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ROCK DRILL BIT

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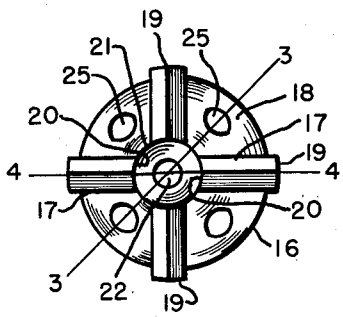

FIG. 2

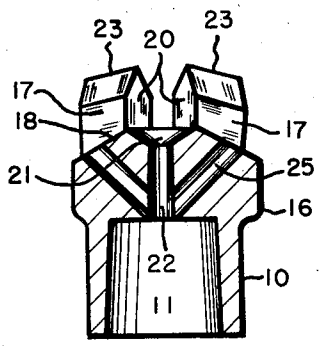

FIG. 3

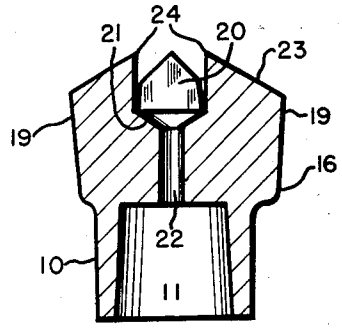

FIG. 4

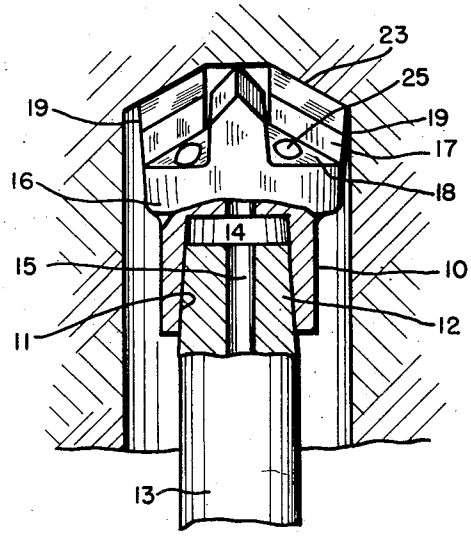

FIG. 1

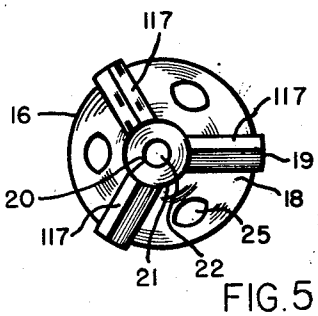

FIG. 5

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ROCK DRILL BIT

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2 Claims. (Cl. 255—64)

This invention relates broadly to drills, but more particularly to that class of drills adapted for use in rock drilling, mining and the like.

One object of this invention is to provide an improved rock drill bit of the off-center type capable of drilling oversize hole with means enabling efficient removal of cuttings before they are recut or pulverized by the bit, thereby resulting in more efficient drilling as well as causing the bit to remain sharp and to maintain a full gauge hole for a longer period.

Another object of this invention is to provide such a bit with cutting edges arranged and disposed in a manner facilitating the start of the hole at the desired location, and thereafter assuring the drilling of a hole in coaxial alignment with the drill rod.

Another object of this invention is to produce an efficient detachable bit which can readily be manufactured at a relatively low cost.

Other objects of this invention will be apparent from the following detailed description wherein similar characters of reference designate corresponding parts and wherein:

Fig. 1 is a side view partly in section of a bit mounted on the end of a drill rod and showing its position relative to the drilled hole.

Fig. 2 is a view of the cutting end of the bit shown in Fig. 1.

Fig. 3 is a longitudinal sectional view taken on line 3—3 in Fig. 2.

Fig. 4 is a longitudinal sectional view taken on line 4—4 in Fig. 2.

Fig. 5 is a view of the cutting end of a bit embodying a modification of the invention.

Referring to the drawing, **10** designates a cylindrical body portion formed with an inwardly tapered flat bottom socket **11** adapted to fit tightly on the correspondingly shaped end **12** of a usual drill rod such as **13**. As clearly shown in Fig. 1, the end of the rod is spaced from the bottom of the socket to form therebetween a chamber **14** from which leads the drill rod passage **15**.

