June 28, 1966 O. PHIPPS 3,258,077

PIERCING POINT HAMMER DRILL BIT

Filed Dec. 30, 1963

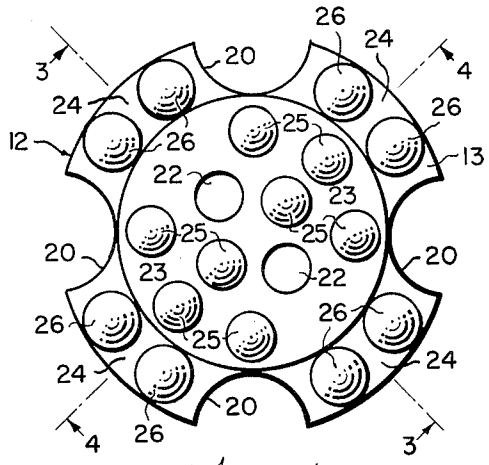


Fig. 1

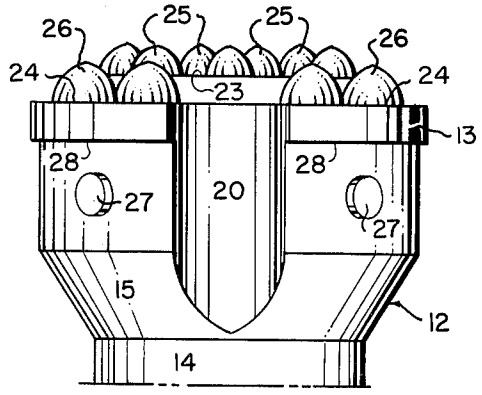


Fig. 2

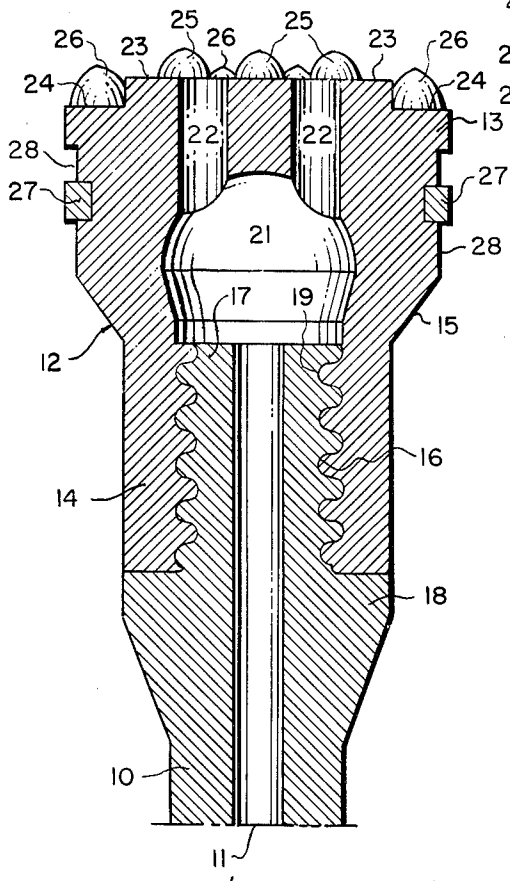


Fig. 3

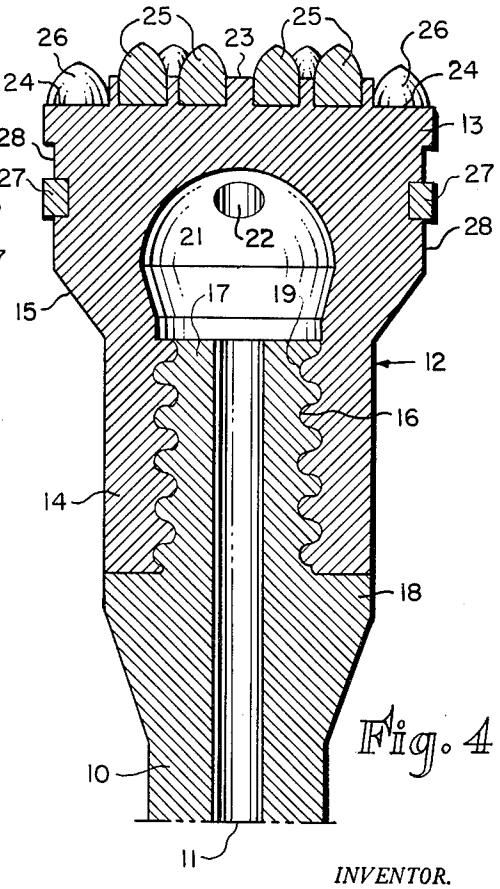


Fig. 4

INVENTOR.
ORVILLE PHIPPS
BY
ATTORNEY

United States Patent Office 3,258,077
Patented June 28, 1966



3,258,077

# PIERCING POINT HAMMER DRILL BIT

Orville Phipps, 607 Interstate Trust Bldg., Denver 2, Colo.

