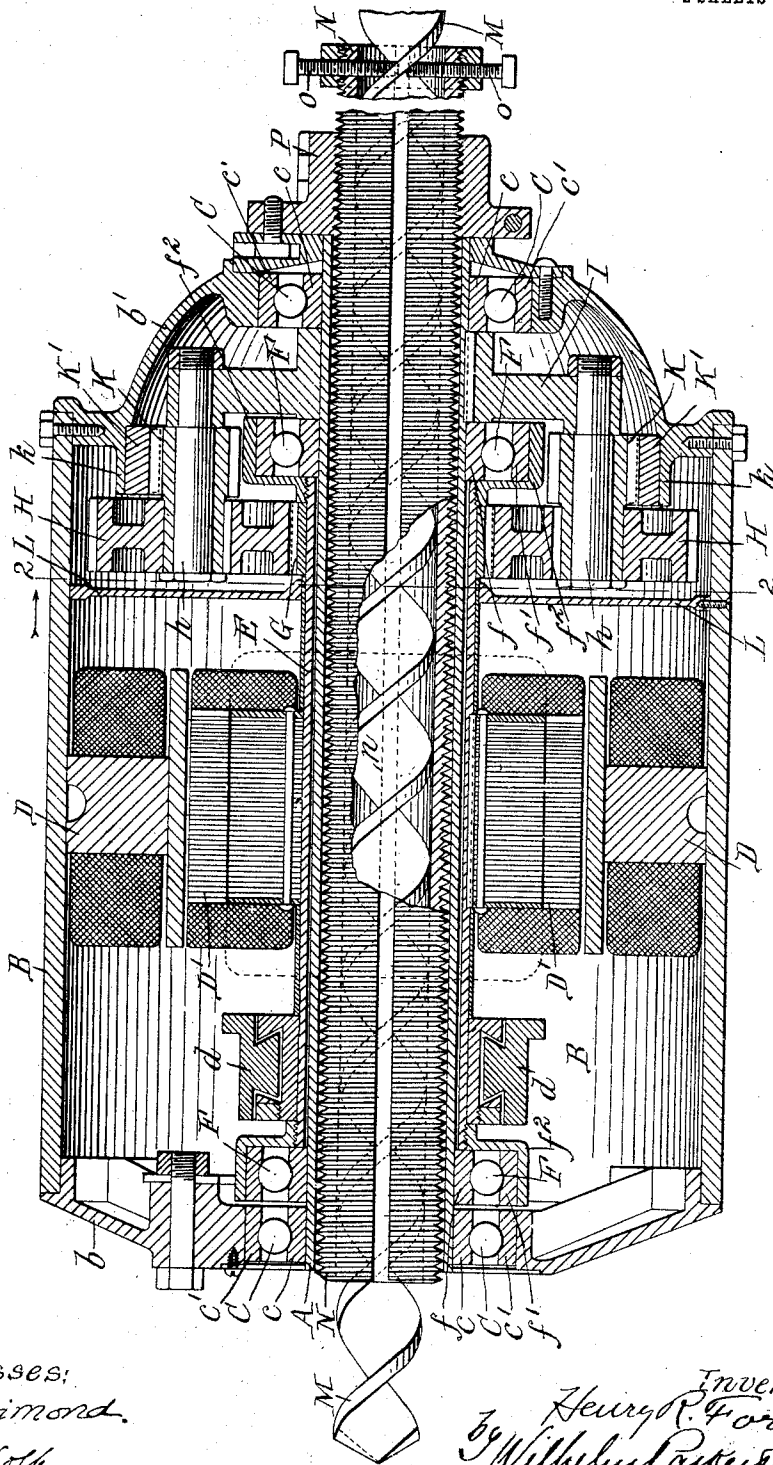
No. 882,878.

PATENTED MAR. 24, 1908.