Formed integrally with the body portion **10** and extending axially from the inner end thereof, is a substantially circular head **16** eccentric relative to the body portion **10**. In other words, the axis of head **16** is offset from but parallel to the axis of the body portion **10**, the extent of offset or eccentricity varying with the size of the bit, but being within a range of one thirty-second to one eighth of an inch.

A plurality, four in this instance, of wings **17** extend axially from head **16**, all wings being substantially of rectangular cross section and peripherally spaced equally to form between any two adjacent wings a triangular trough, all of which converge toward the axis of the bit. From the limits of head **16**, each trough leads inwardly between the converging relatively straight sides of two adjacent wings **17**, while the bottoms **18** of the troughs may be defined as portions of a cone extending from the

limits of head **16** toward the free end of the bit as clearly shown in Fig. 3. The wings **17** extend radially beyond the limits of head **16**, with their radial outer ends **19** forming parts of an imaginary circle greater than and coaxial with head **16**. The radial inner ends **20** of the wings **18** fall short of each other to form parts of an imaginary cylindrical recess coaxial with the body portion **10**. At their bases, the inner ends **20** are interconnected by the funnel-shaped bottom end **21** of the cylindrical recess above referred to, which in fact constitutes the inlet end of a central port **22** opening into chamber **14**. The free ends of the wings **17** are straight and outwardly tapered from the outer radial ends thereof to form between any two diametrically aligned wings an included angle preferably of about 120°. The extent of this angle may vary somewhat without materially affecting the efficiency of the bit, but when too small it has been found that the bit had the tendency to wedge itself into the bottom of the hole, and when too large the bit lost the drilling characteristics hereinafter explained. The free or axial ends of the wings are of inverted V-shape with the apices thereof forming cutting edges such as **23**. Like the wings **17**, the cutting edges **23** of course extend radially outward an equal distance beyond the limits of the head **16**, and consequently may be said to have outer ends eccentric with respect to the body portion **10** or the drill rod **13**. The inner ends of the cutting edges **23** fall short of each other a distance equal to the diameter of the funnel-shaped inlet end **21** of the port **22**, and consequently can be defined as concentric with the body portion **10**. As previously stated, the inner ends **20** of the wings **17** form parts of an imaginary cylindrical recess, thereby resulting in laterally concaved and longitudinally straight inner ends parallel to the axis of the body portion **10**, and defining with the inner ends of the cutting edges **23** relatively sharp pointed acutely angular teeth **24**, which teeth are radially spaced equally from the axis of the body portion **10**.

In addition to the central port **22**, the bottom **18** of each trough or space between any two adjacent teeth **17**, is provided with a port **25** extending angularly therefrom into chamber **14** by intersecting the inner end of the central port **22**.

As shown in Fig. 2, the bit is formed with its right hand wing **17** extending radially the greatest distance from the center axis of the body portion **10**, consequently causing the end wall **19** of that wing to be the only one engageable with the wall of the hole. This construction has been found satisfactory in the majority of rock formation. However when drilling in a very abrasive rock, it might be desirable to locate the wings at 45° from the maximum eccentricity of the head, thereby enabling at least two wings to have their outer end walls **19**, which project radially beyond the peripheral wall of the head **16**, engageable with the wall of the hole. Also if desired, the number of wings can be increased, or decreased as shown in Fig. 5, wherein the bit is provided with only three wings **117**.

When a bit constructed according to the invention is placed on the end **12** of a drill rod such as **13** and put in operation, the pointed inner ends **24** of the cutting edges **23** will first contact the face of the rock to start the hole at the desired location. Because these pointed ends are concentric with the drill rod and result in a relatively small combined contact area with the face of the rock, the hole will start without the difficulties heretofore encountered when starting holes with the entire face of the bit contacting the rock, which often caused the bit to walk away from the desired starting point.

