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R. C. NATER

2,733,943

ROCK DRILL BITS AND RODS

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FIG. 1.

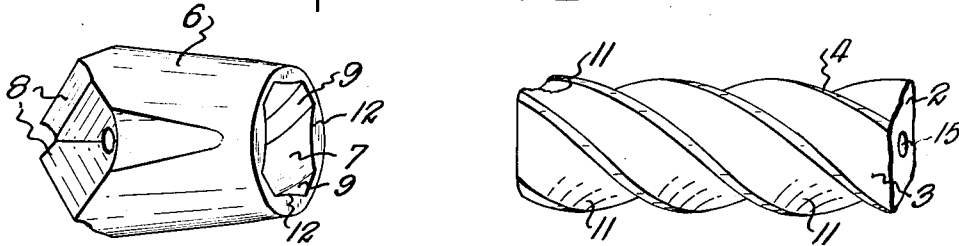


FIG. 2.

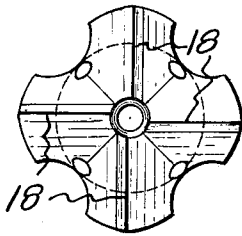


FIG. 3.

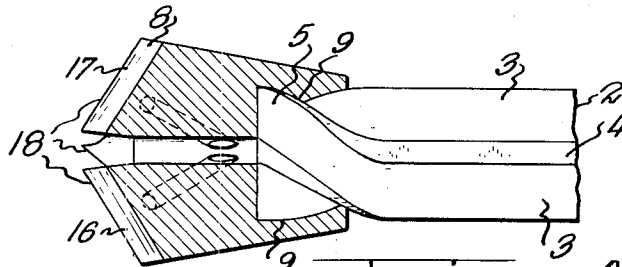


FIG. 4.

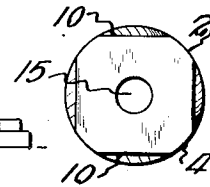


FIG. 6.

FIG. 8.

FIG. 5.

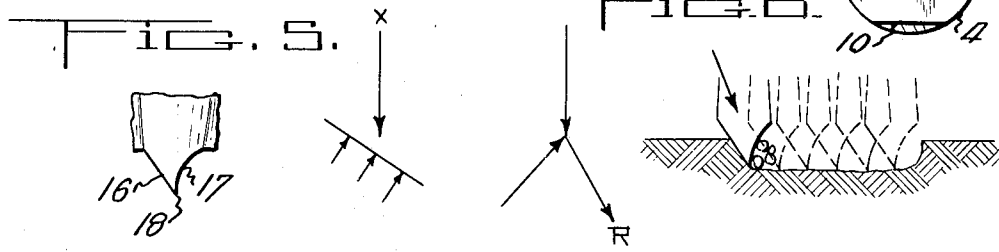
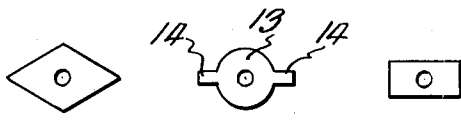


FIG. 7.



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ROCK DRILL BITS AND RODS

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2 Claims. (Cl. 287—125)

My invention relates to improvements in rock drill bits and rods wherein the bit is detachably secured to the end of the drill rod, and the object of the invention is to devise a drill in which the bit may be readily and quickly attached to the rod without the necessity of employing any special tools, the bit and rod being so designed that the rod end is receivable within a socket in the bit and the bit secured in place by being given a quarter turn upon the rod.

A particular object of the invention is to furnish a rod of spiral fluted form wherein the angular contours of the rod are in the form of a spiral approximating a twist of forty-five degrees wherein the rod has a screw formation of maximum coarse pitch; the normal drilling rotation of the rod and the resistance of the bit to such rod turning effecting a locking action of the bit upon the rod.

A further object of my invention is to preferably form the rod of rectangular cross section and wherein the rod is twisted or forged into its spiral form the corner edges of the rod constituting the coarse pitch threads.

Another object of the invention is to so construct the bit that its cutting edges or teeth are particularly designed to set up a rock cutting and cleaving action which produces a resultant force tending to positively retain the bit in its locked position upon the end of the rod; the bit being formed with four radial oblique cuttings edges wherein one face of each edge is flat and the other face of each edge is concave.

With the foregoing and other objects in view as shall appear, my invention consists, in its preferred embodiments, of the construction and arrangement all as hereinafter more particularly described and illustrated in the accompanying drawing in which:

Fig. 1 illustrates a perspective side view of the drill, showing the twisted rod and bit detached from each other.

Fig. 2 is an inverted plan view of the bit.

Fig. 3 is a side view of the drill showing the bit and rod in the connected position, the rod being formed with a single bit entering twist upon its end.

