Oct. 26, 1937. R. J. KILLGORE 2,097,030

ROCK DRILL BIT

Filed Dec. 15, 1934

Fig. 1.

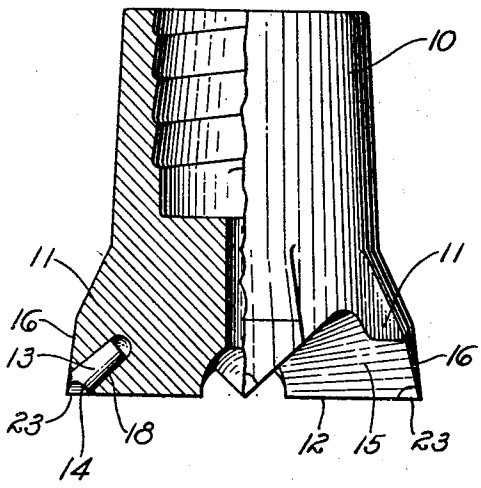


Fig. 3.

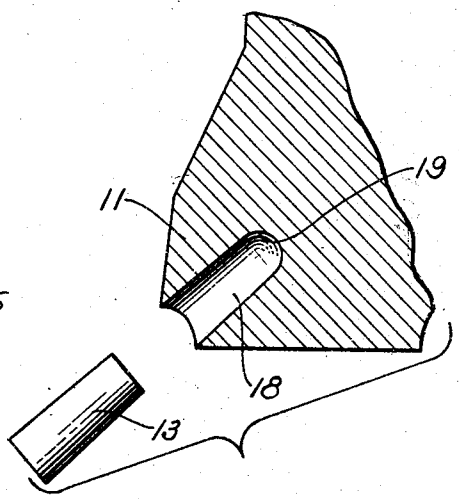


Fig. 2.

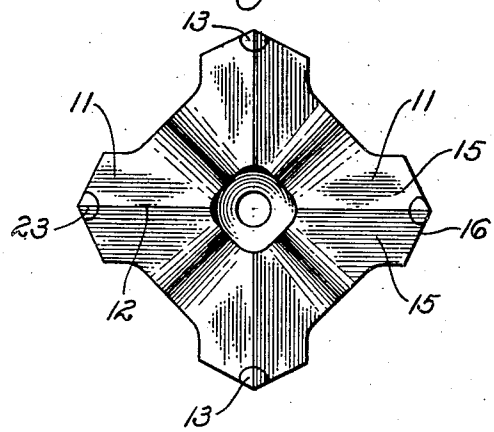
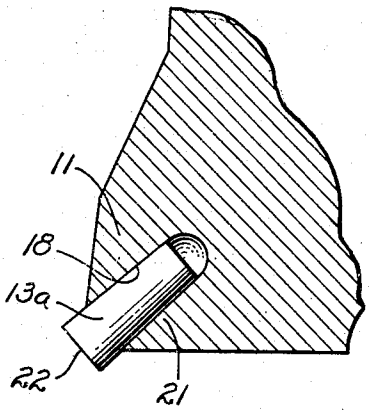


Fig. 4.



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ROCK DRILL BIT

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10 Claims. (Cl. 255—64)

My invention relates in general to percussion drilling tools, and relates in particular to percussion rock bits of the type ordinarily employed in quarrying and excavating.

The invention may be used with percussion bits in which the cutting edges are formed on the lower end of a drill stem or bar or are formed on a removable head adapted to be secured to the lower end of the drill stem or shank. The first rock bits were made by forming the forward end of a bar of metal to a desired chisel form or to what is termed "star form". The cutting edges of such bits, being subject to very severe conditions of operation, rapidly dulled so as to make frequent resharpening necessary. To effect a saving over the old practice of resharpening cutting edges which were forged on the end of a bar of bit steel, we now find it relatively common practice to employ a drill stem or shank having a threaded lower end to which the rock bit or cutter is screwed.

It is an object of my invention to provide a further advance in the art of drilling by the use of percussion bits by the production of a rock bit having cutting edges which will drill further and maintain the gauge of the hole longer than the standard types of rock bits now employed.

Where a deep hole is to be drilled, it is customary to start the hole with a large bit and to decrease the size of the bit as the depth of the hole increases. In such drilling operations it is important that the diameter of hole drilled by each bit shall be maintained as long as possible so that the bit diameters will not have to be decreased too rapidly for the depth of hole desired.

It is an object of the invention to provide a bit capable of maintaining its gauge for a longer period of time than standard bits and capable of decreasing its gauge at a slower rate than standard bits.

