Oct. 3, 1950 O. PHIPPS 2,524,570

CORE DRILL BIT

Filed Aug. 30, 1946

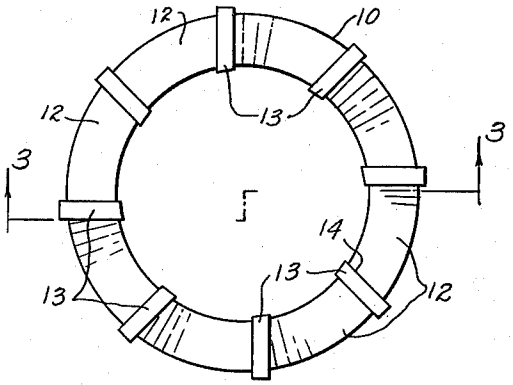


FIG. 1

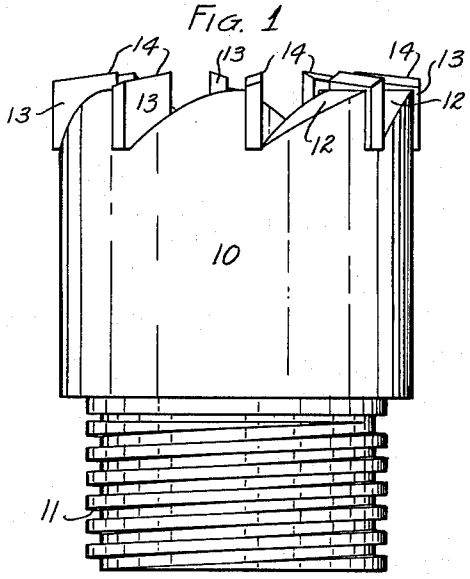


FIG. 2

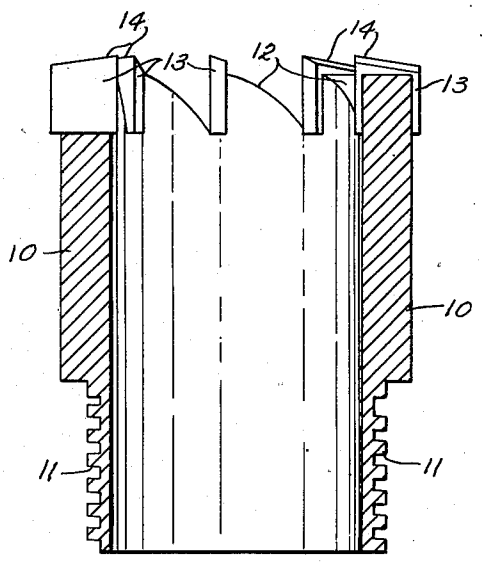


FIG. 3

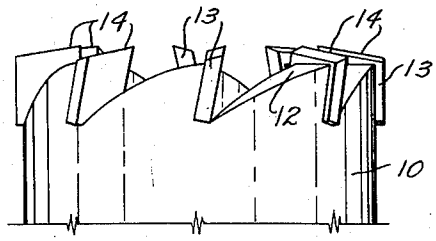


FIG. 4

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Patented Oct. 3, 1950

2,524,570

UNITED STATES PATENT OFFICE

2,524,570

CORE DRILL BIT

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Application August 30, 1946, Serial No. 693,985

3 Claims. (Cl. 255—72)

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This invention relates to bits for core drills of the type commonly employed for the severance and extraction of continuous cylindrical samples of earth strata from considerable depths below the earth surface, and has as an object to provide an improved bit adapted to function as the cutting or core severing element of conventional core-type drill rigs.

A further object of the invention is to provide an improved core drill bit characterized by high operative efficiency and amenability to simple, convenient, repetitious reconditioning in the field.

A further object of the invention is to provide an improved arrangement and operative combination of elements constituting a relatively inexpensive core drill bit of enhanced performance and sustained cutting efficiency.

A further object of the invention is to provide an improved core drill bit that is self-guiding for the development of a straight, true bore and the consequent production of a straight core accurately representing the penetrated strata.

A further object of the invention is to provide an improved core drill bit productive of interior and exterior operating clearances such as obviate sticking or binding of the bit and twisting or like deformation of the core.

A further object of the invention is to provide an improved core drill bit convenient of substitution for conventional and hitherto known bits in and for operative association with rigs and equipment now in use, which in no way alters or interferes with the operation of conventional core lifting adjuncts, which is removable and replaceable relative to the usual actuating drill stocks or lines, and which is susceptible of ready production in a range of sizes and specific forms to meet all field requirements.

