

March 4, 1941.

P. LIDDICOAT
DETACHABLE DRILL BIT
Filed Oct. 31, 1938

2,233,421

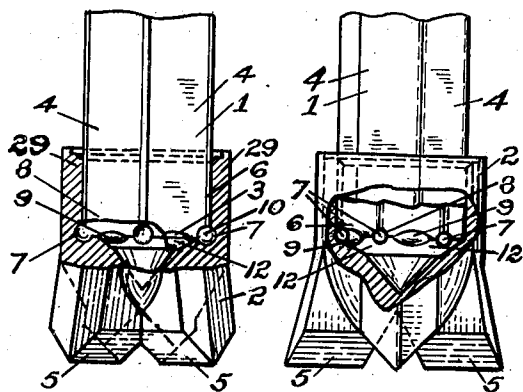


FIG. 1.

FIG. 3.

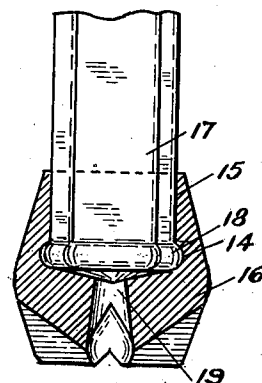


FIG. 5.

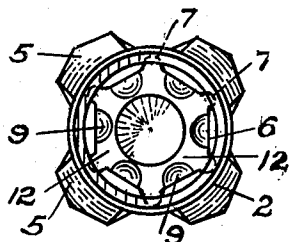


FIG. 2.

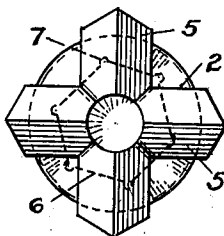


FIG. 4.

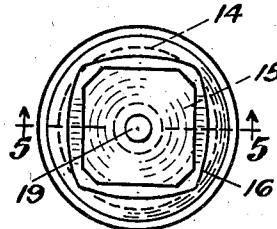


FIG. 6.

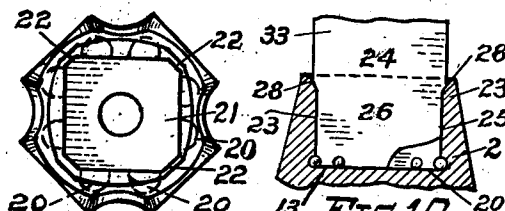


FIG. 8.

FIG. 10.

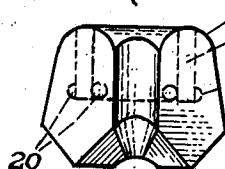


FIG. 9.

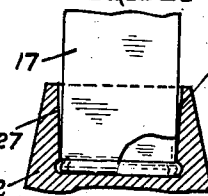


FIG. 11.

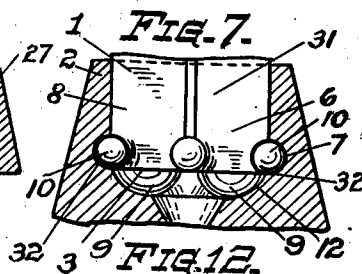


FIG. 7.

FIG. 12.

P. LIDDICOAT,
INVENTOR,
W. A. Hirtle,
ATTORNEY.

UNITED STATES PATENT OFFICE

2,233,421

DETACHABLE DRILL BIT

Percill Liddicoat, St. Catharines, Ontario, Canada

Application October 31, 1938, Serial No. 237,875

In Canada November 15, 1937

9 Claims. (Cl. 255-64)

In the present invention I have devised a detachable drill bit with modifications, adapted to be easily mounted, and dismounted from the end of the shank of a drill rod used in boring rock, ore, etc., in mining, and similar operations where boring is required through hard material.

A feature of the invention is that the shank of the drill rod with which the bit is used may have any of the usual cross sections, such as square, hexagonal, octagonal, oval or the like, and the lower extremity of the drill rod does not have or require any previously made special shape, or conformation in order to engage the bit, and the successive blows received by the drill rod in the boring operation, are transmitted to the bit, and provide a method whereby the bit becomes locked fast to the end of the drill rod. The bit in each of the forms which are described herein, is provided with a socket or recess formed in the body of the bit, said socket having in turn small recesses, grooves, convolutions, corrugations and beveled surfaces formed therein, which are adapted to form on the end of the drill rod, complementary projections, shapes, and surfaces, which secure the bit on the drill rod, as will be more fully described as the description proceeds herein. Moreover the said projections, shapes, surfaces just mentioned are formed on the drill rod, by and during the normal operation of the drill rod, by means of the impacts received by the drill rod from the machines and devices normally reciprocating, and torsionally operating said rod.

