

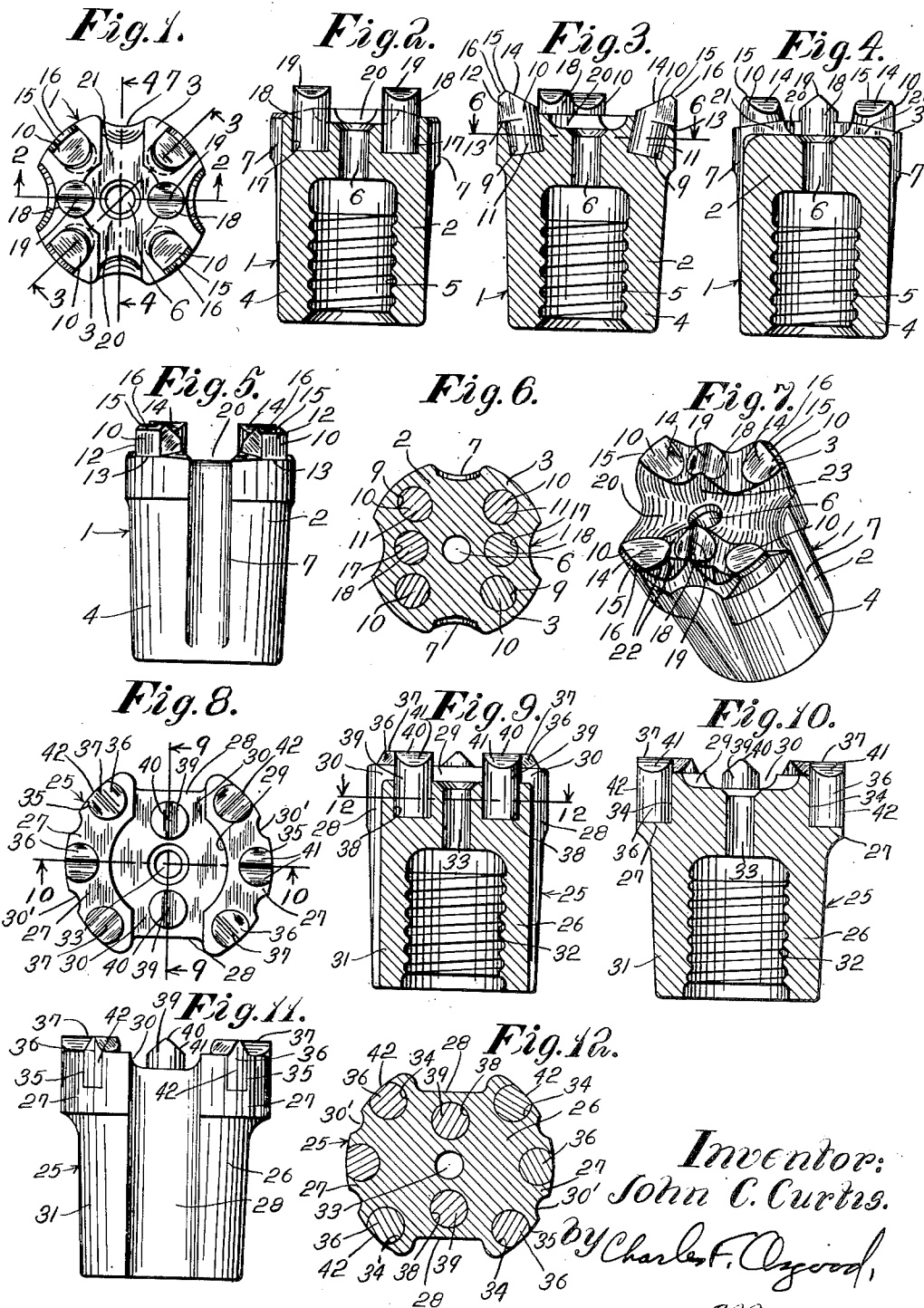
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ROCK DRILL BIT

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ROCK DRILL BIT

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1 Claim. (Cl. 255—64)

This invention relates to rock drill bits and more particularly to rock drill bits of the impact type having hard metal inserts firmly embedded in the cutting face of the bit to provide wear resisting cutting edges.

