Feb. 9, 1926. 1,572,067

R. E. BOOKER

MINE DRILL

Filed Jan. 11, 1922

Fig. 1.

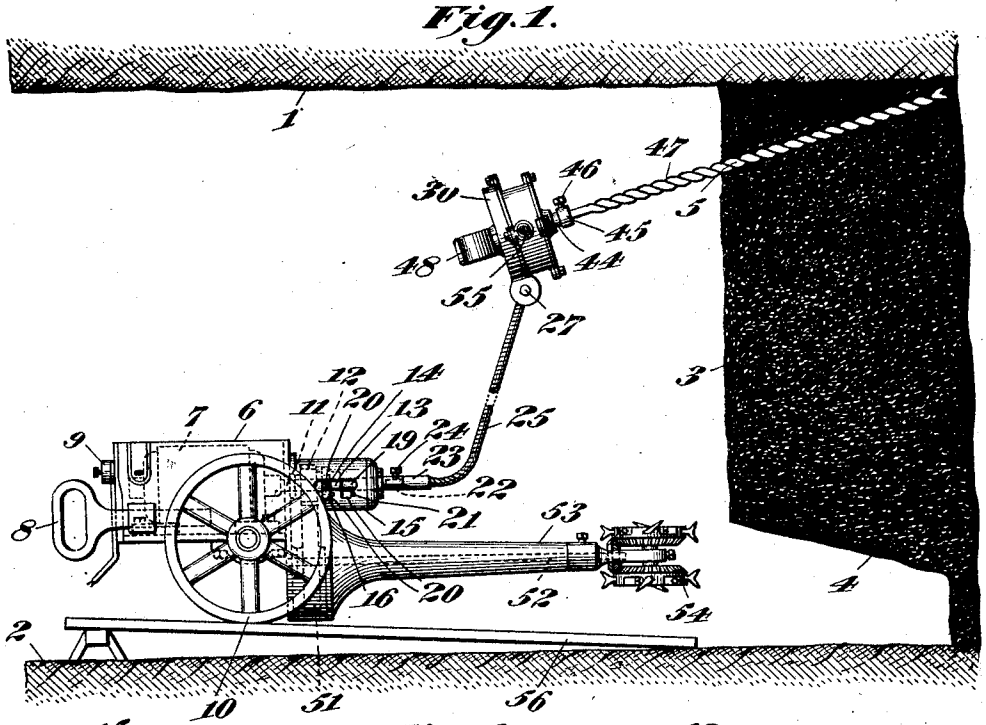


Fig. 2.

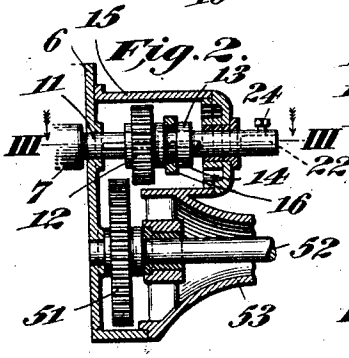


Fig. 4.

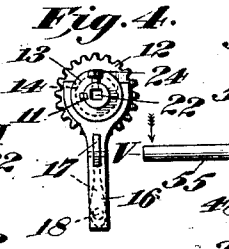


Fig. 6.

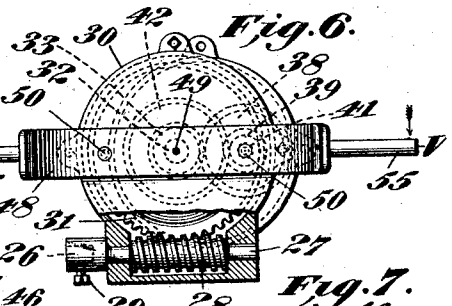


Fig. 5.

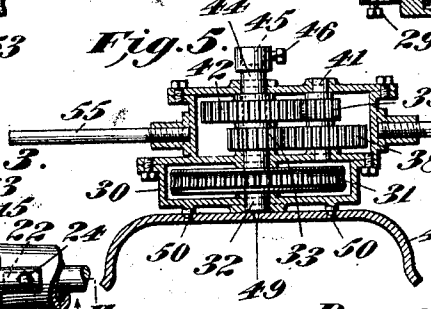


Fig. 7.

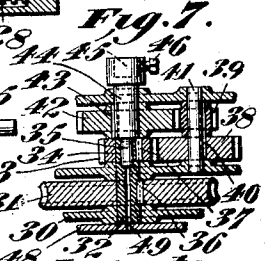
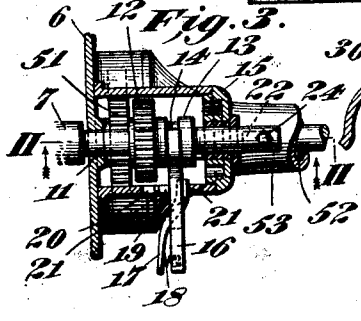


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MINE DRILL.

