Aug. 21, 1956 G. E. BJÖRKMAN 2,759,705

ROCK DRILLS WITH INSERTED CUTTING EDGES

Filed April 28, 1952

FIG. I.

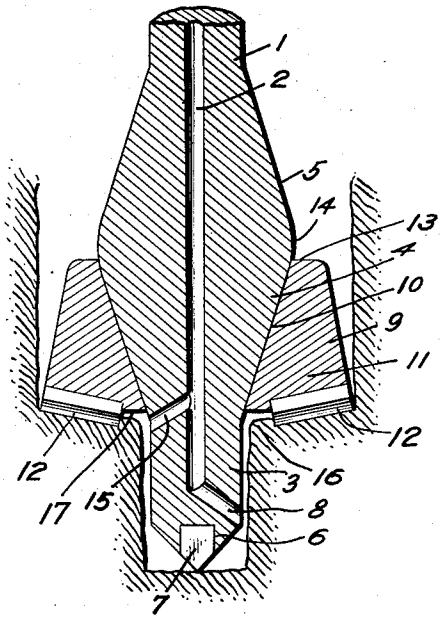


FIG. II.

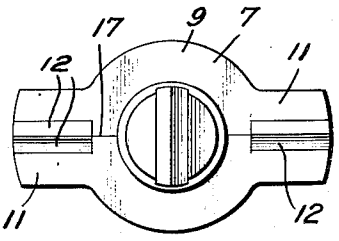


FIG. III.

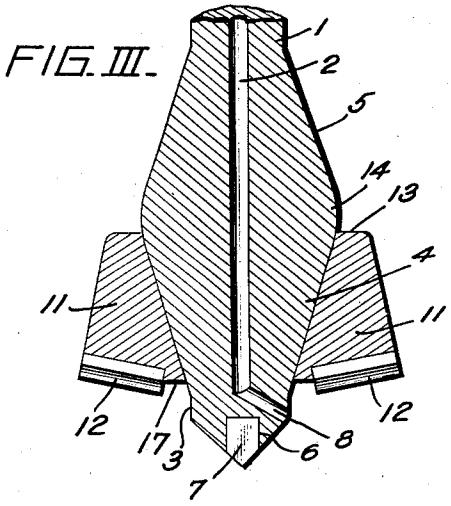
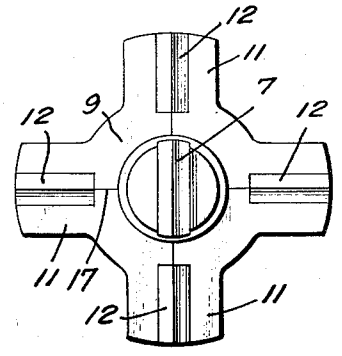


FIG. IV.



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United States Patent Office 2,759,705
Patented Aug. 21, 1956

2,759,705

ROCK DRILLS WITH INSERTED CUTTING EDGES

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Application April 28, 1952, Serial No. 284,747

Claims priority, application Union of South Africa May 1, 1951

2 Claims. (Cl. 255—63)

This invention relates to rock drills or rock drill bits having cutting edges preferably formed of hard inserts brazed or otherwise secured in place.

Rock drills especially those having hard inserts, frequently give trouble due to breakage of the steel at or about the head owing to the deformation the steel of the drill rod has undergone in swelling it to a form required to support the inserts and also due to the subsequent heat treatment to which it must be subjected. Drill bits separable from the drill rod have, therefore, been used, said bits carrying the hard inserts, but in this case the difficulty has been to attach the bit to the rod in a satisfactory manner. A further difficulty has been experienced when a cruciform shape of cutting edge has been made, owing to the necessary restriction of the metal in the body of steel to hold the inserts.

The object of this invention is to provide a cruciform type of drill bit preferably with hard inserts brazed or otherwise fixed in position.

According to this invention the rock drill is provided with a cutting edge at the end of the drill steel and further cutting edges are carried in a separate bit in the form of a ring or sleeve, the drill steel and the sleeve being preferably mutually tapered and united by frictional engagement. In other words, the drill steel and sleeve are so cut that they fit snugly together without the aid of screws or other conventional attaching means. The combined cutting edges have a somewhat cruciform pattern. The water holes are located to direct water to the cutting edge or edges. One or more of the cutting edges may be formed by hard inserts.