Filed Dec. 30, 1963, Ser. No. 334,118
8 Claims. (Cl. 175—389)

In broad analogy with the disclosures of United States Patent No. 3,071,201, dated January 1, 1963, and as an adaptation and particular reorganization of features characterizing the patent disclosure suited for efficient specific application, this invention relates to bits effective to penetrate rock and similar obdurate materials in reaction to percussive and rotary influences conventionally applied thereto, and has as an object to provide a novel and improved hammer drill bit of superior operative efficiency.

A further object of the invention is to provide a novel and improved hammer drill bit that is distinguished by high penetrative effect in proportion to bit wear.

A further object of the invention is to provide a novel and improved hammer drill bit that is productive of enhanced penetrative effect in proportion to the percussive influences applied thereto.

A further object of the invention is to provide a novel and improved hammer drill bit that is continuously and repetitiously operable to destruction without occasion for servicing or rehabilitation throughout prolonged periods of unimpaired productive use.

A further object of the invention is to provide a novel and improved hammer drill bit that promotes maintenance of gauge and alignment in bores generated thereby.

A further object of the invention is to provide a novel and improved hammer drill bit that is amenable to operative association in a customary manner with conventional rod and hammer equipment of diverse speciality.

A further object of the invention is to provide a novel and improved hammer drill bit that is capable of applying the usual percussive and rotary influences of conventional rod and hammer equipment with combined advantageous effect.

A further object of the invention is to provide a novel and improved hammer drill bit that is expedient of economical production in a wide range of preferred sizes and proportions, that applies known principles with advantage of result, and that is rugged and durable under any and all conditions of use.

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

FIGURE 1 is an end view showing the working face of a typical drill bit exemplifying the principles and incorporating the features of the present invention.

FIGURE 2 is a partial, side elevational view of the organization according to FIGURE 1, a terminal length of the socket skirt being broken away to conserve space.

FIGURE 3 is a section longitudinally through the illustrated bit as coupled ready for operation to the complementary end of a conventional drill rod, said section being taken diametrically of the bit substantially on the indicated line 3—3 of FIGURE 1.

FIGURE 4 is a section similar to FIGURE 3 taken substantially on the indicated line 4—4 of FIGURE 1.

As long and extensively practiced, hammer drilling for the production of bores in and through stubborn materials is characterized by repetitious application of impacts to an end of a straight, rigid rod having at its other end a bit opposed to the material to be penetrated and coincidental rotation of the bit about its axis. Widely variable in specific adaptations, the rod and bit components suited for use in hammer drilling operations may



be integrally or separably associated for intended reaction to impacts occasioned either manually or mechanically, rotation of the bit may be effected either manually or mechanically, and provision may be had for the circulation of cooling and scavenging fluids outwardly from and across the working face of the bit during customary use of the tool, all of which is embraced in the well-known art and practice of hammer drilling and hence needless of further elaboration. Employable as just discussed the present invention relates to the bit component of the drill and provides a novel and improved such feature useful in substitution for hitherto-known hammer drill bits to promote the facility, efficiency, and economy of hammer drilling operations.