With the foregoing and other objects in view, my invention consists in the construction, arrangement, and combination of elements hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawing, in which:

Figure 1 is an end elevation of a typical core drill bit embodying the principles of the invention. Figure 2 is a side elevation of the bit construction according to Figure 1. Figure 3 is a section axially of the improved bit taken substantially on the indicated line 3—3 of Figure 1. Figure 4 is a fragmentary side elevation of the cutting end portion of the improved drill bit as slightly modified within the contemplation of the invention.

Core drill rigs have long been used to explore

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and precisely determine the nature of earth substrata and operate to cut out an annular or tubular bore from about a cylindrical body of the penetrated strata and to lift sections of said body to the surface without alteration in the original relation of the intersected beds, folds, and formations. Such rigs include a vertically-disposed, continuous line or string of tubular sections power-rotatable about its axis and armed at its lower end with a bit presenting a lower annular margin, frequently inset with diamonds, which does the actual cutting or drilling as it is caused to rotate with the line or string and through which the developed core rises within the line or string for elevation, through the agency of lifting adjuncts, with the line or string as the latter is withdrawn from the bore. Bits for the arming of the line or string lower end, as heretofore constructed, are expensive if at all efficient in penetrative effect, short-lived in use, and difficult of reconditioning in the field, and it is to the correction of these prime deficiencies of the usual bits that the improvements of the instant invention are directed.

In the construction of the improved bit, as shown, the numeral 10 designates a tubular body portion formed from any suitable, readily-workable material, such as tool steel, in any convenient manner and to the general form, outline, and proportions common to conventional bit bodies. The body 10 preferably has a maximum exterior diameter equalling that of the string or line wherewith it is to be associated for actuation, an interior diameter the same as or slightly less than that of the said string or line, it being within the contemplation of the invention that the body bore may be very slightly conical instead of truly cylindrical, as is common practice in the construction of conventional drills, a right cylindrical portion adjacent and forming the cutting edge end of the bit, means, such as threads 11, either external or internal, formed at its end remote from the cutting edge to engage and cooperate with complementary means on the drill line or string for the removable and replaceable mounting of the bit assembly on and in rotatably driven association with the line or string, and a radial thickness at its cutting edge end adequate to resist and withstand the forces to which the bit is subjected when operated. All of the foregoing is standard practice, variable as to size, form, and proportions to meet the wide range of associated equipment variation and field requirements, and in and of itself forms no part of the instant invention save insofar as it provides the

support and mounting essential for the improved cutting edge wherein the invention resides.

It is known that certain non-ferrous alloys, such as one comprised from tungsten, titanium, tantalum, nickel, and cobalt, are exceedingly tough, approach the diamond in hardness, do not easily chip or fault, are susceptible of being ground, and are amenable to welding without loss or destruction of their characteristic properties. Such alloys can be formed to desired size and shape, securely attached to and permanently associated with forms and shapes of other metals, and ground and reground while mounted, without need for heat-treating, forging, or tempering, hence are ideally suited for use as durable, long-wearing, rehabilitatable teeth to cut through refractory material encountered by the cutting edges of core drill bits, and are so used, in a novel and effective manner, in the improved bit of the invention.

For rapid-cutting, long-wearing, repetitiously-reconditionable mounting of the non-ferrous alloy teeth on the body **10**, the cutting edge end of said body is divided into a plurality of uniform, angular segments, eight such being shown in the views of the drawing, and each of said segments is worked to present a flat, smooth face, paralleling the body **10** axis in the showings of Figures 1, 2 and 3, on its end leading in the direction of bit rotation and a curved or inclined, axially-projected end surface **12** smoothly interconnecting the outer end of its flat face with the inner end of the flat face leading the next succeeding segment. The segment flat faces, which serve as abutments for the mounting and operative support of the alloy bit teeth, may be radial of the body **10**, tangent to a small circle concentric with said body **10**, parallel to the body **10** axis in either radial or tangential disposition, or inclined to the said body axis with their outer ends leading in overhanging relation with their inner ends, as shown in Figure 4, according to the nature of the material to be penetrated and the preferences of the user, each arrangement having certain functional characteristics which recommend it for use in particular occasions.