Application filed January 11, 1922. Serial No. 528,437.

To all whom it may concern:

Be it known that I, RUSSELL E. BOOKER, a citizen of the United States, and a resident of Windber, county of Somerset, and State of Pennsylvania, have invented certain new and useful Improvements in Mine Drills; 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 appertains to make and use the same.

My invention relates to a mine drill which is adapted to form holes in earthy or mineral material, either in mines, quarries, tunnels, open cuts or elsewhere, but is particularly adapted for drilling holes in coal for the purpose of inserting explosives to blow it down after it has been undercut or undercut and side cut by other apparatus.

My drill is also adapted to drill holes in soft kinds of rock, but for the purpose of simplicity of description and illustration herein, I will confine myself to its use in connection with coal mining. My mine drill is arranged and adapted for use in connection with a mining machine which undercuts or shears the coal, or adjacent material, or both undercuts and shears, and my drill is adapted to be driven by the motor which operates the mining machine, but is provided with separate means of attachment thereto.

My mine drill is driven by the shaft of an electric or other motor of a mining machine, and a flexible shaft connects it therewith, which flexible shaft may be of any of the well-known types.

My drill is provided with a casing, in which is mounted a set of reduction gears, so that a small but fast-running motor will suffice, and the drill is consequently geared down therefrom, to run at a proper and lesser speed of rotation.

The gear casing is provided with a breast-plate or other abutment adapted to be held by the operator against his body or legs, as the case may be, and is provided with a pair of handles by which it is grasped and held in position during the drilling operation.

In order to rotate the drill I preferably use a worm drive for the first reduction, including a worm, a worm wheel and shaft having a pinion mounted thereon which meshes with a larger gear wheel mounted on a jack shaft, which again has a pinion mounted thereon, which meshes with another gear wheel on the drill drive shaft, the axis of which is substantially coincident with and has a bearing in the worm wheel shaft, thus forming a quill shaft, and the drill shaft is provided with a socket and set screw to receive a drill or auger, which may be of any of the well-known types used for this purpose.

Having thus given a general description of my invention, I will now, in order to make the matter more clear, refer to the annexed sheet of drawings, which form part of this specification, and in which like characters refer to like parts.

Figure 1 is a side elevation of my improved mine drill showing it in a coal mine with the undercut portion of the vein of coal excavated, and the drill or auger bit in the position it will assume when the hole is finished, illustrating the application of my invention; Figure 2 is a central vertical longitudinal sectional elevation through the driving gear casing, taken on the line II—II of Figure 3; Figure 3 is a horizontal longitudinal sectional elevation through the clutch gear casing taken on the line III—III of Figure 2; Figure 4 is an end elevation of the clutch gear mounted on the end of the motor shaft with its operating lever and attachments; Figure 5 is a longitudinal sectional elevation through the drill driving mechanism taken on the line V—V of Figure 6; Figure 6 is a front elevation of the drill driving mechanism with the lower portion of the casing broken away to show the worm gear, and Figure 7 is a longitudinal section through the drill driving gear mechanism.

Referring now to the characters of reference on the drawings:—1 is the top or roof of a mine, 2 the bottom or floor thereof, 3 the vein of coal, 4 the undercut portion of the vein which is so cut that it can be readily blown down by inserting and firing an explosive at the end of the drilled hole 5. The body of the mining machine is 6, the motor mounted therein is 7, 8 are the handles of the mining machine, 9 is the switch for starting and stopping the motor, 10 are the wheels of the mining machine on which it is supported and mounted, 11 is the motor shaft of the motor 7, 12 is the clutch pinion, which, when meshed with the gear 51, drives