In a preferred form of the invention the drill rod is bumped up to form a swelling or enlarged cross sectional area some distance back from the normal cutting edge. Said enlarged area tapers backwardly at a suitable angle to leave the end of the steel substantially in its normal size and shape. The maximum diameter of the enlarged area is smaller than the reaming size of the finished bit to allow clearance for sludging. It will be understood that the swelling will taper both ways therefore leaving no shoulder. It will be apparent from Figures 1 and 3 that the swelling or area having an enlarged cross section constitutes the medial portion drill rod. The drill rod tapers from its medial portion to its narrower terminal portions.

An example of the cutting end of a drill according to this invention is illustrated in the accompanying drawing in which:

Fig. I is a section of the cutting end of a drill penetrating into a hole in rock;

Fig. II is a bottom plan view of the drill shown in Fig. I;

Fig. III is a side elevation of the cutting end of a drill showing a modification, and

Fig. IV is a bottom plan view of the drill shown in Fig. III.

In the drawings the drill rod **1** is shown as a normal round rod of hollow steel having a hollow core **2**.

A little distance back from the end **3** of the drill rod it is bumped up to make the tapered swelling or enlarged area **4** and then tapers rearwardly at **5** to the normal diameter of the rod **1**.

A diametrical cut **6** is made at the end **3** for the reception of a hard insert **7** which will normally extend at least the full width across the diameter of the steel and may be slightly longer to provide a reaming side edge. The end **3** of the drill rod **1** may be finished off as a normal chisel bit as shown.

The insert **7** when used would normally block the hollow core **2** or water hole and, therefore, a subsidiary hole **8** is made to come out on the side of the drill at right angles to and just below the bottom of the insert **7**.

The further cutting edges for the bit according to this invention are formed on a sleeve **9** having a tapered bore **10** to fit the forward portion **4** of the enlarged portion of the drill **1**. Its outside shape may be circular with a diameter sufficient to give it strength to resist bursting under the wedging effect of the taper. In addition it usually has, as shown, two or more winged extensions **11**. If two extensions **11** are provided as shown in Fig. II, they are formed diametrically opposite one another and have a diametrical dimension equal to the diameter of the required drill hole. In any case said diameter will be larger than the diameter of the enlarged portion **4** of the rod **1**.

The end of the drill rod **1** and the sleeve **9** may have their cutting edges formed directly thereon, but usually and as shown, these parts are slotted for the reception of hard inserts **12** and the surface of the sleeve is frequently given a chisel bit form. Said inserts **12** may extend the full width of their respective wings **11** or remain somewhat short as shown in Fig. I.

To form the required drill the two members namely the drill rod **1** having a hard insert **7** at its end **3** and an enlarged portion **4** some little distance from its end, and a sleeve **9** with cutting edges and/or inserts **12**, are fitted together as shown in Figs. I and III. The sleeve **9** fits the taper **4** at the end **3** of the drill **1** so that its end **13** is located substantially at the point **14** of the largest diameter of the swelling. A second water hole **15** will preferably open directly opposite the inside of the cutting edges, that is, as shown, the inside ends of the inserts **12** in the sleeve **9**. The assembled drill does not give a truly cruciform pattern, but rather the form of two chisel bits with their cutting edges at an angle to one another, as shown in Fig. II, but with the centre one occupying a fraction of the total width of the cutting face.

The centre or drill rod **1** may project from the top of the sleeve **9** any suitable distance as shown in Fig. I, which distance may vary from practically nothing to the width of the drill rod **1** or even more.

In use the middle portion may be made to act as a centre bit during drilling operations. Such a drill bit tends to keep the drilled hole straight. Also, once the centre is cut the rock around the edge is more easily broken away than when the whole face is struck by the full cruciform face of a drill of the same size and, therefore, the expense of providing inserts **12** instead of cutting edges formed directly on sleeve **9** may be avoided.

