

May 9, 1950

O. PHIPPS

2,507,221

SINGLE EDGE PERCUSSION BIT

Filed Aug. 19, 1946

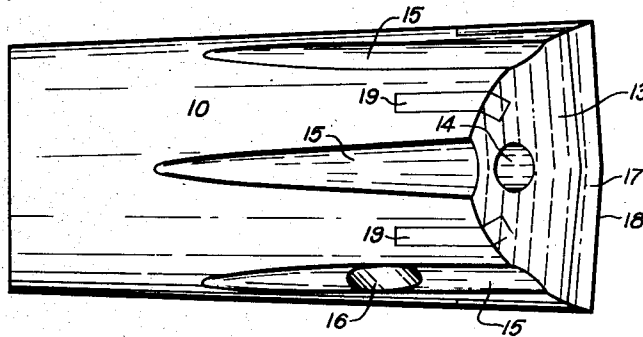


FIG. 1

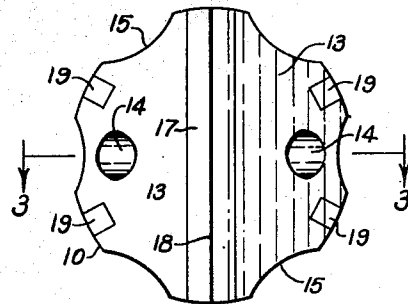


FIG. 2

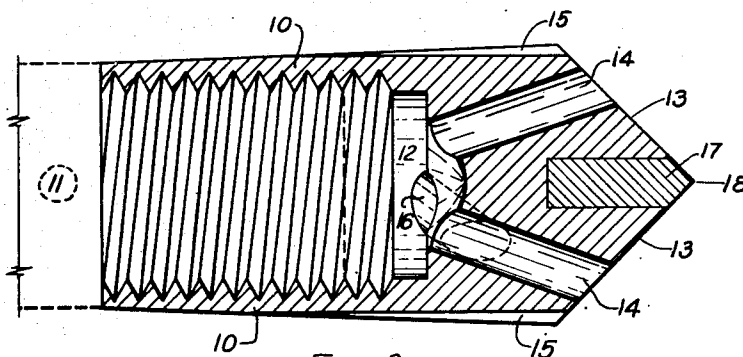


FIG. 3

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2,507,221

SINGLE EDGE PERCUSSION BIT

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Application August 19, 1946, Serial No. 691,512

3 Claims. (Cl. 255—64)

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This invention relates to drills adapted for use in the development of holes or bores in rock, masonry, and the like, and more particularly to such drills in a type reactive to axial percussion for penetrative effect, and has as an object to provide an improved construction and arrangement of elements constituting such a drill.

A further object of the invention is to provide an improved percussion-type drill bit adapted for removal and replacement relative to conventional, variable-length, drill stock.

A further object of the invention is to provide an improved percussion-type drill bit having a single cutting edge diametrically of its working face.

A further object of the invention is to provide an improved percussion-type drill bit having a single, diametric cutting edge and adapted for rotation about its axis as an incident of its use.

A further object of the invention is to provide an improved, single cutting edge, percussion-type drill bit arranged for the development of a bore wherein the said bit is at all times rotatably accommodated.

A further object of the invention is to provide an improved percussion-type, operatively rotatable drill bit arranged for the circulation of cooling and scavenging liquid to and about the drill working face.

A further object of the invention is to provide an improved single cutting edge, percussion-type drill bit which is effectively rapid and highly efficient in use, which evidences a minimum of wear in relation to drilling progress, which is simple and relatively inexpensive of production in an almost infinite variety of sizes and specific forms, which is susceptible of construction as a unit adapted for cooperation with and in mounted relation on various forms and types of conventional drill stock, and which is convenient of successive and repetitious rehabilitation throughout a long life of practical utility.

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 a side elevation of a typical embodiment of the invention in the form of a removable and replaceable drill bit unit. Figure 2 is an elevation of the operating end or working face of the construction according to Figure 1. Figure 3 is a section longitudinally through the previously-illustrated construction taken on the in-

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dicated line 3—3 of Figure 2, a fragment of conventional drill stock being indicated by broken lines in normal operative association with the improvement.

