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DRILL GUIDE

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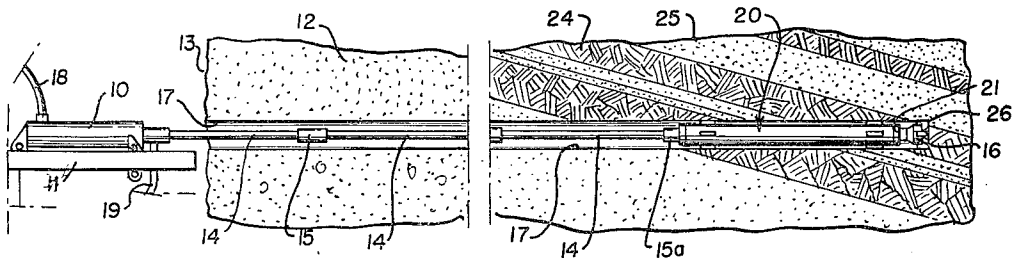


Fig. 1

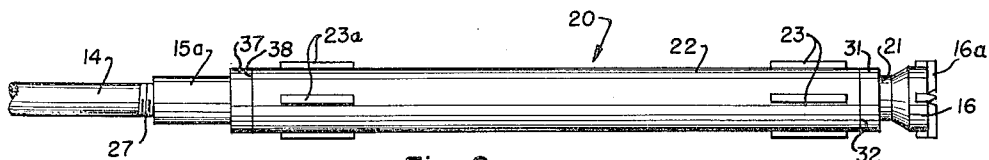


Fig. 2

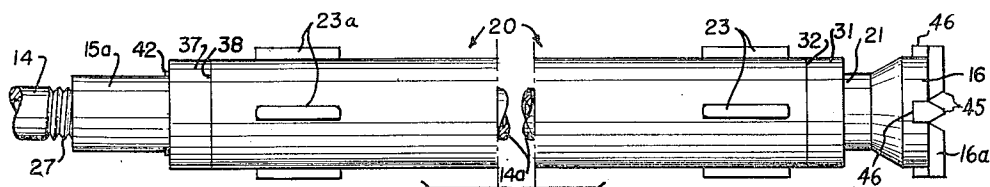


Fig. 3

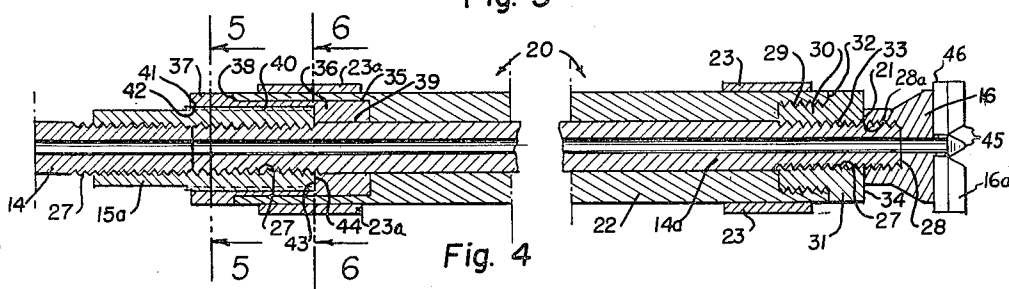


Fig. 4

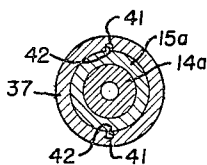


Fig. 5

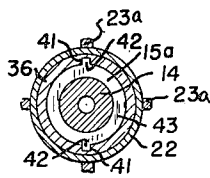


Fig. 6

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1

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DRILL GUIDE

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5 Claims. (Cl. 255—61)

This invention relates to rock drills and especially to an improved guide and bit for use in such drill.

An object of this invention is to provide a guide for rock drill which will hold the drill bit in alignment and cause it to drill a straight hole even where the bit strikes an inclined surface or other obstruction normally tending to deflect the bit from a straight course.