Typified by the views of the drawing in an embodiment suited for separable coaction with and to terminate a drill rod **10** having, as is usual, a fluid flow channel **11** axially and longitudinally therethrough, the improved bit exemplary of the present invention is unitarily comprised with an integral bit body **12** formed, as by molding or forging, from any suitable strong metal, such as alloy steel, to provide a generally-cylindrical end portion **13** diametrically equal to and determinative of the bore size resulting from bit operation in an axial length approximating its radius and a cylindrical skirt portion **14** of relatively-reduced diameter coaxially conjoined to said end portion by a frusto-conical band **15**. The skirt portion **14** surrounds and defines a socket concentric with the body **12** which opens through the end of the skirt portion remote from the band **15** and is internally threaded, as at **16**, to serve as one complement of a coupling suited to separably connect the bit body to and as a coaxial extension of the drill rod **10**. Obviously, mating thread couplings for operative connection of a drill bit to the end of an actuating rod being ancient in the art, any practical such coupling may be availed of within the scope and contemplation of the present invention to mount the bit body **12** for operation on an end of a conventional rod **10**, the means for so doing represented by FIGURES 3 and 4 being, while desirable and preferred, no part of the present invention and specifically the subject of my copending application for patent Serial No. 334,117, filed December 30, 1963, entitled Drill Bit and Rod Coupling. As herein illustrated and elaborated in the noted copending application, the coupling separably conjoining the bit body **12** and rod **10** is distinguished by a stud **17** coaxially projecting from the end of the rod for reception within the socket defined by the skirt portion **14**, a shouldered rod enlargement **18** about the base of said stud presenting an annular plane face radial of the rod adapted to abut the correspondingly plane annular free end area of the skirt portion, a sinuous profile for the internal socket threads **16**, and sinuously-profiled threads **19** externally of the stud **17** loosely complementary to the threads **16**, whereby mating of the threads **16** and **19** to full reception of the stud **17** within the socket of the skirt portion serves to seat the annular end of the skirt portion **14** firmly against the radial face of the rod enlargement **18** for direct transmission of impacts received axially of the rod **10** to the bit body **12** without damaging effect upon the mated threads. The mating threads of the coupling are pitched to apply rotation of the rod had during drilling operations with tightening effect upon the joint and consequent firm coaction of the abutted rod and bit body elements, while the intentional loose coaction of the complementary threads preserves a desirable facility of bit detachment from and reconnection to the associated rod.

In further conformity with known practice as exemplified by the patent above noted, the bit body **12** is formed or worked to provide an angularly-spaced plurality of

like, transversely-concaved flutes or channels **20** longitudinally of and interrupting the cylindrical exterior surface of the body end portion **13** in extension across the contiguous band **15** as passages for the accommodation of cooling and scavenging flow uprise past the bit when working in a bore, which flutes or channels in a flow capacity are suitably proportioned to the size of the bit are uniformly spaced circumferentially thereof in a number and arrangement typified by the four such features shown in FIGURE 1 that provides a relatively-considerable segment of uninterrupted body end portion material therebetween. Similarly reflecting known practice, a domed chamber **21** disposed to receive fluid input from the channel **11** of the drill rod coactively engaged with the bit is formed centrally of the bit body **12** as an enlarged extension from the inner end of the socket defined by the skirt **14** where it functions as a fluid reservoir for maintained pressure supply of fluid input to and for output through outflow passages **22**, represented as two in number, opening as straight, tubular bores from said chamber and through the working face of the bit in spaced parallelism with the bit body axis.

Featuring the present invention is the organization of the working face of the bit as a plane, circular area **23** concentric with and closing perpendicular to the bit body axis across the end of the bit end portion **13** remote from the skirt **14** within and peripherally substantially tangent to the arcs of the flutes or channels **20** and an interrupted, annular plane area **24** parallel to and offset toward the skirt **14** from the area **23** in circumscribing relation therewith, whereby to establish for intended completion and advantageous operation as the working face of the bit a flat, central, circular exposure uninterrupted save by the outlets of the passages **22** advanced in the direction of bit penetration within a surrounding, concentric, parallel annulus diametrically coequal with the bit body end portion, intersected by ends of the flutes or channels **20**, and retracted in the direction of bit penetration relative to the exposure thereby embraced. Naturally susceptible of some specific size variation, the axial offset of the area **24** relative to the area **23** and the radial width of the annular area **24** proportional to the size of the bit as determined by its major diameter are significant, as will hereinafter appear, to intended completion and operation of the improvement in accordance with the principles of the invention. Characteristically, it has been determined that for a hammer bit of four inch effective diameter the radial width of the area **24** desirably should be five-eighths of an inch and said area **24** should be offset one-fourth of an inch inwardly of the bit from the plane of the area **23**.

