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WEDGE-LEVEL REAMER

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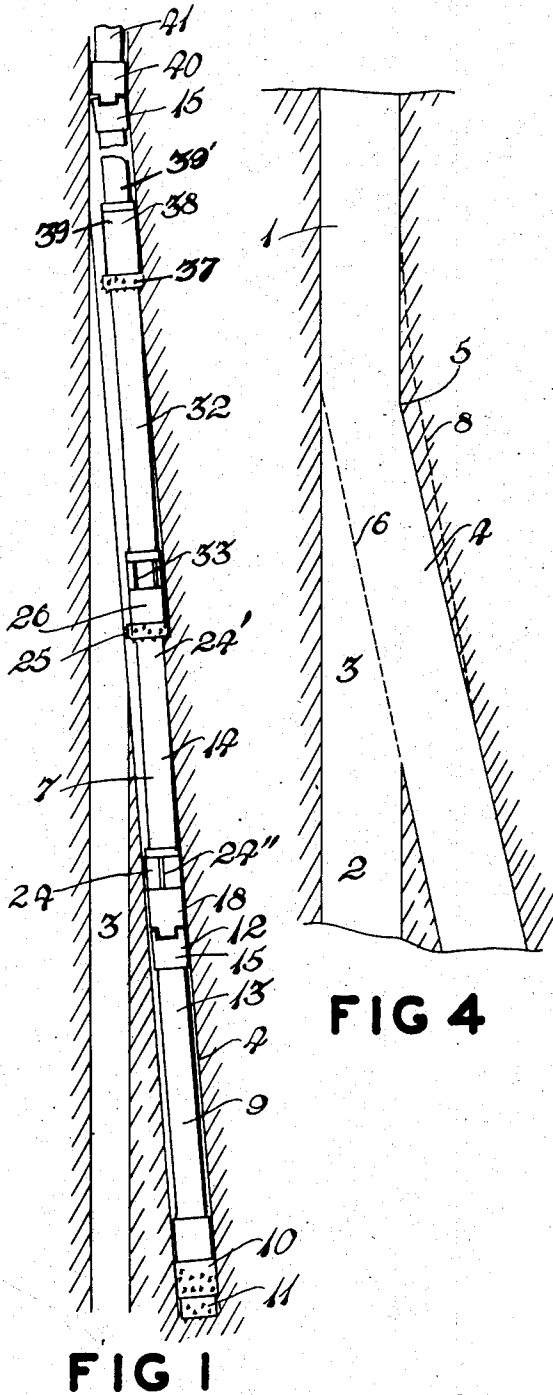


FIG 2

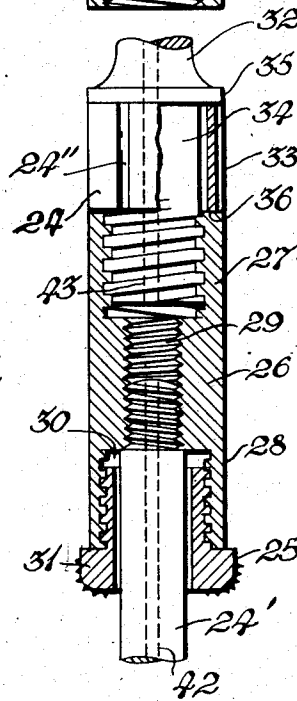
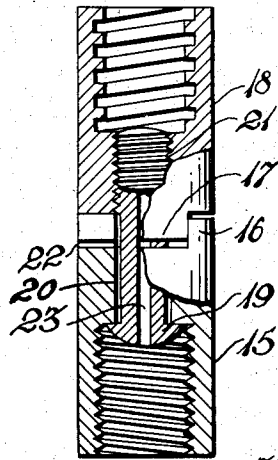


FIG 3

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WEDGE-LEVEL REAMER

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3 Claims. (Cl. 255—1.6)

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My invention relates to new and useful improvements in wedge-level reamers for use in the mining operation of wedging-off a branch hole from the main drill hole at the level at which a wedging assembly is situated, an object of my invention being to provide a device of the character herewithin described whereby the wedging-off operation is facilitated by the reamed removal of the obtuse angled rock shoulder which would otherwise interfere with the use of relatively long core barrel sections. It will be appreciated that when the drill bit is wedged-off, the new drill hole is inclined from the original drill hole thereby causing an angled shoulder in the rock against which the following drill-rod sections bear with subsequent bending thereto.