Another object is to provide a guide for a rock drill which will hold the drill shaft true and concentric within the hole and prevent wearing of the shaft and couplings caused by movement against the wall of the hole during the drilling operation.

Another object is to provide a guide for a rock drill which is adapted to rotate and reciprocate with movement of the drill bit, whereby the hole-aligning elements of the guide facilitate scavenging of cuttings by churning and moving such cuttings.

Another object is to provide an improved bit and guide for a rock drill wherein the bit cutting flanges outstand from the body of the bit with sharp corners at the back side of the diametrical extensions of the outstanding flanges.

Yet other objects are to provide an improved guide and bit for a rock drill which are simple in construction, economical in cost, which may be quickly and easily attached to a drill, which may be adapted for use with any type of conventional rock drill and which are a rugged and durable units adapted to withstand rough usage over a long period of time.

With these and other objects in view, all of which more fully hereinafter appear, my invention comprises certain new and novel constructions, arrangements and combinations of elements and parts as hereinafter described and as defined in the appended claims and illustrated, in preferred embodiment, in the accompanying drawing, in which:

Figure 1 illustrates a rock drill, boring a hole into a rock mass wherein there are inclined strata of a character which would normally cause the drill to veer or curve out of line, showing the rock mass in section, and in side elevation, a conventional drill with my improved guide and bit operatively positioned thereon.

Figure 2 is an enlarged view of the leading portion of the drill shown at Fig. 1 illustrating my improved guide and bit operatively positioned thereon.

Figure 3 is a further enlarged, but broken, view of the construction shown at Fig. 2.

Figure 4 is a central longitudinal section of the showing at Fig. 3.

Figure 5 is a transverse section as taken on the indicated line 5—5 at Fig. 4.

Figure 6 is a transverse section as taken on the indicated line 6—6 at Fig. 4.

The problem of drilling a straight, small diameter, hole into a rock mass for blasting, grouting or exploratory purposes becomes increasingly difficult as the depth of the hole is increased, and this is true for both reciprocating and rotary types of drills. As the depth of hole

2

increases, the drill shaft lengthens and becomes relatively more and more deflectable, and where the rock mass includes inclined stratified layers of different hardnesses, the drill bit tends to be deflected and cut out of alignment and move laterally and there will be no resistance to such lateral movement until the bit bears against the wall of the hole. When this occurs, the friction of the shaft against the hole wall reduces the cutting efficiency of the bit and the shaft becomes worn and abraded and the hole is distorted.

With this and other problems in view, the present invention was conceived and developed and includes a guide which is telescoped over the lead drill shaft section adjacent the bit and is adapted to hold the shaft centrally aligned with the hole and thereby to prevent its misalignment and resulting wear and force the bit to drill a straight hole.

The present invention also includes an improved bit having cutting flanges outstanding from the body of the bit with sharp outer corners at the back sides thereof.

An application of my invention is clearly illustrated at Fig. 1, which shows a drill 10 shiftably carried upon a frame 11 to bore a hole into a rock mass 12 from a vertical face 13 thereof. The drill carries a string of shafts 14 connected by couplings 15 with a bit 16 at the leading end, which cuts a hole 17 in the rock mass. The drill, which may be either a rotary or reciprocating type, includes power supply means such as a compressed air line 18 and a water feed line 19, which delivers a flow of water under pressure through a passage in the shafts 14 to the bit 16 to lubricate and cool the bit as it cuts into the rock and to wash out or scavenge the chips from the hole 17. My improved guide 20 is telescoped over the forward shaft 14a adjacent to and abutting the rear shoulder 21 of the bit 16 at the forward end and a modified coupling 15a at the rear end, all as hereinafter described in detail.