Completing the improved bit, a plurality of identical blocks **13** of the characteristically hard, tough, abrasive resistant, alloy material, one for each of the segment flat faces, is formed, each of said blocks having a length exceeding the depth of a segment flat face, a width exceeding the width of a segment flat face, a thickness proportioned to the bit size and alloy material properties to insure adequate strength against shear, and a substantially rectangular outline. As so formed, a block **13** is mounted against and securely welded to each of the segment flat faces, the inner end of each block basing solidly in the correspondingly-worked angle between a surface **12** and the next succeeding flat face, the outer end of each block **13** projecting axially of the body **10** beyond the outer margin of its mounting face, and side margins of each block **13** extending, respectively inwardly and outwardly, beyond the adjacent cylindrical walls of the body **10** to define planes and cutting corners effectively parallel to, longitudinally of, and inwardly and outwardly spaced from the said body walls. With the blocks **13** mounted on and secured to the body **10** segments as shown and described, the outer, axially-projecting ends of said blocks are ground to lie and work in a common operating surface, preferably that of a flat cone coaxial with the body **10** and having its apex directed outwardly of and away from the bit assembly, and the outer end of each block **13** is beveled and inwardly and rearwardly inclined, in the direction of bit rotation, to provide a chisel-type cutting edge **14** in the plane of the block exposed surface and for engagement with the material to be penetrated as the bit assembly is rotated.

When operated in the usual manner on and as the terminal extension of a power-rotated drill string or line, the cutting effect of the improved bit is developed through, and solely by means of, engagement of the block **13** outer ends and inner and outer side margins with the material to be penetrated, all of the wear incident to the drilling operation being imposed on the alloy material blocks or teeth which are natured to resist and withstand it in a manner to protect the less resistant body **10** against any substantial impairment. The parallel, inwardly and outwardly extending side margins of the blocks **13** cut and form a cylindrical channel wherein the following body **10** and drill string or line is freely accommodated without tendency to bind and provide clearances through which the drillings may pass without adverse compacting thereof. The flat cone disposition of the cutting edges **14** cooperates with the block side margin alignment to center and guide the tool in the development of a straight, true bore, concentrates the "bite" of the tool at the inner margin of its cutting orbit, and acts to move the drillings outwardly of the bore and away from the internally accommodated core. Obviously, the effective "bite" of the tool is a function of the block **13** "rake," variable from neutral through several degrees of positive inclination at the time of bit manufacture, and of the tooth cutting edge bevel, which latter may be varied in the field by changing the angle to which the individual teeth are ground and sharpened. Reconditioning, or "dressing," of the tool for rehabilitation after use is a simple matter of grinding, readily accomplished in the field, and may be repeated at need to utilization of substantially the entire effective depth of the blocks **13**, the segment surfaces **12** being ground away as the block length is reduced, thus contributing a remarkably long life of practical use to a given bit unit.

Since changes, variations, and modifications in the specific form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

1. A core drill bit comprising a tubular body of tractable metal connectible as a coaxial terminal extension on and for rotation with a drill string, a succession of uniformly spaced, flat, axially-directed abutments formed in the annular working end of said body to face in the direction of bit rotation, and a block of hard, tough, abrasive resistant alloy material welded to and in covering relation with each abutment face to project in abutment-backed support of its major area at its side and outer end margins beyond the adjacent body surfaces; together with notches intersecting the body annular working end between adjacent said blocks and each extending at an angle from the rear face of a leading alloy block to the root of a trailing block to thereby fully uncover the leading face of the trailing block and provide a single circulatory path for cuttings and coolant.

2. A core drill bit comprising a tubular body of tractable metal connectible as a coaxial terminal extension on and for rotation with a drill string, a succession of uniformly spaced, flat abutments longitudinally intersecting the annular working end of said body to face in the direction of bit rotation, and a cutting element of hard, tough, abrasive resistant alloy material welded to and in covering relation with each abutment face, each of said elements consisting of a substantially rectangular block having parallel side margins, a width exceeding the body annular wall thickness, and a length exceeding the abutment depth, and is disposed in abutment-backed support of its major area for projection of its side and outer end margins beyond the adjacent body surfaces; together with notches intersecting the body annular working end between adjacent said blocks and each extending at an angle from the rear face of a leading alloy block to the root of a trailing block to thereby fully uncover the leading face of the trailing block and provide a single circulatory path for cuttings and coolant.

3. In a core drill bit having a tubular body of tractable metal connectible as a coaxial terminal extension on and for rotation with a drill string, a succession of uniformly spaced, flat abutments longitudinally intersecting the annular working end of said body to face in the direction of bit rotation, and a cutting element consisting of a substantially rectangular block of hard, tough, abrasive resistant, non-ferrous material amenable to welding and grinding affixed, in a face area exceeding that of the individual abutments, to and in covering relation with each said abutment to project in abutment-backed support of its major area at its outer end and side margins beyond the adjacent body surfaces; together with notches intersecting the body annular working end between adjacent said blocks and each extending at an angle from the rear face of a leading alloy block to the root of a trailing block to thereby fully uncover the leading face of the trailing block and provide a single circulatory path for cuttings and coolant.

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