Because the cutting edges **23** of the wings **17** are tapered outwardly with the inner ends thereof furthest from

the body portion 10, it will be understood that once the hole is spotted by the pointed ends 24, that is after the drilling of the initial depression by the points 24, the depression or start of the hole will gradually increase both in depth and in diameter until it finally reaches the full diameter of the hole intended to be drilled. This feature is important because it permits the operator to gradually increase the speed of the drilling motor with which the drill is operatively associated with little or no danger of the bit jumping out of spotted or started hole.

The outwardly inclined or tapered cutting edges 23 enable the start of a hole to a diameter equal to twice the radial extent of the shortest cutting edge relative to the axis of the drill rod, before the eccentric portion of the bit can become effective for drilling an oversize hole. In other words, the major portions of the cutting edges 23 encompassed within an imaginary circle concentric with the drill rod 13 and of a radius equal to the radial length of the shortest cutting edge, operate concentrically within the corresponding funnel-shaped bottom portion of the hole to guide or maintain the drill rod and hole in coaxial alignment and obviate any tendency of the eccentric portion of the bit to cause the hole to depart from that alignment.

As the drill rod is connected to the vacuum source of the dust collecting device, not shown, in a manner well known in this art, suction is created within the drill rod passage 15 and chamber 14, causing air together with dust and cuttings to be drawn through the bit passages 22 and 25 to be carried into the dust collecting device. The relatively large space or so-called cylindrical recess provided between the inner ends of the wings 17, together with the funnel-shaped inner end 21 and the passage 22, afford a passageway of ample capacity to effectively convey the cuttings produced by the inner end portions of the drilling edges 23. Preferably the wings 17 are relatively high to produce between any two adjacent wings a trough, all of which are of sufficient depth to afford passageways of ample capacity for effectively conveying the cuttings from the outer end portions of the cutting edges 23 into the angular passages 25, and therefrom into the dust collecting device via the chamber 14 and drill rod passage 15. These features, combined with the oversized hole, have been found very advantageous in entirely eliminating the possibility of the bit becoming stuck in the hole. Even when the bit is used without a dust collecting device, the oversized hole affords ample clearance around the bit to enable the effective removal of the cuttings from the bottom of the hole. When the drilling

dust is accidentally permitted to accumulate and pack on the bit body portion, the resulting dust collar is smaller than the drilled hole and does not prevent the removal of the bit from the hole as heretofore experienced with concentric drill bit of conventional shape.

The operation of the bit shown in Fig. 5 is substantially as above described. In certain rock formation it has been found that a bit formed with only three wings is more efficient than one provided with more wings, while in other formation a bit formed with more than four wings has been found equally efficient. However, for an all around bit, that is one likely to operate satisfactorily in every rock formation, it is preferred to use a four wing bit as shown in Figs. 1 to 4.

I claim:

1. A detachable rock drill bit comprising a body portion formed with a drill rod receiving socket, an integral circular head extending axially from said body portion on an axis offset from but parallel to the main axis thereof, a plurality of integral equally spaced wings extending axially from said head having radial outer ends projecting equally beyond the limits of said head, radially spaced inner ends for said wings each defining a curved surface extending axially from the bottom to the top ends of the wing with every point of said surface equidistant from said main axis, the axial ends of said wings forming cutting edges inclined outwardly with the inner ends thereof furthest from said body portion, and a passage leading from said bottom ends of said wings into said socket.

2. A detachable rock drill bit comprising a body portion formed with a drill rod receiving socket, an integral circular head extending axially from said body portion on an axis offset from but parallel to the main axis thereof, a plurality of integral equally spaced wings extending axially from said head having radial outer ends projecting equally beyond the limits of said head, radially spaced inner end walls for said wings parallel to said main axis, the axial ends of said wings forming cutting edges inclined outwardly with the inner ends thereof furthest from said socket and forming with said inner end walls acutely angular pointed teeth concentric with said socket.

References Cited in the file of this patent

UNITED STATES PATENTS

443,072	Chapman	Dec. 16, 1890
1,118,292	Knapp	Nov. 24, 1914
2,494,188	Meaney	Jan. 10, 1950
2,654,573	Annesley	Oct. 6, 1953