The body 22 of the guide is a tubular member having an inside diameter adapted to slidably fit over the shaft 14a and having a wall thickness sufficient to contain threaded connecting means hereinafter described, but with an outside diameter less than the diameter of the cutting flanges 16a of the bit 16, which cuts hole 17, to permit a discharge of water and movement of chips therepast within the hole. This body 22 is adapted to be aligned concentrically in the hole 17 by a set of radially disposed lugs 23 at its forward end and a similar set of lugs 23a at its rear end, said lugs being of hard wear-resistant material, outstanding from the body 22 with their outer faces defining elements of a cylindrical surface having a diameter equal to the diameter of the hole 17. Thus, where the bit has moved into a layer of soft material such as a shale stratum 24 and commences to move into an inclined layer of hard sandstone 25, there is a tendency for the bit to move along the slope of the shale-sandstone underface and out of alignment with the hole; but the lugs 23 prevent this deflection by bearing against the walls of the hole 17 and the two sets 23 and 23a are sufficiently spaced so as to prevent any buckling or misalignment of the drill shaft at its forward end. It follows that the bit is held straight and commences to cut into the sandstone layer as at the notch 26.

The guide 20 is tightly affixed to the forward shaft 14a of the shaft string by the incorporation of connector means which abut against the bit shoulder 21 and against the coupling 15a. The threading 27 of the shafts 14 in the couplings 15 and in the drill bit 16 is of such a character that the ends of the drill shafts abut against each other within the couplings and against the face 28 of a threaded socket 28a in the bit 16 to permit percussion or rotative movements to be imparted directly from shaft

3

to shaft and to the bit without straining the connecting threads, and the abutting of the guide 29 is likewise arranged to accomplish the same purpose. The forward end of the body 22 has a concentric internally-threaded recess 29 which is adapted to receive a threaded boss 30 concentrically outstanding a connector 31. The connector 31 is formed as a short cylindrical member having the same outer diameter as the body 22, a shoulder 32 at the base of the boss 30 which abuts the end of body 22 when the boss is screwed into the recess 29, and a concentric threaded passage 33 therethrough adapted to be screwed on the threads 27 of the shaft 14a with the forward end face 34 abutting the bit shoulder 21 of the bit when in position. It follows that the threading of this connector 31 onto the shaft 14a against the bit shoulder 21 and the threading of the body 22 onto the boss 30 of the connector secures the body 22 to the forward end of the shaft 14a. The threaded connection of boss 30 in recess 29 may be made up permanently, to, in effect, permanently interconnect the body 22 with the connector 31.

The rear end of the body 22 has a concentric recess 35 which is adapted to receive the cylindrical boss 36 of a retainer 37 with a sliding and rotating fit. The retainer 37 is formed as a short cylindrical member having the same outer diameter as body 22, a shoulder 38 at the boss 36 which abuts the end of the body 22 with the boss 36 in the recess 35, a concentric passage 39 therethrough which is of the same internal diameter as the passage through body 22, whereby it is adapted to slidably fit over the shaft 14a, and a concentric recess 40 in its rearward portion which is adapted to slidably receive preferably a half portion of the coupling 15a. Two diametrically-opposed longitudinal grooves 41 are provided in this recess 38 which slidably receive lugs 42 diametrically outstanding the coupling 15a and the slidable meshing of the lugs 42 with grooves 41 causes the retainer 37 to rotate with coupling 15a. Thus, after the forward end of the body 22 is fastened to the shaft 14 by connector 31, the boss 36 of retainer 37 is slidably inserted into the recess 35, and the coupling 15a is turned onto the threads 27 of shaft 14a, moving into the recess 40 of the retainer 37 with lugs 42 in grooves 41. The rotation of the coupling 15a continues until the forward end 43 abuts the interior face 44 of the recess 40 to complete attachment of the guide 29 onto shaft 14a. The length of the elements constituting the guide 29 is such that the coupling 15a moves onto the threads 27 of the shaft 14a inside the body 22 to lock the guide in position with sufficient length of coupling outstanding to receive the threaded end 27 of the next shaft 14 in the string.