H. R. FORD.
COAL AND ROCK DRILL.
APPLICATION FILED DEC. 17, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

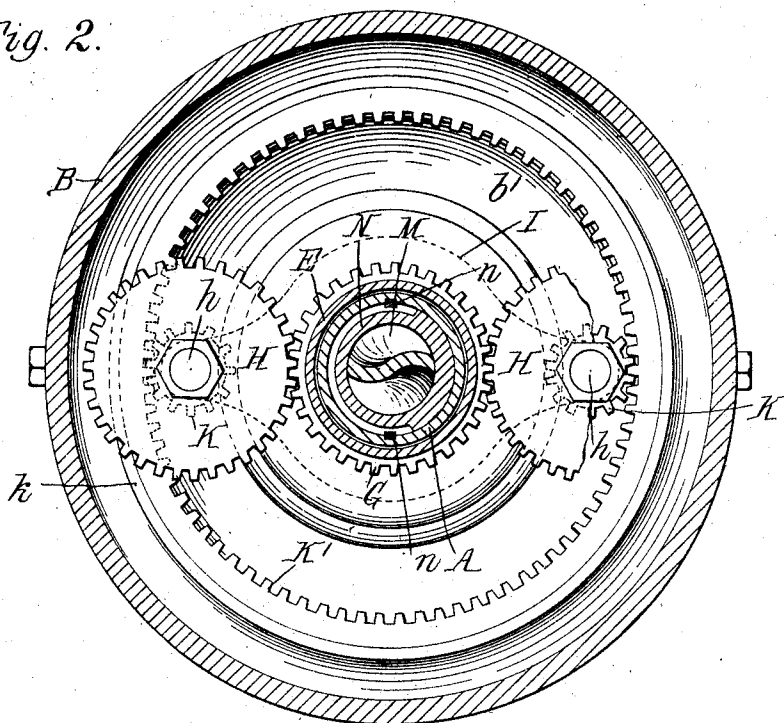


Fig. 3.

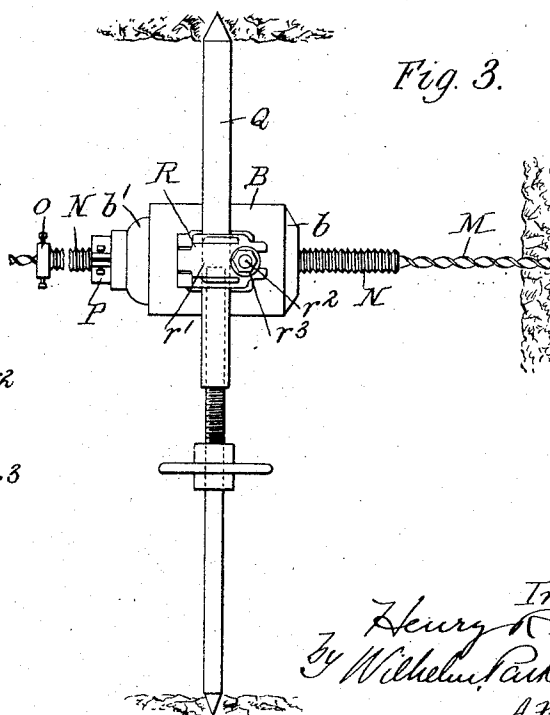
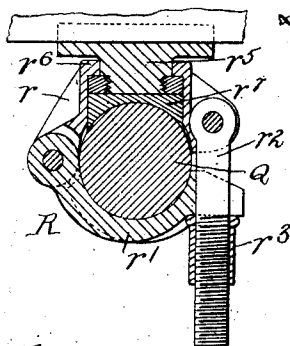


Fig. 4.



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UNITED STATES PATENT OFFICE.

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COAL AND ROCK DRILL.

No. 882,878.

Specification of Letters Patent.

Patented March 24, 1908.

Application filed December 17, 1906. Serial No. 348,287.

To all whom it may concern:

Be it known that I, HENRY R. FORD, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Coal and Rock Drills, of which the following is a specification.

This invention relates more particularly to electric coal and rock drills of that sort in which the bit or boring tool is secured to a shaft which is driven by the motor and is moved longitudinally forward by a feed device to advance the bit. The tool and the tool shaft are usually quite long and should have a relatively long bearing in the drill.