Fig. 4 is an end view of the bit receiving end of a rod.

Fig. 5 is an enlarged fragmentary end view of one of the bit teeth.

Fig. 6 diagrammatically illustrates the rock cutting and wedge action of a drill tooth.

Fig. 7 shows a number of rod cross sectional shapes which may be used in my invention, and

Fig. 8 is a diagrammatic view showing the cutting action of one of my bit teeth, the diagram showing the progressive cutting movement of the tooth in a straight line, though in practice, the cutting movement follows the path of a circle.

Like characters of reference indicate corresponding parts in the different views of the drawing.

My rod 2 as illustrated in Figs. 2, 3 and 4, is of oc-

tagonal cross section consisting of four major sides 3 and four minor sides 4 which constitute the corners of a substantially square rod.

In the form shown in Fig. 1 the rod 2 is twisted along its length in such a manner that the sides and flat corners 4 form flutes having a coarse spiral approximating forty-five degrees.

In the arrangement shown in Fig. 3 the bit receiving end 5 of the rod is the only portion that is twisted, which formation is obtained by twisting the end of the rod one quarter of a turn or through ninety degrees which produces four flutes having a spiral approximating forty-five degrees and similar to the spiral shown in Fig. 1.

The bit consists of a head 6 containing a rod receiving socket 7 and formed with drilling teeth 8 upon its outer end. For receiving square twisted rods of the type shown in Figs. 1 and 3, the socket 7 is of substantially square transverse cross section and formed with four spiral grooves 9 within which the corners or edges 4 of the flutes are received when the rod is turnably inserted into the bit.

When the bit is being attached to the rod, the end of the rod is inserted into the entrance of the socket 7 and the bit given a quarter of a turn in a counterclockwise direction which seats the rod end within the bit socket as illustrated in Fig. 3.

Upon reference to Fig. 4 it will be seen that while the edges 10 of the sides 3 at the end of the rod are straight the spiral corners of the flutes give the twisted rod a cylindrical contour and wherein the rod sides 3 assume the fluting concavities as indicated by the reference numeral 11 in Fig. 1; and that therefore while the socket 7 of the bit is of substantially square transverse cross section its sides 12 are slightly convex to correspond with the concavities of the spiral rod flutes.

While the use of a rod of square cross section is the preferred form of my invention, it will be appreciated that rod of any polyangular cross section shape may be used. In Fig. 7 I show a number of such sections, and in which is included a section 13 wherein the circular center carries a pair of radial fins 14 which form the spiral flutes when a rod of this shape is twisted. The rods are of course formed with the usual water lubricating central bores 15, and may be either twisted or forged into shape.

Upon reference to Figs. 1, 2 and 3, it will be seen that the four drilling teeth 8 upon the socket 7 are obliquely arranged and each formed with one flat face 16 and one concave face 17, which converge to form a cutting edge 18.

Referring to Fig. 6, the vertical blows delivered are represented by the vector X and are resisted at an oblique angle which gives rise to the resultant force R. It will therefore be seen upon reference to Fig. 8 that the cutting edge 18 penetrates in the direction of the main resultant force R, and being an acute angular wedge fractures the rock towards the free face of the cut to produce better breakage and larger chips which are ejected from the cutting zone by the cleavage action.

As the bit delivers its blows and rotates to re-position the cutting edges 18 from the positions shown in dotted lines to the positions shown in full lines in Fig. 8, the rubbing of the back 16 of the edge 18 against the rock shoulder tends to sharpen the cutting edges 18 and maintain the angle of incidence; the pressure against the sloping faces 16 of the teeth of the bit also tending to rotate the bit in a counterclockwise direction whereby it reacts against the right hand spiral flutes and is retained firmly upon the end of the rod.

Although I have shown and described a particular arrangement for the attachment of my bit to my rod and have also shown and described a particular form and

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arrangement of cutting teeth upon the bit, it is to be understood that I do not desire to confine my invention to the specific arrangements specified, and that I may make any such changes or alterations as I may at any time deem necessary, without departing from the spirit of my invention as set forth in the appended claims. 5

What I claim as my invention is:

1. A rock drill bit and rod assembly comprising a rectangular rod twisted less than a complete turn about its longitudinal axis at its bit receiving end whereby the corner edges of the rod are in the form of spiral flutes and the faces of the rod between the flutes are slightly concave, the bit being formed with a drill rod end receiving socket of substantially the same shape and size as the drill rod end. 10

2. A rock drill bit and rod assembly comprising a rod of square cross-section with flattened corners twisted less than a complete turn about its longitudinal axis at its bit receiving end whereby the flattened corners of the rod are in the form of spiral flutes and the faces of the rod between the flutes are slightly concave, the bit being 15

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formed with a drill rod end receiving socket of substantially the same shape and size as the drill rod end.

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