While the showing herein describes a guide which is attached to the forward shaft 14a of the drill string adjacent the bit 16, such guide may be adapted for use with an intermediate shaft member 14 of the drill string, with but slight modifications of the construction shown. One modification would be to use a guide having each end constructed in the same manner or in a manner similar to the rearward end of the guide 29. The similarities between such a modified construction and that shown renders it unnecessary to provide additional drawing elaborating upon the mounting of a guide 29 upon an intermediate shaft 14.

My improved bit 16 is formed as a generally cylindrical member having a threaded socket 28a at the back side thereof which is adapted to receive the threads 27 of a drill shaft 14 and permit the end of the shaft 14 to abut against the bottom face 28 of the socket and a shoulder 21, also at the back side, as hereinbefore described. The forward end of this bit expands in section to support and carry a plurality of cutting flanges 16a, generally four as shown. The cutting flanges are hardened metal inserts and are rectangular in shape, with the forward side being sharpened to form a leading edge 45. Each flange extends radially beyond the expanded bit

4

body to define the hole diameter, and as the rear outward corner 46 of this extended portion is formed as a sharp square edge as shown, the peripheral side thereof being at the diameter of the hole. The peripheral side face of each flange 16a thereby lies in spaced parallelism with the axis of the shaft with the rear outward corner 46 being at the diameter of the hole to provide a cutting action when backing the bit out of the hole.

While I have herein described a preferred construction of my invention, it is apparent that alternatives and equivalents of construction and arrangement of elements will occur to those skilled in the art which are within the scope and spirit of my invention, and hence it is my desire that I be limited in my protection not by the illustrations and descriptions, but only by the proper scope of the appended claims.

I claim:

1. In combination with a rock drill having a shaft section carrying a bit at its forward end and a coupling sleeve threaded on its rearward end, a guide including a tubular member adapted to snugly encase the shaft section, a tubular connector, including a rearwardly extending boss, adapted to be threaded on to the forward end of the shaft section and to abut against the bit, a threaded recess within the end of the tubular member adapted to be threaded on to the boss, whereby the member is affixed to the forward end of the shaft.

2. In combination with a rock drill having a shaft section carrying a bit at its forward end and a coupling sleeve threaded on its rearward end, a guide including a tubular member adapted to snugly encase the shaft section, means for attaching the guide to the forward end of the shaft section and abutted against the bit, a cylindrical recess in the rearward end of the guide, a retainer adapted to be inserted into the recess and abut against and be rotatable within the guide, said retainer having a recess including an internal seat adapted to receive said coupling sleeve against the seat and cooperating guiding means carried by the coupling and the retainer adapted to permit interrelative longitudinal movement of the coupling and the retainer but to prevent interrelative rotation thereof.

3. In combination with a rock drill having a shaft section carrying a bit at its forward end and a coupling sleeve threaded on its rearward end, a guide including a tubular member adapted to snugly encase the shaft section, means for attaching the guide to the forward end of the shaft section and abutted against the bit, a cylindrical recess in the rearward end of the guide including an internal seat and being adapted to receive said coupling sleeve and permit said sleeve to be screwed and thereby shifted on its threaded connection to bear against said internal seat.

4. In combination with a rock drill having a shaft section carrying a bit at its forward end and a coupling sleeve threaded on its rearward end, a guide including a tubular member adapted to snugly encase the shaft section, means for attaching the guide to the forward end of the shaft section and abutted against the bit, the rearward end of the guide being recessed, an annular flanged retaining member within said recess, a recess within the retaining member including a seat being adapted to receive said coupling sleeve and being adapted to permit said sleeve to be screwed thereagainst and upon said seat.

5. For a drill having a shaft and a bit of diameter larger than the shaft with a shoulder back of the bit, a guide having a tubular body adapted to snugly encase the shaft, a tubular element threaded into one end of the body and threaded onto the shaft adjacent the bit, whereby to solidly secure the body to the shaft adjacent to the bit, said element including an annular flange between the bit abutting the bit shoulder and said end of the body, the periphery of the body being less than that of the bit and lugs carried on the periphery of the body

and radially spaced thereabout and thereby adapted to center the shaft in a hole drilled by the bit.

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