The bit body provided with the step-related working face areas **23** and **24** as shown and described is conditioned to effect its penetrative function through secure attachment to said areas of piercing points **25** and **26** particularly arrayed in correlation therewith and to project therefrom. Save as to specific size adapting them for use in the particular arrangements hereinafter described, the piercing points **25** and **26** are throughout of similar conformation and identical nature. Constituted from extremely-hard, highly-wear-resistant, alloy material whereof the properties are well known to be inherent in a composition of tungsten, titanium, tantalum, nickel and cobalt, known as tungsten-carbide, resulting from repeated, tremendous compression of the properly-proportioned, powdered constituents and ultimate sintering of the components formed therefrom, the points **25** and **26** are generally cylindrical, solid bodies of appropriate diameter small in relation to the bit body diameter characterized by a length substantially equal to diameter, a flat base perpendicular to axis at one end and a coaxial point of smooth ogive contour at the other end representing about half the full length of the point. Arrayed substantially as shown and hereinbelow discussed, the piercing points **25** and **26** are socket-seated in and permanently affixed to the working face areas **23** and **24** with the axes of the points parallel to the axis of the bit body **12** and the tips thereof defining planes parallel to the areas wherein they are based. As known and practiced in the related art, permanent attachment of the points **25** and **26** to and in the desired arrangement on the flat areas **23** and **24** is readily accomplished through the provision in intersecting relation with said areas of cylindrical sockets adapted to snugly receive the blunt, cylindrical base ends of the points, treatment of said sockets and coacting portions of the points with a suitable high-strength brazing alloy and flux, and appropriate heat treatment of the combination after insertion of the points to perfect a brazed bond between the material of the body portion **13** and the bases of the points **25** and **26** seated therein. In accordance with the principles and to effectuate the purposes of the present invention the points **26** are proportioned for and affixed in operative correlation with the interrupted annular area **24** in a significant distinctive arrangement functionally supplemental to a particular arrangement of the points **25** on and in operative association with the circular working face area **23**. Characterizing the distinctive arrangement of the points **26** in association with the bit body as best shown in FIGURE 1 is size qualification of the points **26** to a diameter equal to the radial width of the area **24** and a length substantially the same as such diameter, whereby socket-seating of each individual such point in and through an exposure of said area establishes tangential contact of cylindrical base arcs of the point with the peripheral boundary of the area exteriorly delimiting the bit and also with the circular shoulder marking the axial projection of the area **23** relative to the area **24**, in which disposition seating of the point to full engagement of its cylindrical base portion within the material of the bit body locates the tip of the point as a determinant, in common with its counterparts, of a plane parallel to that of the area **24** closely adjacent the plane of the area **23**. Proportioned to the radial width of the area **24** as above set forth and with the said area interrupted by the flutes or channels **20** as shown and described, it is feasible to locate but two of the points **26** in each segment of said area available between adjacent interruptions thereof, the diametric size of the points correlating with the arcuate extent of the area segment to accommodate attachment of the points in spaced-apart, symmetrical relation thereon for a total of eight of the points **26** on the typical embodiment of the drill bit illustrated by the drawing. The points **25** associated with the circular area **23** differ from the points **26** only as to size, in which respect they are relatively smaller in diameter and correspondingly shorter than the points applied to the area **24**, whereby to further the operative effectiveness of the points **25** in a patterned array expedient of accommodation within the boundary of the area **23**. Again as best shown by FIGURE 1, the points **25** are affixed to and to project from the area **23** to align four thereof diametrically of the area in symmetry with and between opposed segments of the interrupted area **24** as spaced-apart pairs of spaced-apart points related to establish a like spacing between the points of each pair and a somewhat greater spacing centrally of the area between the opposed inner elements of the pairs. Outermost point elements of the aligned pairs are correspondingly located inwardly adjacent and in a slight separation from the circular boundary of the area **23** between flanking points **25** spaced at each side therefrom in like juxtaposition to the area boundary, whereby to complete on the area **23** a patterned array of eight points **25** having their tips in a common plane spacedly parallel to said area in a spacing outwardly from the bit body beyond the plane common to the tips of the points **26**, within which array the two fluid flow passages **22** are accommodated to open at the opposite sides of the area center on a diameter of

the area perpendicular to that marking the alignment of the spaced pairs of spaced-apart points above identified. In the case of the four inch bit having for the area 24 a radial width of five-eighths of an inch as previously mentioned, the points 26 affixed thereto will be of five-eighths inch diameter and substantially like length to satisfy the conditions of their association with the bit body above set forth and the points 25 desirably should have a diameter of one-half inch with corresponding length.