It will be noticed that in Fig. I the portion **16** of the rock around the drilled hole is not directly struck by the cutting edges **7** or **12**. The reason is that it has been found in practice and when drilling most types of rock, the drilling will go faster if the ring portion **16** is left to break away without any direct impact from the cutting

edges **12**. In most cases the width of the rock forming the ring **16** should be about 3/16 of an inch.

Figs. III and IV show a modification in which the ring **9** has four wings **11** and inserts **12**.

The number may be three if desired or any other convenient number. In these figures the end **3** of the drill rod **1** projects only a short distance from the sleeve **9**. The construction makes a very strong drill bit.

There is another advantage, common to the various constructions namely, that if the middle cutting edge **7**, that is the one on the drill rod, breaks, the sleeve **9** may be knocked off and used on another drill rod **1**, and vice versa if it is the sleeve **9** which becomes broken.

With this invention during drilling operations the blow on the drill is transmitted to the drill face direct through unbroken metal by the centre cutting edge **7** which acts as a pilot drill. If desired, the sleeve **9** may be soldered or brazed in place by a soft solder or other easily fusible metal.

Round hollow drill steel has been used in the bit described, but any other type of steel having an hexagonal or other cross section may also be used.

The sleeve **9** as well as the drill rod **1** and the wings **11** are individually shaped to conform about the cutting edges **7** or **12** to a chisel bit or wedge shaped end face, the wedge shaped end portions of the sleeve being designated by the reference character **17**. They may also be made to conform to a cruciform or any other type of multiple cutting bit.

In operation the cutting edge **7** on the drill rod guides the drilling operation. The radial cutting edges **12** disposed on the wings **11** of the sleeve **9** at a distance from the drill rod leave a ring portion **16**, shown most clearly in Figure I, about the drill rod. Each end portion **17** is disposed between the radial cutting edges **12** and the drill rod. The end portions **17** of the sleeve crush or crumble this ring of rock as the drilling proceeds downwardly. Thus this disposition of radial cutting edges, a central cutting edge, and a non-cutting crumbling portion on the lateral forward portion of the wings brings about a rapid and efficient cutting.

This invention provides a drill bit with hard inserts in which the rod behind the bit is strengthened and the body of steel around the inserts is strongly supported and in which the central part of the drilling blow is transmitted through a hard insert and a length of unbroken or homogeneous metal.

I claim:

1. A rock drill comprising a drill rod, the medial portion of said drill rod having a greater cross-sectional area than the terminal portions, said rod tapering forwardly and rearwardly from said medial portion to a point spaced from said terminal portions, a central cutting edge disposed at the forward end of said rod, said cutting edge having a length substantially equal to said end of said drill rod, a removable sleeve having a bore complementary to said tapered portion of said drill rod and frictionally engaged with said forward tapering portion of said drill rod, wings extending laterally from said sleeve, the forward portion of each of said wings being wedge shaped to provide a radial cutting edge laterally disposed from said drill rod and advanced forwardly from said sleeve and the portions of said sleeve between said radial cutting edges and said drill rod being wedge shaped whereby in use a ring of uncut material is formed between said central cutting edge and said radial cutting edges which is crushed by the wedge shaped portions of the sleeve.

2. A rock drill comprising a hollow drill rod, the medial portion of said drill rod having a greater cross-sectional area than the terminal portions, said rod tapering forwardly and rearwardly from said medial portion to a point spaced from said terminal portions, a diametrical slot disposed across the forward end of said rod, a hard insert accommodated within said slot to provide a central cutting edge, said central cutting edge having a length substantially coextensive with the diameter of said forward end of said drill rod, a removable sleeve having a bore complementary to said tapered portion of said drill rod and frictionally engaged with said forward tapered portion of said drill rod, wings extending laterally from said sleeve, the forward portion of each of said wings being wedge shaped and provided wtih a radial slot, a hard insert accommodated within each of said radial slots and disposed from said drill rod to provide a plurality of radial cutting edges, said radial cutting edges being advanced forwardly from said sleeve, and the portion of each wing disposed between said radial cutting edge and said drill rod being wedge shaped, whereby in use a ring of uncut material is formed between said central cutting edge and said radial cutting edges which is crushed by the portion of said sleeve disposed between said radial cutting edges and said drill rod.

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