A further object of my invention is to provide a device of the character herewithin described which incorporates what I define as flexible joints in order to relieve the strain on the drill-rod sections when deviating from the original drilling at the wedge-level until the aforementioned rock shoulder has been reamed so that a progressive arc is formed which facilitates passage therepast of the following drill-rod sections and more particularly the core barrel which has a diameter slightly larger than said drill-rod sections.

Another object of my invention is to provide a device of the character herewithin described which incorporates a centering device in order to prevent a spiral curve or wandering of the drill bit after wedging-off.

A still further object of my invention is to provide a device of the character herewithin described which may incorporate a plurality of shoulder-reamers if desired depending upon the conditions and hardness of the rock being drilled and the length of drill-rod sections being used.

A yet further object of my invention is to provide a device of the character herewithin described, the use of which reduces the frictional interference of the rock with the drill-rod sections and core barrel at wedge-level.

Another object of my invention is to provide a device of the character herewithin described, whereby the recovery is facilitated of lost equipment within the drill hole by permitting the use of fishing tools without interference from the shoulder at wedge-level.

A still further object of my invention is to provide a device of the character herewithin described which is adapted for use with standard drill-rod sections and which can be readily attached and detached therefrom.

With the foregoing objects in view, and such

other objects and advantages as will become apparent to those skilled in the art to which this invention relates as this specification proceeds, my invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawings in which:

Figure 1 is a schematic view of my device shown in use with a conventional coring bit and reaming shell and shown within a drill hole at wedge-level.

Figure 2 is an enlarged sectional view of my flexible joint.

Figure 3 is an enlarged partially sectioned view showing the assembly of the reaming-bit between the lead reaming-bar and the trail reaming-bar.

Figure 4 is a schematic view of an original drill-hole with the wedge in position and a branch hole wedged-off.

In the drawings like characters of reference indicate corresponding parts in the different figures.

In the art of rock drilling and particularly with relation to what is known as core sampling, extensive use is being made of a retrievable wedge assembly whereby a further drilling may be made at an angle from the original drilling at any desired depth either for the purpose of extending the scope of the rock core sampling or to correct a drill hole which may have deviated from the desired direction. Irrespective of the rate of deviation caused by the wedge assembly, an obtuse angled shoulder is formed upon the wall of the drilling opposite the wedge at wedge-level, which interferes with the passage therepast of the core barrel and the following drill-rod sections. Due to this shoulder considerable strain and frictional interference is imposed upon the equipment and the effective length of core barrel that may be used is seriously reduced.

The present invention incorporates one or more reaming-bits which, in conjunction with one or more flexible couplings or joints, removes this obtuse angled shoulder as the assembly passes the wedge thereby producing a progressive arc past which the drilling equipment may pass more readily.

Proceeding now to describe my invention in detail it will be seen from reference to the accompanying drawings that I have illustrated in Figure 4 thereof a schematic sectional view of a main drill hole 1 continuing downwardly as at 2 and having a wedge 3 the location of which I designate as wedge-level. A branch hole 4 is shown wedged-off from the main hole 1 and in this

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view, both the wedge 3 and the angle of the branch hole 4 have been exaggerated for clarity.

It will be seen upon reference to this view that an obtuse angulated shoulder 5 is formed and that this shoulder will exist no matter how slow the tapered surface 6 of the wedge 3 be made. This shoulder 5 seriously interferes with the passage thereby of the core barrel causing frictional interference at this point also with the possibility of bending or flexing of the barrel taking place.