The impacts received by the drill rod, being transmitted to the bit, directly over the cutting blades of the latter, tend to bore a straight hole in the rock or other material being "worked"; and the "torsion of rotation" of the drill rod is readily transmitted to the flattened side walls of the bit socket, as will be fully described below.

The types of bit in the present invention can be easily and cheaply manufactured by pressing or drop forging, without subsequent "machining," all of which tends to make the use of the bits in large numbers a commercial and practical matter. This is an important consideration when it is stated that bits have to be very frequently replaced on the drill rod, as they soon become dull on the cutting blades in service.

A most important feature is also the ease with which the bit can be detached or dismounted from the drill rod shank, by merely hitting the bit on its outer perimeter a few blows with a hammer, or the shank of the drill rod can readily be withdrawn from the bit socket using tools; in

which event it will be noted that the projections, enlargements and the like which have been formed on the end of the drill rod, are flattened sufficiently to permit the end of the drill rod to be re-inserted in other or freshly sharpened bits.

In the accompanying drawing forming part of this specification, I have shown a physical embodiment of the invention, with several modifications, constructed according to the best mode I have so far devised for the practical application of the principles of my invention.

In said drawing, Figure 1 is a front elevation, partly in section, of the invention, showing a hexagonal shaped drill rod shank inserted in the bit.

Figure 2 is a top plan view of the bit shown in Figure 1.

Figure 3 is a side elevation of the device shown in Figure 1, taken from the position indicated in Figure 4; and with part of the device shown in section to show the interior of the bit.

Figure 4 is a bottom view of the bit shown in Figure 3.

Figure 5 is a vertical section on 5-5 of Figure 6, showing a modified form of the invention, having a circumferential groove formed in the socket of the bit.

Figure 6 is a top plan view of Fig. 5, the drill rod not being shown.

Figure 7 is a bottom view of the bit shown in Figure 6.

Figure 8 is a plan view of another modification of the bit.

Figure 9 is a front view in elevation of the Figure 8.

Figure 10 is a vertical section through a portion of a drill bit, illustrating a modified means of mounting a drill rod in the bit socket.

Figure 11 is a vertical section through a portion of a drill bit, illustrating another modified means of mounting a drill rod in the socket of the bit.

Figure 12 is an enlarged vertical section through a portion of a drill bit illustrating in detail the means for mounting the end of a drill rod in the bit socket.

In the drawing, the numeral 1 indicates a rock cutting drill rod having before its insertion in the socket of the bit 2, a plane flat surface 3 on its bottom end, and the side walls 4, 4 being flat and forming the hexagonal sides of the rod as shown. The bit is provided with the usual cutting teeth, 5, 5, and is provided with the socket or recess 6, formed in cross-section complementary to the drill rod. At the bottom of the recess

6 are formed a series of smaller recesses 7, 7, etc., and the bottom 12 of the socket in this illustration is concave in shape. On the surface of this bottom are formed bossed corrugations 9, 9, etc., as clearly illustrated in Figures 1, 2 and 3 of the drawing. It is pointed out that after the end of the drill rod is inserted in the socket 6 of the bit, the repeated blows on the upper end of the drill rod, drive the rod downward into the bottom of the socket, and the metal of the rod shank 8 forms protrusions or projections 10, 10 thereon, and the metal of the bottom of the drill rod also forms complementary shapes to the convolutions or corrugations 9, 9, the metal being crowded somewhat between each pair of same as is at once understood. The beveled or concaved surface 12, on which the corrugations 9, 9 are formed as may be readily understood from Figure 12 tends to form the projections 10, 10 on the end of the drill rod. There is no objection however so far as the formation of the projections 10, 10 are concerned to having the bottom of the recess 6 flat as at 13, in Figure 10. In the type of the device just described in reference to Figures 1 to 4 inclusive it is evident that the drill rod 1, when it is withdrawn from the bit 2 has the projections 10, 10, etc., flattened out in line with the surface of the side walls of the drill rod, so that the drill rod can readily be used for reinsertion in any other bit, or in the old one after the cutting blades have been re-sharpened for subsequent use.

While in the type of bit and drill rod just described the cross-section of the drill rod is hexagonal, it is evident that any other type of cross-section commonly used, such as a square, oval, or hexagonal cross-section may be used, if the socket of the bit is made complementary thereto.