Completing the bit organization of the invention for realization of its intended purposes and advantages, the cylindrical surface areas of the bit end portion 13 between the flutes or channels 20 interrupting the same are armed with gauge points 27 of the tungsten-carbide material inset and affxed radially of the bit for reaming coaction with the walls of the bore as the bit is percussively and rotatably actuated therein. Expediently somewhat smaller than the piercing points 25, three-eighths inch as against one-half inch diameter and one-fourth inch as against one-half inch length, for example, the gauge points 27 are socket-seated in and securely affixed to the material of the bit end portion as are the points 25 and 26 in a preferred effective arrangement reflecting attachment of one such point 27 to the peripheral aspect of each bit end portion segment intercepted between adjacent flutes or channels 20 in centered relation arcuately of the segment and a disposition axially thereof somewhat closer to the band 15 than to the bases of the piercing points 26. Qualified in the arrangement and correlation shown and described to develop a bore-reaming effect supplemental to and manifest inwardly of the bit from that occasioned by the sides of the points 26 tangent to the bit circumference, the guage points 27 contribute importantly to maintenance of gauge and alignment in the bore under development by the bit, in furtherance whereof it is practical that the segment areas carrying the points 27 be moderately undercut, or radially relieved, between the bases of the points 26 and the band 15, as at 28, to expose the outer ends of the points 27 in slight extension coincident with the projection thereover of the cylinder established by the major diameter of the end portion 13 and to largely obviate tendency of the bit body material to gall in its contact with the walls of the bore.

The operative advantages of the improved bit should be reasonably apparent from the foregoing description. Associated with and to terminate a drill rod as indicated by FIGURES 3 and 4 the bit reacts to impacts applied axially to and transmitted by the rod with a disruptive penetration of its percing points 25 and 26 effective to fracture, fragment, and disintegrate the material engaged by the working face of the bit, during the progress of which operation the relatively-smaller points 25 excavate a central, shallow advance within a circumscribing shoulder of material opposed to the area 24 and points 26 which readily yields to the chipping influence of said latter points to facilitate and enhance the advance of the drill. Rotation of the tool during its percussive actuation serves to alter and vary the bite of the piercing points against the material under excavation and to progressively sweep the points over the entire area at the foot of the bore with concomitant disruption of the material disturbed by point penetration, while customary circulation of fluid under pressure through the rod, bit, outflow passages 22, and flutes 20 functions as is conventional to cool the working face of the bit and to scavenge the bore. Distinctive and significant to the high operative efficiency of the improved bit is the provision of the relatively-smaller piercing points 25 arranged to initially penetrate undisturbed material opposed to but a central area, rather than the full effective area, of the bit and the adaptation of the relatively-larger points 26 as retracted in the direction of bit advance to supplement the action of the smaller points in a manner very much enhancing the effectiveness of the impacts applied to the tool. The smaller points 25 acting upon a reduced central area at the foot of the bore under development concentrate impact influence to effectively chip and dislodge undisturbed material within a shouldered ring of the material subject to the action of the larger points 26 which, because of the lack of support interiorly of the material ring, readily break and disrupt the material of the ring with but nominal diversion of impact energy from the area armed by the points 25. Consequential to the unique association and operative correlation of the piercing points, the improved bit operates to fragment the material under excavation in chips, chunks, and pieces, as distinguished from grains, powder, and dust, thus enhancing the effectiveness of tool rotation within the bore, minimizing frictions tending to impair the efficiency of bit actuation, and promoting the penetrative reaction of the bit to the actuating forces applied thereto. The purpose and operation of the gauge points 27 is neither unique nor needful of elaboration.

Since changes, variations, and modifications in the form, construction, and specific 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 hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein said central area is substantially tangent to the intrusive arcs of the flutes peripherally interrupting the body to establish in consequence a segmenting of the annular area by the flutes.

2. A hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein the piercing points affixed to the central area are identical in size, conformation, and mode of attachment to establish at their tips a common plane

parallel to that of the central area, and the points affixed to the annular area are also identical in size, conformation, and mode of attachment to establish at their tips a common plane parallel to and inset inwardly of the body from that determined by the tips of the points carried by the central area.

3. A hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein said flutes are uniformly spaced angularly of the body, said central area is substantially tangent to the intrusive arcs of the flutes peripherally interrupting the body to establish in consequence a uniform segmenting of the annular area by the flutes, the piercing points carried by the central area are correspondingly and symmetrically arrayed with reference to the area boundary at each side of an area diameter, and the piercing points carried by the annular area are correspondingly and symmetrically arrayed on the several segments thereof.