In rock drill bits of the impact type, it has recently become common practice to secure hard metal inserts, usually of tungsten carbide, in radial slots cut in the cutting face of the bit to provide radial cutting edges, and usually such cutting edges are arranged in generally cruciform relation to provide what is commonly called a cross bit. In drill bits of known types, considerable difficulty has been encountered in the manufacture of such bits, and particularly in the securing of the hard metal inserts in place on the bit face, and frequently the inserts become loosened under the terrific impact action during the drilling operation. It has also been found that if the tungsten carbide inserts become sufficiently loose so that they slide inwardly in the radial slots to cause direct contact between the inserts, the inserts quickly break. The present invention contemplates improvements over such known types of drill bits in that improved structural features are provided which not only tend to reduce loosening of the inserts and avoid undue breakage and completely avoid lateral displacement and resultant direct contact of the inserts, but also a more efficient cutting action is attained due to a novel distribution of the cutting edges on the bit face.

An object of the present invention is to provide an improved rock drill bit. Another object is to provide an improved rock drill bit having hard metal inserts set in a novel manner on the bit face. A further object is to provide an improved rock drill bit of the impact type having hard metal inserts, preferably of tungsten carbide, embedded in the bit face in an improved manner and providing an improved distribution of the cutting edges. Yet another object is to provide an improved rock drill bit having hard metal inserts in the form of pluglike elements, preferably of tungsten carbide, secured as by brazing in bores formed in the cutting face of the bit. A still further object is to provide an improved rock drill bit of the impact type having hard metal pluglike elements, preferably of tungsten carbide, set in bores in the bit face and providing a novel arrangement of the cutting edges whereby an improved cutting action is attained. Still another object is to provide a novel arrangement of the hard metal inserts on the bit face and improved means for firmly securing the inserts in

position whereby any danger of direct contact of the inserts and resultant breakage are avoided. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawing there are shown for purposes of illustration two forms which the invention may assume in practice.

In this drawing:

Fig. 1 is a front end view of a rock drill bit constructed in accordance with a preferred illustrative embodiment of the invention, showing the bit prior to the application of brazing material to the bit face.

Fig. 2 is a central longitudinal sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a central longitudinal sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a central longitudinal sectional view taken at right angles to the plane of Fig. 2, on line 4—4 of Fig. 1.

Fig. 5 is a side elevational view of the drill bit shown in Fig. 1.

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 3.

Fig. 7 is a perspective view of the completed drill bit shown in the foregoing figures.

Fig. 8 is a front end view of a rock drill bit of modified construction.

Fig. 9 is a central longitudinal sectional view taken on line 9—9 of Fig. 8.

Fig. 10 is a central longitudinal sectional view taken at right angles to the plane of Fig. 9, on line 10—10 of Fig. 8.

Fig. 11 is a side elevational view of the bit shown in Fig. 8.

Fig. 12 is a cross-sectional view taken on line 12—12 of Fig. 9.

In the preferred illustrative embodiment shown in Figs. 1 to 7 inclusive, the improved rock drill bit is generally designated 1 and has a body 2 formed with a forward portion of generally cruciform shape providing radial wings 3. The body tapers rearwardly from its winged forward portion and has a rearward skirt 4 formed with an internally threaded socket 5 adapted for attachment to the usual threaded shank of a drill rod. Evidently, the bit body may have a rearward threaded stud instead of the socketed skirt portion for attachment to a threaded socket of a drill rod. The provision of either a threaded socket or a threaded stud for the attachment of a drill bit to a drill rod is common in the art. Formed centrally in the bit body and communicating with the socket 5 is a usual cleansing fluid

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passage 6. The bit body between the bit wings is longitudinally recessed or grooved at 7 to provide passages for conducting fluid and cuttings rearwardly from the bit face during the drilling operation in a usual manner.