In the construction of the improvement as shown, the numeral 10 designates the principal portion, or body, of the unit assembly, said body being integrally formed in any suitable or convenient manner, as by forging, pressing, or rolling, from tough, hard, abrasive-resistant material, such as tool steel, to the form of a right frustum of an elongated cone, and to the desired diametric and axial dimensions. The body 10 is exteriorly smooth, circular in cross section, and tapers uniformly from a relatively larger working face end to a slightly smaller attachment end corresponding in exterior diameter with the drill stock shoulder against which the unit is adapted to abut. At its attachment end, the body 10 is axially bored, internally threaded, or otherwise worked for such coaction with the worked end of a drill stock length 11 as will serve to operatively mount said body on and as a terminal extension of the drill stock, as is customary practice, the invention contemplating such working of the body 10 attachment end as will permit of removal and replacement of the body relative to the presently known drill stock types and embracing the various usual methods of inter-connecting drill bits to drill stock, such as welding, special and conventional coacting threads, friction and bayonet-type joints, and the like. Whatever be the specific working of the body attachment end for mounting purposes, an axial bore within and opening through the attachment end of said body is extended toward the working face of the bit sufficiently to provide a chamber 12 interiorly beyond the end of the associated drill stock for the distribution of liquid thereto transmitted, in a usual manner, through the bore of the drill stock.

At its working face end, the body 10 is worked to produce a pair of flat, correspondingly inclined, identical faces 13 diverging at any selected angle, chosen according to the nature of the material to be drilled, from a line of intersection diametrically of the body 10 end, and straight bores 14, in size and number suited to the bit size and work to be performed, open from the chamber 12 through each of the faces 13 at points removed from the line of face intersection and provide channels wherethrough liquid delivered to said chamber may be discharged with cooling and washing effect across the faces

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13. Uniformly spaced circumferentially about and intersecting the body 10 exterior surface, a plurality, in this instance six, of cross-sectionally arcuate channels 15 is formed longitudinally of and in axial parallelism with said body, each of said channels hence intersecting and opening through the arcuate margin defining a face 13 junction with the body exterior surface, thereby interrupting the smoothly circular body working end outline, as is clearly shown in Figure 2, and at its other end merging, by virtue of the body taper, into and with the body exterior surface without interruption or modification of the body attachment end outline; said channels constituting relief passages wherethrough, when the drill is operating, drilled material and liquid may flow rearwardly past the drill bit and along the drill stock for ultimate escape from the drilled bore. While the channels 15 may vary in number and circumferential width of "lands" separating adjacent channels, the said channels should in every event be so arranged as to open through the face 13 margins at points sufficiently removed from the line of face intersection as to avoid any interruption or reduction in the effective length of said diametric line. To assist in the scavenging of the drilled hole, and to augment the volume of liquid supplied to the working end of the drill bit, one or more bores 16 is arranged in communicating relation between the chamber 12 and an intermediate point of one or more of the channels 15.

Diametrically of its working end and in symmetrical relation with the axial plane containing the line of face 13 intersection, the body 10 is formed with a cross-sectionally angular, axially relatively deep slot which opens at its ends through opposite "land" portions of the body exterior surface, the base of said slot defining a plane perpendicular to the body axis, and an insert 17, in the form of a block of special alloy, highly-abrasive-resistant material, exactly fills said slot and is permanently secured, as by means of welding, in seated relation therein, the ends and exterior margin of said insert being ground and finished to conform with the adjacent body 10 exterior circular and face surfaces, so that the line of face 13 intersection is re-established as a cutting edge 18 centrally along the insert exterior margin. If desired, and in accordance with conventional practice, the cutting edge 18 may be ground to greater or less angle of "sweepback" away from the center of the tool, as suggested by the showing of Figure 1.

Operatively supplementing the insert 17 and to enhance the action of the "lands" in the development and maintenance of a straight, uniformly circular drill bore, inserts 19, of material the same as or characteristically similar to that of the insert 17, and of substantially rectangular block form, are embedded and secured, as by welding, in and longitudinally along the body 10 cylindrical surfaces intermediate the channels 15 and in intersecting relation of their ends with the inclined faces 13. The inserts 19 preferably have effective lengths axially of the body 10 substantially equal to the depth of the insert 17 and are surface ground and finished where they intersect the body circular exterior and end faces to conform to and merge with adjacent areas of said surfaces, whereby said inserts supplement and reinforce the softer, more wearable, metal of the "lands" and inclined face arcuate margins, thus maintaining the original size and operative dimensions of the

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drill bit assembly, even through successive reconditionings of the latter, and preserve an effective shearing shoulder or margin where each of the "lands" is intersected by an inclined face 13.