In the Figures 5, 6 and 7 of the drawing is shown a modified form of the invention, in which the drill rod is of the square type, and a continuous groove 14 is formed at the base of the socket or recess 15 of the bit 16. It is evident that the drill rod 17 may be withdrawn from the bit in the same way as before described, and the projection 18 in the groove 14 flattened out in the same manner as the projections 10, 10 of Figure 1. In some cases the bit may be provided with a central hole or passage 19, which permits water to pass through the bit, and also is of assistance in removing the rod from the bit. This is true of all the types of bit mentioned in this specification.

In the Figures 8 and 9 of the drawing is shown another modified form of bit, which is provided with recesses 20, 20, etc., formed in the side walls of the socket 21, and between the corners 22, 22, of the socket 21. These various types of recesses, such as 7, 7, and corrugations 9, 9 concaved bottom 12, shown in Figures 1, 2 and 3; the groove 14, Figure 5; and the small recesses 20, 20 of Figures 8 and 9; may all be used in combination as desired, and as found suitable to the particular cross-sectional shape of the drill rod being used.

In the Figures 10, 11 and 12 is illustrated diagrammatically several features of the invention, as will now be described. For instance (Fig. 10) the side walls 23, 23 are shown as being perpendicular and the end of the drill rod 33 is made in some instances of a thickness or diameter 24, greater by several thousandths of an inch than the corresponding dimension of the socket 25, at point 26. This insures a "driven" fit between the

drill rod and the walls of the socket. In other instances it may be found desirable to have the walls of the socket of the bit tapered slightly as illustrated at 27, Figure 11 of the drawing. Moreover this type of beveled or tapered side walls may be used with or without the "driven fit" or binding action just described between the drill rod and the socket walls. In some instances the top edges of the sockets of the bits may have a beveled or flared mouth as at 28, 28 to permit of easy insertion of the drill rod, as is at once understood. Also in some cases it may be deemed advantageous to bevel the exterior top edges of the bit as shown at 29 Figure 1, or 30 in Figure 9.

In Figure 12 the advantage of having a concaved bottom 12 for the bit recess, or a beveled partially cone-shaped bottom, is clearly illustrated, as it is at once evident from this enlarged drawing that when the drill rod shank 31 meets the beveled or curved surface 12, at points 32, 32, there is a tendency to cause the material of the shank to at once form the desired projecting bosses 10, 10 which are thus formed complementary in shape to the recesses 7, 7 and form the means of locking the bit on the end of the drill rod; and also to conform the said material to the corrugations 9, 9.

Referring now to the features and advantages mentioned in the preamble of this specification, it is believed after what has been described, that these features are readily understood. It is especially emphasized that in the present invention, no unusual preparation is needed for the shank of the drill rod, when the present type of drill bit is used; in other words the end and the sides of the shank of the drill rod are plane surfaces in correspondence with the type of cross-section of the rod being used, square, hexagonal, oval, etc., being used. In many of the drill bit devices in current use the end of the drill shank has to receive considerable preliminary treatment, in order to be used with a special type of bit. In the present device it is evident no preliminary treatment or manipulation whatever is required for the end of the said rod other than the use of a cross-sectional shape of rod corresponding to the type of socket in the drill bit. Moreover the same shank may be used many times, after withdrawal from the bit.

Attention is called to the ease with which the bit is secured on the drill rod, by means of the first few impacts received by the drill rod during its ordinary reciprocation in service. Also how easily the bit may be again detached from the shank of the drill rod for replacement purposes. This last feature is of course one of the important features of the invention, since bits have to be replaced frequently in mining and similar boring operations, as is at once understood.

As the bits have to be rotated torsionally when in use, the torsional rotation is transferred from the drill rod to the bit by means of the shaped sidewalls of the rod and the bit socket.

By means of the bit undercut recesses, depressions, grooves and corrugated surfaces the necessary enlargements, bosses, projections and conformations are readily formed on the end of the rod shank, and yet these deformations are such that the end of the same may readily be withdrawn from the bit, ready for a subsequent use, and for a large number of repetitions of such use.

From which description, as above given, it is seen that I have provided an exceptionally useful type of detachable drill bit device, which is not expensive to manufacture, which requires no

specially formed end on the drill rod, which in consequence is commercially attractive to the trade to which it relates, as well as being very desirable from a mechanical point of view.