The objects of the invention are to produce a strong and efficient drill in which the drive shaft for the tool and motor shaft by which it is driven are concentrically arranged and supported at opposite ends in widely separated bearings whereby a steady bearing support for said shafts and the tool rod or shaft is afforded; also to secure this result in a construction in which the tool rod or shaft, drive shaft and motor shaft are concentric with respect to each other, the motor and the gearing connecting the motor and drive shafts, so that the several parts will be compactly arranged and can be inclosed within a protecting casing, while at the same time the power will be applied to the best advantage to the tool rod or shaft; also to provide a simple and readily operated clamp for securing the drill in any desired position on its supporting column or stand.

In the accompanying drawings, consisting of two sheets: Figure 1 is a longitudinal sectional elevation of an electric drill embodying the invention, the bit or boring tool and the bit shaft being broken. Fig. 2 is a transverse sectional elevation thereof in line 2—2, Fig. 1. Fig. 3 is an elevation, on a reduced scale, of the drill and its supporting stand or column. Fig. 4 is a horizontal section, on an enlarged scale, of the clamp for adjustably securing the drill on the supporting column.

Like letters of reference refer to like parts in the several figures.

A represents a hollow drive shaft which is journaled at its opposite ends on the opposite ends of a suitable supporting and containing frame or casing for the motor and the moving parts of the drill. The containing frame or casing may be of any suitable construction adapted to provide a strong and stable support for the parts of the drill. A

closed casing is shown in the drawings comprising a hollow cylindrical body B and ends or caps *b b'* which are bolted or otherwise secured to the opposite ends of the body. The bearings for the drive-shaft are supported in these ends of the casing, antifriction bearings being shown consisting each of a circular row of balls C which run in a race formed by inner and outer bearing rings *c c'* secured respectively on the ends of the drive shaft and in central openings in the ends *b b'* of the casing. Any other suitable sort of bearings for the drive-shaft supported at the ends of the frame or casing could be employed.

D and D' and *d* represent respectively the field magnets, armature and commutator of an electric motor of any usual or suitable construction. The armature and commutator are secured upon a hollow armature or motor shaft E which surrounds the drive shaft A, and is journaled at its opposite ends on suitable bearings supported by the drive shaft. Antifriction bearings are shown for this purpose, consisting of annular rows of balls F which run in races formed by inner and outer bearing rings *f f'* secured respectively on the drive shaft A near its ends and in cups or hollow flanged collars *f²* screwed or otherwise secured to the ends of the motor shaft. The armature shaft thus surrounds the drive shaft and is supported thereon by end bearings which are widely separated, while the drive shaft is supported at its ends by bearings on the ends of the containing frame or casing. The bearings for the motor shaft being arranged in the outwardly-facing cups on the shaft, the oil for lubricating the bearings is effectually prevented from working its way inwardly on the commutator or armature of the motor. The construction of the motor itself forms no part of the invention and only the parts thereof necessary to an understanding of the invention are illustrated.

The motor shaft is connected to the drive shaft to drive the latter by planetary speed-reducing gearing arranged concentrically with respect to said shafts. The gearing shown comprises a gear pinion G which is fixed in any suitable manner to the motor shaft adjacent to one end thereof and meshes with and drives planet gears H which are journaled on stud shafts *h* secured to a spider or wheel I or are otherwise suitably journaled on said wheel I which is secured to the hollow drive shaft A between one bearing for the

same and the adjacent bearing for the armature shaft. Planet pinions K are secured to or formed with the planet gear wheels H and mesh with an internally toothed gear wheel K' which is held stationary in any suitable manner in the supporting frame or casing. The internal gear K' shown is secured in an inwardly-projecting flange k on the adjacent end of the frame or casing. Two planet gears and pinions are shown arranged diametrically opposite to each other on the wheel or spider I, but any other suitable number could be used. The inner drive shaft is driven by this gearing from the motor shaft at a reduced speed and in the same direction as the motor shaft, in a well known manner. The planetary gearing is contained wholly within the frame or casing and concentrically with respect to the motor and drive shafts so that the parts are compactly arranged and the power is applied and the strains equally and symmetrically distributed around said shafts. A partition L is preferably provided in the frame or casing between the motor and the speed-reducing gearing to prevent the lubricating oil for the gearing from finding its way to the motor.