Now referring to the improved bit construction, it will be noted that formed, as by drilling or otherwise, in the bit face on each wing is an oblique opening or bore 9, preferably of circular cross section, herein extending outwardly and forwardly at a slight angle with respect to the bit axis, as clearly shown in Fig. 3. These oblique bores open forwardly through the bit face near the outer periphery of the bit and are herein located centrally between the sides of each bit wing. Embedded in the bit body are hard metal inserts 10, preferably of tungsten carbide and of pluglike form. The pluglike inserts have cylindrical shanks 11 firmly secured in the bores as by brazing or silver soldering and firmly abutting the bottoms of the bores. The inserts preferably have enlarged outer portions 12 providing a rearwardly facing shoulder 13 at the juncture of the enlargements with the shanks, and these shoulders abut the forward face of the bit body in the manner shown. The outer enlargements 12 of the plugs have exposed cutting portions formed with plane diagonal faces 14 extending forwardly and outwardly from the bit center and terminating in curved cutting edges 15. The faces 14 may be slightly concaved if desired. The curved cutting edges of the four diagonal inserts 12 lie in a surface of revolution of slightly smaller diameter than the surface of revolution in which the bit periphery lies. Thus the cutting edges lie in a circle concentric with a larger circle in which the curved outer extremities of the wings lie. A narrow curved receding surface 16 extends outwardly and rearwardly from each arcuate cutting edge to the bit periphery, and these receding surfaces preferably lie in a surface of a cone whose apex is located forwardly of the bit face in the axial line of the bit. The arcuate edges constitute chopping edges located near the bit periphery, and the curved receding surfaces 16 constitute wedge surfaces for reducing loss of gauge of the bit and decrease in cross-sectional area of the hole being drilled. Also formed in the bit face, as by drilling, are longitudinal openings or bores 17, likewise preferably of circular cross section, whose axes lie in a diametric plane midway between the pairs of outer diagonal bores. Secured in these bores, as by brazing, as shown in Fig. 2, are cylindrical pluglike hard metal inserts 18, likewise preferably of tungsten carbide. Thus the inserts 18, like the inserts 10, are firmly embedded in the bit body. The inserts 18 have exposed cutting portions providing straight cutting edges 19 lying in said diametric plane. The inserts 18 are preferably located inwardly of the bit periphery nearer to the bit axis than the diagonal inserts 10, and the straight cutting edges are preferably disposed a slight distance in advance of the arcuate chopping edges 15. The front face of the bit body is centrally recessed at 20, as shown in Figs. 1 and 3, and transverse fluid passages 21, formed transversely of the bit face between pairs of the wings, communicate with a pair of grooves 7 so that the cleansing fluid flowing through the passage 6 to the central recess 20 may flow freely across the front face of the bit between the inserts. The completed bit is shown in Fig. 7, and brazing material is applied to the surfaces of the bit face to fill the spaces and crevices, as

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at 22, and built up around the inserts, firmly to secure the inserts in place and to provide smooth flow surfaces between the inserts for the flow of fluid across the bit face. As shown, the brazing material is also built up around the walls of the central recesses 20 at the inner sides of the inserts 18, as at 23. It will thus be seen that the hard metal inserts 10 and 18 are firmly embedded in the bit body, with their exposed cutting portions projecting forwardly from the front face of the bit body, and by the arrangement of the arcuate and straight cutting edges, as disclosed, an improved cutting action is attained.