I claim:

1. In a drilling device as described herein, a drill rod of substantially angular cross-section, a bit with a socket of complementary outline to that of the rod, having a number of undercut recesses formed therein between the angular corners of the socket, and a yielding end on the drill rod adapted to engage the undercut recesses and form a holding means for the bit, when the drill rod is reciprocated during the drilling operation, and said rod also being adapted to be readily detached from the bit, when it is necessary to place a resharpened or a new bit on the end of the rod.

2. A drill rod and bit assembly for percussive drilling, said assembly consisting of a bit having cutting teeth on its lower portion and having its upper portion shaped to define a central recess, open at its upper end and bounded by an upstanding annular wall and a bottom seat, said wall having a side recess on its inner face positioned close to said seat, and a drill rod slidably entered in said bit and with an end engaging said seat, said end being formed of a material integral with the rod and arranged deformable upon impact of the end on the seat when the assembly is used in cutting to provide an end edge portion movable into said side recess to hold the rod and bit in assembled relation during the cutting operation, said end edge portion being arranged readily deformable to facilitate the withdrawal of the rod from the bit at the end of a cutting operation.

3. A drill rod and bit assembly for percussive drilling, said assembly consisting of a bit having cutting teeth on its lower portion and having its upper portion shaped to define a central recess open at its upper end and bounded by an upstanding annular wall and a concave bottom seat, said wall having a side recess on its inner face positioned close to said seat, and a drill rod slidably entered in said bit with its lower end having a marginal portion seated on said seat, said end being of a material arranged deformable upon impact of the end on the seat when the assembly is used in cutting to provide an end edge portion movable into said side recess to hold the rod and bit in assembled relation during the cutting operation.

4. A drill rod and bit assembly for percussive drilling, said assembly consisting of a bit having cutting teeth on its lower portion and having its upper portion shaped to define a central recess open at its upper end and bounded by an upstanding annular wall and a bottom seat, said seat being shaped to define a plurality of upstanding and spaced anvils, said wall having a side recess on its inner face and close to said seat, a drill rod slidably entered in said bit with its lower end engaging said anvils, said end being of a material arranged workable upon said anvils upon impact of said end on said anvils when the assembly is used in cutting to provide an end edge portion movable into said side recess and a face portion fitting between said anvils,

5. A drill rod and bit assembly for percussive drilling, said assembly comprising a bit having cutting teeth on its lower portion and having its upper portion shaped to define a central recess open at its upper end and bounded by an upstanding annular wall and a bottom seat, said wall having a side recess on its inner face positioned close to said seat, means on said seat defining a plurality of spaced anvils each having a curved upper face adapted to engage the bottom end of a drill rod entered in said recess, a drill rod slidably entered in said bit and with its bottom end seated on said anvils, said end being of a material deformable upon impact of said end on said anvils when the assembly is used in cutting to provide an end edge portion movable into said side recess to hold the rod and bit in assembled relation during a cutting operation, said end being also deformable to fit between said anvils and resist relative turning of said rod and bit.

6. A drill bit having cutting teeth on its lower portion and having its upper portion shaped to define a central recess open at its upper end and bounded by an upstanding annular wall and a bottom seat, said seat being shaped to define a plurality of spaced and upstanding anvils, and said wall being provided with a side recess on its inner face and positioned close to said seat.

7. A drill bit having cutting teeth on its lower portion and having its upper portion shaped to define a central recess open at its upper end and bounded by an upstanding annular wall and a concave bottom seat, said wall having a single groove only which is positioned close to said seat.

8. A drill rod and bit assembly for percussive drilling, said assembly comprising a bit having a central recess bounded by an upstanding annular wall and a bottom seat, a drill rod slidably entered in said recess and having an end seated on said seat, means operable upon impact of said end on said seat when the assembly is used in cutting to removably connect said bit and said rod in assembled relation, said means comprising a groove formed on the inner face of said wall and close to said seat and integrally formed metal at the end of said rod arranged deformable to provide an end edge portion movable into said groove, said end portion being also arranged readily deformable to facilitate the withdrawal of the rod from the bit at the end of a cutting operation.

9. A drill rod and bit assembly for percussive drilling, said assembly comprising a drill rod and a bit adapted to house an end of said rod, means in said bit defining a seat for the housed end of the rod, said rod being freely slidable in said bit to engage said seat until said end of the rod is deformed by impact on said seat when the assembly is used in cutting, said end of said rod being formed of material integral with said rod and deformable under impact, and means in said bit normally out of engagement with said rod and cooperable with said end of said rod when the assembly is used in cutting to engage said end and hold said bit and said rod in assembled relation.

PERCILL LIDDICOAT.