My drilling and reaming assembly collectively designated 7 is shown in situ in Figure 1 of the accompanying drawings and the primary purpose of this assembly is to remove the aforementioned shoulder 5 in order that the branch hole 4 may be provided with a progressively curved wall as shown by the broken line in phantom at 8 in Fig. 4.

My assembly comprises a leading-section 9 manufactured preferably from a length of conventional core-barrelling which has been reduced in transverse diameter in order to clear the aforementioned shoulder 5. A conventional reaming shell 10 is secured to the leading-end of section 9 and is provided with a leading end drill-bit 11 which may take the form of either a bull nose or coring bit.

A primary flexible coupling or joint 12 is screw-threadably attached to the opposite end 13 of the leading-section 9 and to a lead reaming-bar 14. The flexible joint 12 is clearly illustrated in Fig. 2 of the accompanying drawings and comprises, in this embodiment, a socket 15 which screw-threadably attaches to the aforementioned leading-section 9 and is provided with a castellated upper surface 17 formed within an upper socket 18 which in turn is screw-threadably secured to the reaming-bar 14.

A bolt 19 acts as a connector between sockets 15 and 18 passing through an aperture 20 within socket 15 to be received within a corresponding aperture 21 within the socket 18 to which it is screw-threadably attached. In assembly, clearance as shown at 22 is provided between the interfaces of the castellated portions 16 and 17 thereby permitting rotary motion to be transmitted from one to the other and at the same time permitting misalignment between the two parts. In this connection it should be observed that a centrally located passageway or drilling 23 is provided within bolt 19 to permit passage therethrough of water in the conventional manner.

A fluted ferrule 24 is included above the flexible joint 12 having a diameter approximately equal to the diameter of the drill-hole against which it bears thereby acting as what I define as a leading-end section centering component which prevents the drill-bit 11 from deviating or spirally curving by providing a support to the rear thereof. This ferrule, which is hereinafter to be described, is best shown in Fig. 3 of the accompanying drawings.

The trailing end 24' of the lead reaming-bar 14 is provided with a primary reaming bit 25 secured within a coupling 26 details of which are best shown in Fig. 3.

Reference to this figure will show that the coupling 26 comprises a relatively short cylindrical rod having screw-threaded sockets 27 and 28 formed within each end thereof, and a centrally located drilling 29 communicating therebetween. Sockets 27 and 28 together with drilling 29 are screw-threaded to receive the components hereinafter mentioned.

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The trailing end 24' of the reaming-bar 14 is reduced in diameter and threaded to be receivable within the aforementioned drilling 29 of the coupling 26 and when in position, an annular space 30 remains between the end 24' and the wall of the socket 28. The reaming-bit 25, which is of conventional design, is centrally apertured and capable of free sliding movement over the reaming-bar 14 to be screw-threadably secured within the aforementioned socket 28 as clearly shown in Fig. 3. In this context it should be observed that the reaming surface 31 of the bit 25 is of a larger diameter than that of the coupling 26, thereby permitting the bit to bear against the shoulder 5 of the drill-hole 1.

A trailing reaming-bar 32 screws into the socket 27 of the coupling 26 and in this connection I have provided a further fluted ferrule 33 being slightly reduced in diameter to the ferrule 24 hereinbefore mentioned in order to permit the bit 25 to operate. This ferrule, which is cylindrical in design, may be adapted to be screw-threadably secured to the engaging end 34 of the trailing reaming-bar 32 or may be held between shoulder 35 of the bar 32 and the upper end 36 of the coupling as illustrated in this embodiment.

I have provided a secondary reaming-bit 37 in the vicinity of the trailing end of the trail reaming-bar 32 and secured thereto by means of a further coupling 38 similar in construction to coupling 26 hereinbefore described.