The modified embodiment of the invention is shown in Figs. 8 to 12 inclusive. In this embodiment, the improved rock drill bit is generally designated 25 and has a body 26 having its forward portion provided with diametrically opposite lateral enlargements 27 of generally arcuate form, and these lateral enlargements are separated by longitudinal side grooves or recesses 28. The bit face is centrally recessed at 29 intermediate the lateral enlargements, and transverse grooves 35, extending across the bit face, connect the central recess 29 with the side grooves 28. Relatively shallow, longitudinally extending side grooves 30' are formed in the outer surfaces of the arcuate enlargements on the exterior of the bit body. The bit body has a rearwardly tapered skirt portion 31 formed with a threaded socket 32 in the manner of the preferred embodiment. A central passage 33 for cleansing fluid connects the socket with the front recess 29. Formed, as by drilling, in the lateral enlargements 27 are openings or bores 34, preferably of circular cross section and which, at their outer sides at 35, cut through the side walls of the enlargements 27. Secured in these bores, as by brazing, are cylindrical pluglike hard metal inserts 36, preferably of tungsten carbide, having exposed cutting portions providing straight cutting edges 37 extending in radial lines toward the center of the bit. There are herein shown three inserts in each lateral enlargement 27, and the centers of the six inserts lie in a circle of smaller diameter and concentric with a circle in which the bit periphery lies. Formed in the bit face, also as by drilling, are circular openings or bores 38 arranged with their axes lying in a diametric line midway between the lateral enlargements 27. Secured in the bores 38, as by brazing, are pluglike inserts 39, preferably of tungsten carbide, having exposed cutting portions providing straight cutting edges 40 lying in said diametric line. The inserts 39 are located nearer the bit center than the inserts 36. In this instance, the cutting edges 37 and 40 of the eight inserts are disposed along the lines of convergence of relatively inclined faces 41, and the edges are coplanar perpendicular to the bit axis. The outer side edges 42 of the inserts 36 at the bit periphery provide wear resisting side reaming edges for maintaining the gauge of the bit. After the inserts have been securely placed in position in the bores on the bit face, the spaces and crevices around the inserts and the inner sides of the inserts are filled with brazing material, in the manner of the preferred embodiment, to embed firmly the inserts in place in the bit body and to provide smooth flow passages across the face of the bit. The shallow side grooves 30' cooperate with the side recesses 28 in conducting the fluid and cuttings away from the bit face during the drilling operation.

As a result of this invention, an improved rock

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drill bit of the impact type is provided with hard metal inserts firmly embedded in the bit body and having cutting edges which are distributed in a novel manner on the bit face to attain an improved cutting action. By the provision of the hard metal inserts of pluglike form set in bores on the bit face in the manner disclosed, the possibility of loosening and lateral displacement of the inserts, resulting in direct contact thereof and breakage, as has heretofore been experienced, are completely avoided. By setting cylindrical pluglike inserts, preferably of tungsten carbide, in bores which extend generally longitudinally of the bit, firm lateral support for the inserts is provided, resulting in an impact type drill bit of stronger construction. By the novel construction disclosed, the hard metal inserts are firmly embedded in the body of the bit with only their cutting portions exposed, resulting in an extremely rugged and durable bit, well adapted to meet the severe demands of service encountered in drilling rock. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms are shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claim.

What I claim as new and desire to secure by Letters Patent is:

In a rock drill bit of the impact type comprising a body having diagonal recesses of circular cross section opening through the forward face of said body near the bit periphery, said recesses having parallel sidewalls and flat bottoms and the axes of said recesses extending forwardly and outwardly at a small angle with respect to

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the bit axis, pluglike tungsten carbide inserts embedded in said bit body and having cylindrical shanks fitting said recesses and bonded in fixed position therein, said inserts having outer lateral enlargements providing rearwardly facing shoulders resting against the front face of said body near the bit periphery and said enlargements having exposed cutting portions projecting outwardly from said recesses and providing arcuate cutting edges lying near the bit periphery in a circle which lies just inside of and concentric with a circle in which the bit periphery lies, and bonding material at the sides and bottoms of said recesses for bonding said inserts in position therein with said insert-shanks resting at their bottoms against said flat recess-bottoms.

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