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DETACHABLE BIT

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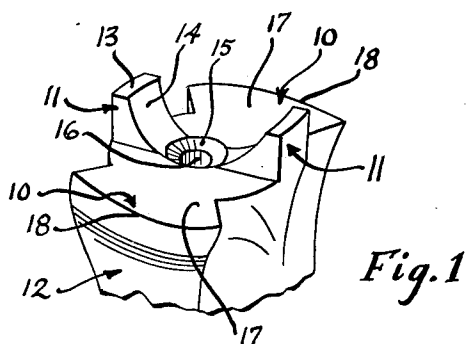


Fig. 1

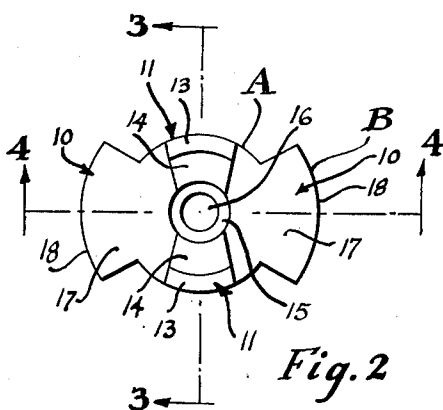


Fig. 2

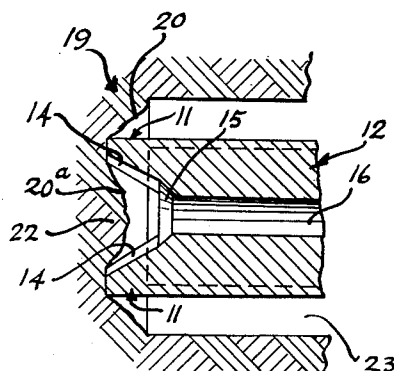


Fig. 3

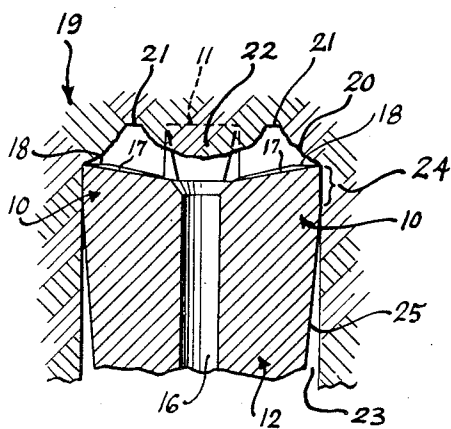


Fig. 4

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## DETACHABLE BIT

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2 Claims. (Cl. 255—64)

1

This invention relates to detachable bits and more particularly to the cutters thereof.

A bit of any conventional type which has its cutting edges coming into percussive contact with the entire face of the hole being drilled as the steel rotates pulverizes most of the rock removed and by so doing unnecessarily dissipates the percussive energy of the machine as well as breaking up and pulverizing of the rock to a smaller size than is necessary. Thus, the leading cutters of conventional drill bits are not as efficient as may be desired and further, as a result of the pulverizing of the rock, the bit may choke in the hole being drilled or the pulverized material may interfere with cutting of the rock by packing against the cutting faces of the cutters.

It is the prime object of the present invention to provide a bit having leading and lagging cutters, the leading cutters being designed to break the rock with a minimum of pulverization.

Another object of the present invention is to provide a drill steel bit in which the leading cutters thereof are disposed in annularly spaced apart relation to the central coolant or flush bore of the bit such that upon rotation of the bit in drilling operations pulverization is eliminated in the central areas of the cutting face of the bit to avoid clogging.

A further object of the present invention is to provide a drill bit of this type which is capable of greater penetration per blow of the driving machine.

A still further object of the present invention is to provide a detachable drill bit as before, the disposition of the cutters of my invention being capable of being forged on conventional detachable bits or standard steel, disposition of the cutters being of such a nature that the same may easily be reconditioned.

With these and other objects in view, the present invention generally comprises a conventional bit stock having lagging cutting means herein-after called reamers designed to finish a hole to the desired diameter. The reaming cutters present cutting edges which constitute only a portion of the total circumference of the hole being bored. Leading cutters are provided and extend in advance of the reamers formerly described from the drill body to present cutting faces to the rock being drilled which are disposed in annularly spaced apart relation to the full diameter of the hole and the central coolant bore of the drill body. The leading cutters are designed to make an annular cut in the rock being drilled of lesser diameter than the full diameter of the hole desired and to efficiently cut away the rock by chipping and breaking.

2

Other objects of the present invention will be revealed by a study of the following specification taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a perspective view of the cutters of a bit face according to my invention.

Figure 2 is a plan view of the cutters of Figure 1.