4. A hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein the piercing points affixed to the central area are identical in size, conformation, and mode of attachment to establish at their tips a common plane parallel to that of the central area, the points affixed to the annular area are also identical in a size greater than that of the points carried by the central area and an equivalent conformation and mode of attachment determining at their tips a common plane also parallel to that of the central area, and the spacing of said annular area inwardly of the body from the central area is such as to locate the plane common to the tips of the piercing points carried thereby inwardly of the body relative to the plane common to the tips of the points carried by the central area.

5. A hammer drill bit comprising a generally-cyindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein said central area is substantially tangent to the intrusive arcs of the flutes peripherally interrupting the body with attendant determination of a radial width for the annular area, the piercing points affixed to said annular area are identical in a diametric size equal to the radial width of the area, in conformation, and in mode of attachment such as to establish at their tips a common plane parallel to the central area, whereby the points carried by the annular area are individually tangent to both the inner and outer boundaries thereof, and the piercing points affixed to the central area are also identical in a diametric size less than that of the points carried by the annular area and an equivalent conformation and mode of attachment effective to establish at their tips a common plane also parallel to the central area.

6. A hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein said central area is substantially tangent to the intrusive arcs of the flutes peripherally interrupting the body with attendant determination of a radial width for the annular area, the piercing points affixed to said annular area are identical in a diametric size equal to the radial width of the area, in conformation, and in mode of attachment such as to establish at their tips a common plane parallel to the central area, whereby the points carried by the annular area are individually tangent to both the inner and outer boundaries thereof, the piercing points affixed to the central area are also identical in a diametric size less than that of the points carried by the annular area and in an equivalent conformation and mode of attachment effective to establish at their tips a common plane also parallel to the central area, and the spacing of said annular area inwardly of the body from the central area is such as to locate the plane common to the tips of the piercing points carried thereby inwardly of the body relative to the plane common to the tips of the points carried by the central area.

7. A hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive

fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein said flutes are uniformly spaced angularly of the body, said central area is substantially tangent to the intrusive arcs of the flutes peripherally interrupting the body with attendant determination of a radial width for the annular area and uniform segmenting thereof, the piercing points carried by the annular area are correspondingly and symmetrically arrayed on the several segments thereof in a uniform diametric size equal to the radial width of the area and in an identical conformation and mode of attachment such as to establish at their points a common plane parallel to the central area, the piercing points affixed to the central area are correspondingly and symmetrically arrayed thereon with reference to the area boundary at each side of an area diameter in an identical diametric size less than that of thte points carried by the annular area and an equivalent conformation and mode of attachment effective to establish at their tips a common plane also parallel to the central area, and the spacing of said annular area inwardly of the body from the central area is such as to locate the plane common to the tips of the piercing points carried thereby inwardly of the body relative to the plane common to the tips of the points carried by the central area.

8. A hammer drill bit comprising a generally-cylindrical, hard, rigid body formed at one end for separable



connection to and as a coaxial terminal of a drill rod, said body having a central chamber arranged to receive fluid input through the associated rod, a plurality of like, transversely-concave flutes angularly spaced apart about and peripherally interrupting said body parallel to the axis thereof, and gauge points of tungsten-carbide material fixed in exposure radially of and to arm the peripheral segments of the body intercepted between adjacent flutes, a working face at the end of said body remote from that connectible to the drill rod constituted as a central, flat, circular body end area perpendicular to the body axis, a complementary flat, annular body end area parallel to, spaced inwardly of the body from, and circumscribing said central area, axially-tapered piercing points separately fixed in patterned array to project axially of the body from both said end areas, and outflow passages from the central chamber opening through said central end area between elements of the associated point array, wherein the piercing points affixed to the central area are correspondingly and symmetrically arrayed thereon with reference to the area boundary at each side of an area diameter in an identical size, conformation, and mode of attachment such as to establish at their tips a common plane parallel to the central area, and the outflow passages open from the central chamber eccentrically of the axis of the body within the associated piercing point array and in centered registration with the area diameter whereto symmetry of the array is referenced.

**References Cited by the Examiner**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,725,216 | 11/1955 | Brown | 175—389 |
| 2,776,819 | 1/1957 | Brown | 175—389 |
| 2,938,709 | 5/1960 | Curtis | 175—410 X |
| 3,071,201 | 1/1963 | Phipps | 175—410 |
| 3,185,228 | 5/1965 | Kelly | 175—410 |


CHARLES E. O'CONNELL, *Primary Examiner.*

JACOB L. NACKENOFF, *Examiner.*

D. H. BROWN, *Assistant Examiner.*