I have found that my new bit drills a much greater depth of hole than standard bits before becoming completely worn out. This beneficial result is in part effected by the ability of the bit to hold its gauge for a long period of time. The drilling of the hole is accomplished by the action of the cutting edges on the bottom of the hole, and my bit, by maintaining the gauge of hole so that the bit may move relatively freely, enables the striking of a harder and sharper blow on the bottom of the hole, with the result that the drilling operation is conducted with greater rapidity and at a material saving in time, power, and labor.

It is an object of the invention to provide a percussion type drill bit having downwardly and outwardly disposed hard metal inserts which preserve the gauge of the hole drilled.

A further object of the invention is to provide a bit of the above character in which the hard metal inserts are tapered inwardly and are seated in tapered openings formed in the bottom of the bit. I find that best results are obtainable where these tapered inserts do not bottom in the tapered openings and are accordingly held against being driven into engagement with the bottoms of the openings by the tapered side walls of the openings. Hard metals are ordinarily relatively brittle and tend to crystallize when subject to severe pounding action to which they are subjected in drills of this character. I find that breakage of the inserts is nearly entirely avoided by holding such inserts under very heavy radial compression, which is preferably obtained by seating tapered inserts in tapered openings so that the walls of the openings press forcibly against the inserts and tend to compress the inserts radially as well as prevent or resist inward movement of the inserts in their tapered openings. These inserts are preferably placed in the openings while the bit bodies are heated, but they may be pressed into the openings under great force.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawing, which is for illustrative purposes only,

Fig. 1 is a partly sectioned elevational view of a rock bit embodying my invention.

Fig. 2 is a bottom plan view corresponding to Fig. 1.

Fig. 3 is an enlarged fragmentary section showing an opening or recess prepared to receive a hard metal insert.

Fig. 4 is a fragmentary sectional view showing an insert in the opening prior to the grinding of the insert to conform to the configuration of the bit.

In Fig. 1 I show my invention embodied in a conventional detachable rock bit 10. Such bits are made with forged extensions 11 which will be hereinafter referred to as wings. The lower edges of the wings 11, whether there be two or more in number depending upon the size of the bit, are sharpened after the manner of chisels to provide downwardly faced cutting edges 12 which are driven sharply against the

bottom of the hole to be drilled so as to crush the material which is being penetrated.

In the form of my invention shown, hard metal inserts 13 are mounted in the bit body 10 in such a manner that the lower ends 14 of the inserts 13 will be downwardly presented in cutting position. It is preferable to so place the inserts 13 that the lower, or outer, ends thereof will lie in and form part of the cutting edge. It is an especial feature of the invention that the inserts 13 are disposed in downwardly and outwardly sloping diagonal relation and are in such position that the lower ends 14 thereof form the corners or outer extremities of the cutting edges 12. Accordingly, these hard metal inserts may be made from selected metals in accordance with the materials to be penetrated, such, for example, as high speed steels, tungsten carbide, etc. The inserts 13 may, as shown in Figs. 1 and 2, be formed or ground to conform to the faces 15 forming the cutting edges and the end faces 16 of the wings 11. Each insert, having its exceptional wear resisting qualities, resists reduction of the gauge of the bit, and in addition to this valuable effect enables the bit to render a greater service in actual penetration of the material or formation in which the hole is being drilled.

In the preferred practice of making a bit in accordance with the principles of my invention, the body 10 is first formed from a steel which is selected for its toughness. Depending upon the diameter of the bit, two or more wings 11 may be formed on the bit body 10. In the drawing I have shown a bit body 10 of medium size having four wings 11. Extending inwardly from the outer corner of each wing 11, a diagonal opening 18 is formed, as shown in Fig. 3, such opening being tapered inwardly and having a rounded bottom 19. As shown in Fig. 4, an insert 13*a* is secured in each opening 18.

The insert in its original form as shown at 13*a* in Fig. 4 is sufficiently larger in diameter than the opening 18 that the insert 13*a* will be firmly gripped by the side walls 21 of the opening 18 and will resist inward movement of the insert under the ordinary conditions of operation encountered in the use of the bit. A preferred method of installing the inserts 13*a* in the openings 18 is to heat the bit body 10 so as to expand the same. The inserts are then forced into the openings to their desired positions, and the bit body is allowed to cool so that the walls 21 of the openings will shrink around or upon the inserts and place the inserts under a very heavy radial compression. If the inserts 13*a* are initially made with the ends thereof blunt as shown at 22 in Fig. 4, the inserts after installation in the openings 18 may be ground off to provide relatively sharp corners 23, as shown in Figs. 1 and 2. I am cognizant of the fact, however, that where exceptionally hard metal or alloy is employed in the inserts, it may be advisable to originally form the inserts with the ends thereof sharp.