The material wherefrom the inserts 17 and 19 are formed must, for best results, be exceedingly tough, resistant to wear, amenable to welding, and capable of being ground to finished form and for the maintenance of cutting edge sharpness. Various alloys are available to supply the requisite properties of the inserts to greater or less degree, but experience has established that a non-ferrous alloy consisting of tungsten, titanium, tantalum, nickel, and cobalt, is superior in wear resistance, does not chip or fault, maintains an effective cutting edge throughout a surprisingly long term of use, and responds to sharpening by grinding without impairment and with consistent utility throughout the full depth of the insert members.

The improvement, constructed as shown and described, has high practical advantages in that the "lands" between the relief channels 15 define a close approximation of a cylinder which serves to guide the bit in the development of a straight smooth, drilled bore, in that all wear on the bit tending to destroy its usefulness is concentrated on the cutting edge 18, adjacent margin of the insert 17, and ends and corners of the inserts 19, especially natured to withstand such wear, with the result that reconditioning of the tool may be had through simple grinding of the faces 13 to a fresh cutting edge, thus dispensing with heating, forging, and tempering requirements in the field, in that the inserts 17 and 19 are of uniform character and quality throughout their depth axially of the tool and hence provided for a long series of reconditioning grindings, in that the insert 17 extends entirely across and diametrically of the tool working face, thereby providing outer cutting edge corners conditioned to withstand wear and preserve the cutting edge effective length for the elimination of drill bore convergence and consequent binding of the tool, in that the inserts 19 preserve the circular outlined and exterior surface contour of the bit, and in that the construction is adaptable to use with any available drill stock material.

Since changes 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 drill bit of percussive type comprising, a generally frusto-conical body of tractable metal adapted for coaxial mounted engagement with and as a terminal extension on a length of drill stock, outwardly-converging, symmetrically-inclined faces on the free end of said body disposed to intersect in a line diametrically thereof, a plurality of angularly-spaced relief channels longitudinally interrupting the body exterior surface and intersecting arcuate margins of said faces, an insert block of highly abrasive resistant, tough, hard alloy material diametrically traversing and fixedly based in and to project axially from said body free end in symmetrically-interrupting relation with said inclined faces and their line of intersection, ends of said insert block intersecting and conforming with the body exterior surface and the axially-projecting block

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margin conforming, in cutting-edge-defining relation, with the adjacent inclined faces, and substantially rectangular blocks of alloy material characteristically similar to that of said first block fixedly embedded in bearing engagement of one end and three sides each within the body material to conformably intersect the body exterior and inclined face surfaces defined between adjacent relief channels.

2. In a drill bit of percussion type having a generally frusto-conical body of tractable metal and a plurality of relief channels spaced angularly about and longitudinally interrupting the body exterior surface, an insert block of highly abrasive resistant, tough, hard alloy material diametrically traversing and fixedly based in the working end of said body with its ends conformably intersecting the adjacent body arcuate surface, outwardly-converging, symmetrically-inclined faces on the working end of said body and extending through the insert block margin to intersect in a cutting edge centrally along the insert block margin and diametrically of the body, and substantially rectangular blocks of alloy material characteristically similar to that of said first block fixedly embedded in bearing engagement of one end and three sides each within the body material and longitudinally of midportions of the body exterior surfaces defined between adjacent relief channels in conformity with said exterior surfaces and in coplanar, end intersection with arcuate marginal areas of said inclined faces.

3. In a drill bit of percussion type, the combi-

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nation with a generally frusto-conical body of tractable metal having a plurality of relief channels spaced angularly about and longitudinally interrupting its exterior surface and a wedge-shaped working end, of an insert block of highly abrasive resistant, tough, hard alloy material fixedly base diametrically of said body working end to project axially therefrom as the acute cutting edge of the body wedge, ends of said block conformably intersecting the body exterior, and a substantially rectangular, elongate block of alloy material characteristically similar to that of said first block fixedly embedded in bearing engagement of one of its ends and three of its sides within, longitudinally of and in surface conformity with a midportion of each body space between adjacent relief channels not intersected by said diametric block in end-intersecting coplanar relation with the arcuate shoulders of the wedge-forming body faces.

ORVILLE PHIPPS.

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