M represents the bit or boring tool, which is of ordinary construction and is secured to and driven by a screw-threaded tool or bit-shaft N which passes longitudinally through and is supported in the hollow drive shaft A. The tool shaft is caused to turn with the drive shaft by longitudinal ribs n on the latter engaging in longitudinal grooves in the former, or by any other means which allow the tool shaft to move longitudinally with respect to the drive shaft. The tool shaft could be solid, and the bit or tool secured to one end thereof, but the screw shaft is preferably hollow so that the bit or tool can pass centrally through the same, the bit being secured to the tool shaft by set screws or other suitable means O. The bit or tool is thus caused to turn with the tool shaft and it can be adjusted lengthwise therein and secured so as to project more or less from the shaft, which permits of a longer tool shaft and bit being used in a given space and enables the bit to be projected farther from the tool shaft as the boring progresses. The bit is gradually advanced by a feed device having a screw-threaded engagement with the tool shaft. The feed device P shown consists of an ordinary split or sectional nut which is secured to one end of the casing and through which the tool shaft passes, the sections of the nut being separable, as usual, to release the tool shaft so that it can be advanced or retracted as required through the feed nut and hollow drive shaft.

In the operation of the drill it is stationarily supported in a suitable position, the tool shaft is moved to the rear and the feed nut is closed upon the same, the bit is moved

forwardly in the tool shaft until its end engages the coal or rock to be bored, when the bit is secured by tightening up the set screws or securing devices O. The motor is then started and through the shafts and gearing described drives the tool shaft and bit. The tool shaft and bit are gradually advanced by the screw engagement of the shaft with the feed nut. When the tool shaft has thus been advanced to the desired limit, the motor is stopped, the set screws or securing devices O are released and the feed nut is opened. The tool shaft is then pulled back through the drive shaft, leaving the bit undisturbed in the bore or hole in the rock. The bit is again secured to the tool shaft by tightening the set screws or devices O, the feed nut is closed upon the shaft and the motor is again started. The bit can thus be driven in the rock to any desired depth without withdrawing it from the hole or changing the position of the drill, and a very long bit can be employed. The tool shaft being supported throughout the length of the drive shaft, and the latter being supported at its opposite ends in the containing frame or casing, the tool shaft and bit have a very stable and rigid support in the drill. The drive shaft also forms a rigid bearing support for the surrounding motor shaft, motor armature and gearing, so that while the machine as a whole is compact and small, it is strong and powerful. The casing incloses all of the moving parts but the relatively slow speed tool shaft and bit and there is therefore little danger of accident to operatives.

The drill can be mounted on any usual supporting stand or column. An ordinary extensible upright supporting column Q is shown in Fig. 3, bearing at its ends in the floor and ceiling of a mine chamber. The drill frame or casing is secured on the supporting column by a clamp R, Fig. 4, which enables the drill to be adjusted to any necessary position. This clamp, in the construction shown, comprises relatively stationary and fixed jaws r r' which are hinged together and embrace the supporting column around which they are clamped by a connecting screw r² and nut r³. The screw is pivoted to one jaw and its threaded portion passes through a slot in the free end of the other jaw with the nut bearing against the free end of the latter jaw r'. A circular headed stud r⁵ is rigidly secured to the drill frame or casing and extends into a circular cavity in the stationary jaw r of the clamp. The stud has a flange or head which bears at its inner side against an internal flange r⁶ on the stationary jaw of the clamp, and a circular clamp block r⁷ is arranged in the cavity of the stationary clamp jaw between the supporting column and the head of the stud r⁵, said block having a concave face bearing against the side of the column and a flat cir-