I have found that where the inserts 13 are held in the openings 18 by the gripping action of the tapered side walls 21 of the openings 18, and without the inner ends of the inserts bottoming in the openings 18, shattering of the inserts rarely occurs. I do not intend to present the idea that the inserts must be at all times prevented from resting on the bottoms of the openings, as I am aware that in certain uses of my invention the inserts may be made of a material of such character that the inserts will not readily shatter in the normal use thereof. I believe, however, that it is at all times advisable to have the side walls 21 of the openings in constricting or compressing relation to the inserts which are held in the openings.

Although I have herein shown my invention in simple and practical form, it is recognized that certain parts or elements thereof are representative of other parts, elements, or mechanisms which may be used in substantially the same manner to accomplish substantially the same results; therefore, it is to be understood that the invention is not to be limited to the details disclosed herein but is to be accorded the full scope of the following claims.

I claim as my invention:

1. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having a downwardly projecting wing with a downwardly faced cutting edge; and an inwardly tapered hard metal insert carried in a tapered opening in said wing in such position that the outer end of said insert will form a part of said cutting edge, said insert being of such length that it does not bottom in said opening and is held against inward movement in said opening by the side walls of said opening.

2. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having downwardly extending wings in opposed relation, said wings having downwardly faced cutting edges with diagonally inwardly and upwardly sloped openings leading from the outer ends of said cutting edges; and an insert of hard metal secured in each of said openings so that the outer end of each insert forms a corner of the wing in which it is secured.

3. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having downwardly extending wings in opposed relation, said wings having downwardly faced cutting edges with diagonally inwardly and upwardly sloped openings leading from the outer ends of said cutting edges; and an insert of hard metal secured in each of said openings in downwardly and outwardly sloping relation so that the lower end thereof forms a corner of the wing in which it is secured.

4. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having a downwardly extending wing with a downwardly faced cutting edge with a diagonally inwardly and upwardly sloped opening leading from the outer end of said cutting edge; and an insert of hard metal secured in said opening in downwardly and outwardly sloping relation so that the lower end thereof forms the corner of said wing.

5. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against

the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having downwardly extending wings forming cutting edges the outer ends of which define a circle, there being a diagonal opening extending inwardly from the outer end of each cutting edge, said openings being characterized by being open only at their ends; and a hard metal insert secured in each of said openings, the outer ends of said inserts lying in said circle and operating to maintain the gauge of the hole cut by the rock bit.

6. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having downwardly extending wings forming cutting edges the outer ends of which define a circle, there being a diagonal, inwardly tapered opening extending inwardly from the outer end of each cutting edge; and a tapered hard metal insert secured in each of said openings, the outer ends of said inserts lying in said circle and operating to maintain the gauge of the hole cut by the rock bit.

7. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having downwardly extending wings forming cutting edges the outer ends of which define a circle, there being a diagonal opening extending inwardly from the outer end of each cutting edge, said openings being characterized by being open only at their ends; and a hard metal insert secured in each of said openings, the outer ends of said inserts lying in said circle and operating to maintain the gauge of the hole cut by the rock bit, said inserts being placed under radial compression and being held against inward movement in said openings by the side walls of said openings.

8. A percussion rock bit of the character described, for use with means adapted to impart impact to the bit so as to drive the same against the material to be drilled, comprising: a body having means for connecting it to said means for imparting impact and having downwardly extending wings forming cutting edges the outer ends of which define a circle, there being a diagonal, inwardly tapered opening extending inwardly from the outer end of each cutting edge; and a tapered hard metal insert secured in each of said openings, the outer ends of said inserts lying in said circle and operating to maintain the gauge of the hole cut by the rock bit, said inserts being placed under radial compression and being held against inward movement in said openings by the side walls of said openings.

9. A percussion rock bit of the character described, comprising: a body having downwardly extending wings forming cutting edges the outer ends of which define a circle, there being a diagonal opening extending inwardly from the outer end of each cutting edge; and a hard metal insert secured in each of said openings, the outer ends of said inserts lying in said circle and operating to maintain the gauge of the hole cut by the rock bit, said inserts being of such length that the inner ends thereof do not bottom in said openings, and said inserts being held against inward movement in said openings by the side walls of said openings.

10. A percussion rock bit of the character described, comprising: a body having downwardly extending wings forming cutting edges the outer ends of which define a circle, there being a diagonal, inwardly tapered opening extending inwardly from the outer end of each cutting edge; and a tapered hard metal insert secured in each of said openings, the outer ends of said inserts lying in said circle and operating to maintain the gauge of the hole cut by the rock bit, said inserts being of such length that the inner ends thereof do not bottom in said openings, and said inserts being held against inward movement in said openings by the side walls of said openings.

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