the mining machine. When the coal cutting machine is being operated the drill may also be operated by another miner so that the work is facilitated as the coal in this case may be undercut and the hole for the blast drilled at the same time. If, however, conditions are such as to make it preferable that either the coal undercutting or drilling should be done first, the work can be arranged in that manner. If the drilling is to be done separately the coal cutting part of the apparatus may be put out of gear by sliding the clutch pinion 12 out of mesh with the gear 51 by proper movement of the operating handle 16, and it may be put into mesh by reverse movement of said handle. Mounted in the clutch gear casing 15 on the shaft 11 and connected with the clutch pinion 12 is the collar 13 having an annular groove 14 therein, while 16 is the operating handle having a fork engaged with the groove 14 and supplied with a pawl 17 and a spring 18, which handle 16 projects through the slot 19 in the clutch gear casing, which is provided with the notches 20 and 21 to hold the operating handle 16 in position for engaging or disengaging the clutch pinion 12 in or out of mesh with the gear 51. The outer end of the motor shaft 11 is provided with a socket 22 to receive the end 23 of the flexible driving shaft 25, which is secured therein by the set bolt 24. The drill casing 30 has a worm shaft 27 rotatably mounted therein and provided with a socket 26 and a set screw 29 to secure the other end of the flexible shaft therein. The worm shaft 27 is provided with a worm 28, which meshes with the worm wheel 31 mounted on the shaft 32; this shaft also having a pinion 33 mounted and secured thereon to rotate with it. The worm wheel shaft is also provided with a cylindrical socket 34, in which fits the reduced end 35 of the drill driving shaft or spindle 44, forming a quill connection, whereby the drill shaft 44, while supported and held in line by the worm shaft 32, may be rotated by the gear 42 at a slower speed than said worm shaft. I provide a key 36 to secure the worm wheel on the shaft 32 and another key 37 to secure the pinion 33 thereon. The pinion 33 meshes with the gear 38 mounted on the jack shaft 41, which carries the gear 38 and the pinion 39, while 40 is the key which secures the pinion 39 and the gear wheel 38 on the shaft 41. Another gear 42 is mounted on the drill driving shaft 44 and secured thereon by the key 43. A drill socket 45 is provided in the outer end of the drill shaft 44 and has a set screw 46 for securing a drill or auger bit therein. 47 illustrates the usual fish-tail type of drill or auger, and mounted and secured to the drill casing 30 is a breast-plate 48, which is adapted to be placed against the body or thigh of the operator to assist in forcing the drill into the coal as it rotates. In the worm wheel shaft 32 I provide an axial oil hole 49 communicating with the socket 34 in order to supply lubricant to the connection between the shafts 32 and 44. The drill casing is made sectional and the parts secured together by tap or through bolts so that they can be conveniently assembled or disassembled. The breast-plate 48 is secured to the drill casing 30 by means of the countersunk machine screws 50, and 55 are handles which are grasped by the drill operator for the purpose of manipulating the drill.

Referring now to the portions of the apparatus particularly relating to the coal cutting mechanism:—51 is the driving gear for the operating shaft 52, which is driven by the pinion 12 when this is in mesh with the gear 51; 53 is the post or support for the operating shaft 52, provided with bearings therefor; 54 indicates the cutting head generally and 56 is the board or support on which the coal cutting machine is mounted and operated.

In headings where the top or bottom rock is being brushed or removed to secure height, the power supplied through the gear reduction of the drill will permit drilling soft rock with a suitable means for supporting the drill and feeding it forward. By removing the motor and substituting an attachment for the flexible shaft any of the commercial types of rock drills can be used for harder drilling.

The operation of my machine is as follows:—The flexible shaft 25 is connected to the motor shaft 11 by the connection 23 and secured thereto by the set screw 24. The operator then holds the drill with its point against the coal seam at the place where he wants it to enter, and the drill 47 revolves as he feeds it into the coal by holding the handles 55 and exerting pressure against the breast-plate or thigh-plate 48. For the purpose of preparing a hole to receive an explosive for blowing down the coal he holds the drill in an upwardly inclined position in such a way as to drill a hole with its inner end substantially above the inner end of the undercut 4. After the hole is so drilled the auger is withdrawn, and an explosive and fuse are inserted in the hole, the tamping being accomplished in any suitable manner, and the shot fired, thereby blowing down that portion of the coal vein 3 between the roof 1 and the undercut 4.

Although I have shown and described my invention in considerable detail, I do not wish to be limited to the exact and specific details thereof, as shown and described, but may use such modifications in, substitutions for, or equivalents thereof as are embraced within the scope of my invention, or as pointed out in the claims.

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

1. A mine drill, comprising a gear casing, a worm mounted therein, means for driving the same, a worm wheel mounted on a shaft and driven by said worm, reduction gears driven from said shaft, a drill shaft in substantial alignment with said worm wheel shaft and provided with a bearing therein, and a drill or auger mounted on said drill shaft.

2. A mine drill provided with a sectional casing, a worm mounted therein and provided with driving means, a worm wheel driven by said worm, a shaft on which said worm wheel is mounted, reduction gears driven from said worm wheel shaft and provided with a bearing therein, and a drill on said drill shaft.

3. A mine drill provided with a sectional casing, a worm mounted therein and provided with driving means, a worm wheel driven by said worm, a shaft on which said worm wheel is mounted, reduction gears driven from said worm shaft, a socketed drill shaft in substantial alignment with said worm shaft and provided with a bearing therein, and a breast plate and handles secured to said casing.

4. In combination, a flexible shaft provided at one end with a coupling member adapted to be connected to a driving shaft, a casing adapted to be manually supported and manipulated, a worm rotatably mounted in the casing and connected to the other end of said flexible shaft, reduction gearing in the casing driven by said worm, and a drill bit arranged exteriorly of the casing and driven by said reduction gearing.

In witness whereof I hereunto affix my signature.

RUSSELL E. BOOKER.