cular face bearing against the head of the stud r^5 . When the clamp nut r^3 is tightened, the jaws of the clamp are contracted about the supporting column and this forces the clamp block r^7 against the head of the stud and draws the flange r^6 on the stationary jaw of the clamp outwardly against the inner edge of the flange or head of the stud. Thus the jaws of the clamp securely grip the column and the head of the stud is securely gripped between the clamping block and flange of the stationary jaw, and the drill frame or casing will be held rigid. When the clamp nut r^3 is loosened the clamp can be raised, lowered or turned horizontally on the supporting column to any desired position and the drill frame or casing can be swung in a vertical plane about the axis of the stud r^5 to any desired position, and the several parts will be held in the position to which they are adjusted when the nut r^3 is again tightened. Thus by the operation of the one nut or device the drill can be secured in any required position.

While the drill illustrated in the drawings is equipped with an electric motor, a similar shaft arrangement could be employed with other kinds of motors or engines.

I claim as my invention:

1. The combination of a frame, a drive shaft bearing in the opposite ends of said frame, a motor located between said shaft bearings and having a shaft concentric with said drive shaft, bearings for said motor shaft on said drive shaft at opposite sides of the motor, drive connections between said shafts, and a tool shaft arranged concentrically of and driven by said drive shaft, substantially as set forth.

2. The combination of a frame, a hollow drive shaft bearing in the opposite ends of said frame, a motor located between said shaft bearings and having a hollow shaft surrounding said drive shaft, bearings for said motor shaft on said drive shaft at opposite sides of the motor and between said bearings for the drive shaft, drive connections between said motor and drive shafts, a tool, and a shaft to which said tool is attached passing through and driven by said drive shaft, substantially as set forth.

3. The combination of a frame, a drive shaft bearing at opposite ends in said frame, a motor having a shaft concentric with said drive shaft, bearings for said motor shaft, drive connections between said shafts, a hollow tool shaft concentric with said other shafts, and a tool which passes through and is secured to said tool shaft, substantially as set forth.

4. The combination of a hollow drive shaft, bearings for the opposite ends of said shaft, a motor having a hollow shaft surrounding said drive shaft, bearings for said motor shaft at opposite sides of the motor, drive connections between said shafts, a hollow tool shaft located in said drive shaft and driven thereby, and a tool which passes through and is secured to said tool shaft, substantially as set forth.

5. The combination of a hollow drive shaft, bearings for the opposite ends of said shaft, a motor having a hollow shaft surrounding said drive shaft, bearings for said motor shaft at opposite sides of the motor, a hollow screw-threaded tool shaft passing through and driven by said drive shaft, screw-feed means for advancing said tool shaft, and a tool passing through and secured to said tool shaft, substantially as set forth.

6. The combination of a frame, a drive shaft bearing in the opposite ends of said frame, a motor having a shaft surrounding said drive shaft, bearings for said motor shaft on said drive shaft at opposite sides of the motor, connecting gearing for said shafts arranged concentrically therewith with one element thereof secured to said drive shaft between adjacent bearings for said drive and motor shafts, and a tool driven by said drive shaft, substantially as set forth.

7. The combination of a frame, a drive shaft bearing in the opposite ends of said frame, a motor having a shaft concentric with said drive shaft, bearings for said motor shaft at opposite sides of the motor, a gear pinion secured to said motor shaft, an internal gear wheel fixed on said frame, a gear support secured to said drive shaft, gear wheels journaled on said support and meshing with said pinion on the motor shaft, and pinions secured to said gear wheels and meshing with said internal gear wheel, substantially as set forth.

8. The combination of a frame, a drive shaft bearing at its opposite ends in said frame, a motor having a hollow shaft surrounding said drive shaft, outwardly-facing bearing cups on said motor shaft, bearings within said cups for supporting said motor shaft from said drive shaft, drive connections between said shafts, and a tool driven by said drive shaft, substantially as set forth.

Witness my hand, this 12th day of December, 1906.

HENRY R. FORD.

Witnesses:

C. W. PARKER,
E. C. HARD.