To the upper end 39 of the coupling 38 is attached an underlength drill-rod section 39' which is provided with a secondary flexible coupling or joint 40 at the trailing end thereof which in turn is connected by means of a standard drill-rod coupling to a conventional drill-rod section 41.

In operation the device is assembled as shown in Fig. 1 and in this connection it is to be appreciated that, if desired, further reaming-bits may be added by means of couplings 26 and bars 32 between flexible joints 12 and 40. Wedging-off now commences and as the leading-section 9 passes the wedge 3 the aforementioned shoulder 5 is formed. This shoulder does not interfere with the passage of the leading-section due to the reduced diameter thereof and the flexible joint 12 facilitates the transference of the rotary drive to the leading-section by acting as a semi-universal joint. The full-sized ferrule 24, which is provided with vertically disposed flutes 24'', within the external wall thereof to reduce frictional interference, maintains the drill-bit 11 in the desired direction as hereinbefore described and the primary reaming-bit 25 reams the shoulder 5 as it passes thereby assisted by the secondary reaming-bit 27 which completes the operation thus forming a smooth contour as shown in phantom by the reference character 8 in Figure 4.

In this connection it is to be appreciated that the leading-section 9 is drilled concentrically to provide a water hole connection to the drill-bit 11 and that this drilling communicates via drilling 23 within the flexible joint 12 to a concentric drilling 42 within the lead reaming-bar 14. This drilling 42 communicates in turn with the coupling 26 and thence to a further drilling 43 within the trail reaming-bar 32 and thence to the coupling 38 which communicates with the conventional drill-rod section 41 in the normal manner.

Since various modifications can be made in my invention as hereinabove described, and many apparently widely different embodiments of same

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made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

What I claim as my invention is:

1. In the mining operation of wedging-off a branch hole at wedge-level, and for use with a set of drill-rod sections, a drilling and reaming assembly for the purpose specified, comprising in combination a leading-section, a leading-end drill-bit attached thereto, a flexible joint connected to the trailing end of said leading-section, a lead reaming-bar connected to said flexible joint, a leading-end section centering component adjacently connected between said lead reaming-bar and said leading section, a primary reaming bit secured adjacent to said lead reaming-bar trailing-end, a trail reaming-bar connected to said lead reaming-bar, a ferrule between said lead and trail reaming bars, and a secondary reaming bit secured adjacent to the trailing end of said trail reaming-bar.

2. In the mining operation of wedging-off a branch hole at wedge-level, and for use with a set of drill-rod sections, a drilling and reaming assembly for the purpose specified, comprising in combination a leading-section, a leading-end drill-bit attached thereto, a flexible joint connected to the trailing end of said leading-section, a lead reaming-bar connected to said flexible joint, a leading-end section centering component adjacently connected between said ream-bar and said leading section a primary reaming bit secured adjacent to said lead reaming-bar trailing-end, a trail reaming-bar connected to said lead reaming-bar, a ferrule be-

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tween said lead and trail reaming bars, a secondary reaming bit secured adjacent to the trailing end of said trail reaming-bar, and an underlength drill-rod section connected to the trailing end of said trail reaming-bar.

3. In the mining operation of wedging-off a branch hole at wedge-level, and for use with a set of drill-rod sections, a drilling and reaming assembly for the purpose specified, comprising in combination a leading-section, a leading-end drill-bit attached thereto, a primary flexible joint connected to the trailing end of said leading-section, a lead reaming-bar connected to said flexible joint, a leading-end section centering component adjacently connected between said lead reaming-bar and said leading section a primary reaming bit secured adjacent to said lead reaming-bar trailing-end, a trail reaming-bar connected to said lead reaming-bar, a ferrule between said lead and trail reaming bars, a secondary reaming bit secured adjacent to the trailing end of said trail reaming-bar, an underlength drill-rod section connected to the trailing end of said trail reaming-bar, and a secondary flexible joint at the trailing end of said underlength drill-rod section and connecting the same to the first or leading standard drill-rod section.

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