Figure 3 is a sectional view of Figure 2 on the line 3—3 thereof, also revealing the nature of a cut made in the body of rock.

Figure 4 is a sectional view of the bit of Figure 2 on the line 4—4 thereof, showing particularly the function of the reamers of the bit in clearing the hole being drilled to the full dimensions desired.

Referring to the drawings, cutters fashioned according to my invention are shown in Figure 1 wherein it will be observed that the reamers 10 are designed to cut the full diameter of a hole, the advanced cutting being accomplished by leading cutters 11. The reaming cutters 10 are formed on the full diameter of the bit stock or body of the bit 12 whereas the leading cutters 11 are formed on a reduced diameter portion such as indicated in Figure 2 by the letter A in contradistinction to the full diametric portion B.

The leading cutters 11 are formed on the reduced diametric portion A, the cutting faces 13 thereof terminating inwardly at the line of juncture with the curved plane surface 14 which extends downwardly to meet the countersink 15 at the extremity of the coolant bore 16.

It will be noted that the sloping faces 17 extend outwardly from the countersink 15 and base of cutters 11 to the full diameter of the portion B to form the reaming cutting edges 18. As shown, the leading cutters 11 have their cutting faces 13 projecting considerably in advance of the reaming cutting edges 18 of the bit.

Thus, as shown in Figure 3, the advance cutters when working into a body of rock 19 cause the rock to chip and break away as at 20 and 20a on either side of each cutter, pulverization of the rock being kept to a minimum and only occurring at the point of contact of the cutting faces 13. It must be pointed out, however, that even though some pulverization may occur that packing of the pulverized material is substantially avoided. This is due to the freedom provided between the cutters derived from their wide spaced apart relation and also due to the fact that the actual areas of the cutting faces of the cutters are kept to a minimum.

Upon further referring to Figure 4, it will be observed that a dome 22 is formed in the body of

3

the rock 19 terminating in the annular trough-like cut 21. Leading cutters 11 also cause fracture of rock outside their dimension, leaving the rough face 20 which extends from the annular trough 21 to the full dimension of the bore 23.

The reaming cutters 18 determine the full dimension of the bore 23 and effectively chip away the remainder of the rock designated by numeral 20, the cutters 18 having the desired strength derived from the portion 24 which engages the inner surfaces of the hole 23, excessive friction being avoided by sloping the surfaces as at 25 on the body of the bit.

I have found through experiment that the present type of bit will drill almost twice as fast as conventional cruciform bits and will penetrate more than twice the depth without requiring re-forming or resharpening. This, of course, is due to the fact that the cutters effect penetration into the rock almost entirely by a chipping function, the disadvantages of pulverization and packing being substantially obviated due to the large clearance afforded between the cutters 11 themselves and between the latter and the cutters 10. The cutting face of the bit is of an open nature thereby presenting a minimum of interference to coolant rushing from the bore 16 to wash chips and the like in the face of the drill hole 23 in and about the areas of the dome portion 22.

It will be apparent to skilled persons that many modifications will be possible from the specific form of the cutters shown, in that the leading cutters may have a body of slightly different shape so long as the cutting faces 13 do not extend inwardly such that the dome portion 22 formed thereby in the rock body 19 is not inordinately small. Further, the cutters 10 and cutters 11 may be aligned such that they are not positioned substantially at right angles as is indicated in Figure 2 without greatly effecting the functions achieved by the specific form shown. It is thus evident that many alternatives will be possible and it is, therefore, intended that the present disclosure should not be limiting in any way other than that indicated by the scope of the following claims.

What I claim as my invention is:

1. In a hollow drill bit having a drill body with

4

a central bore, a full diametric portion and a reduced diametric portion, the reduced diametric portion being in advance of the full diametric portion and having leading cutters formed therefrom, the full diametric portion having reaming cutters formed therefrom, the improvement of forming said leading cutters with elongated arc shaped cutting faces, the outer side edges thereof being defined by the outer periphery of said reduced diametric portion, the inner side edges thereof being substantially parallel to said outer side edges, said drill bit being formed with surfaces sloping inwardly from said inner side edges of said cutting faces to said bore.

2. In a hollow drill bit having a drill body with a central bore, a full diametric portion and a reduced diametric portion, the reduced diametric portion being in advance of the full diametric portion and having leading cutters formed therefrom, the full diametric portion having reaming cutters formed therefrom, the improvement of forming said leading cutters with elongated arc shaped cutting faces, the outer side edges thereof being defined by the outer periphery of said reduced diametric portion, the inner side edges thereof being substantially parallel to said outer side edges, said drill bit being formed with surfaces sloping inwardly from said inner side edges of said cutting faces to said bore, the bore of said drill bit being countersunk where it communicates with said sloped surface.

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