July 8, 1958 W. L. CHURCH ET AL 2,842,343

RETRACTIBLE BIT

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Fig. 1

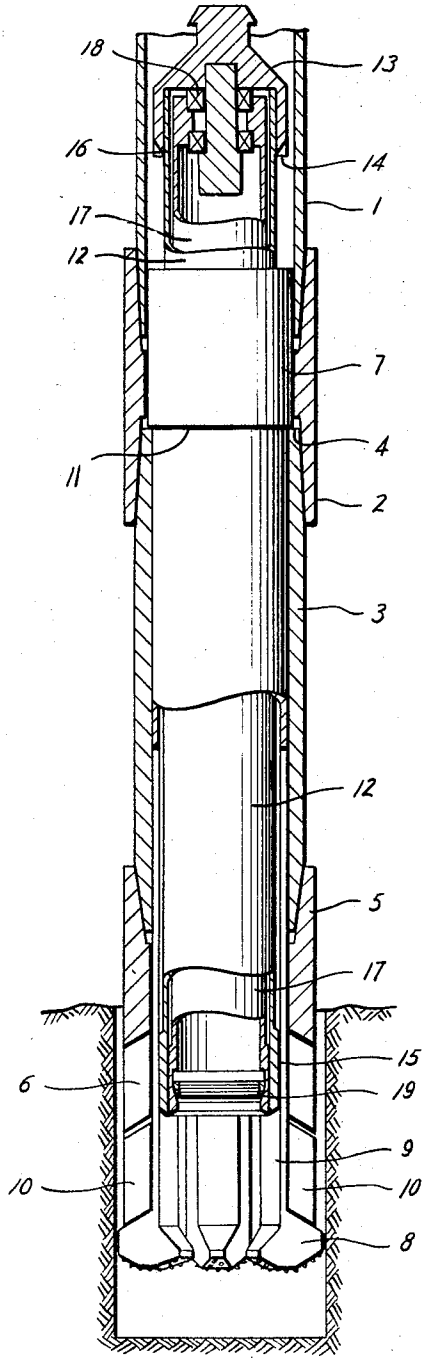
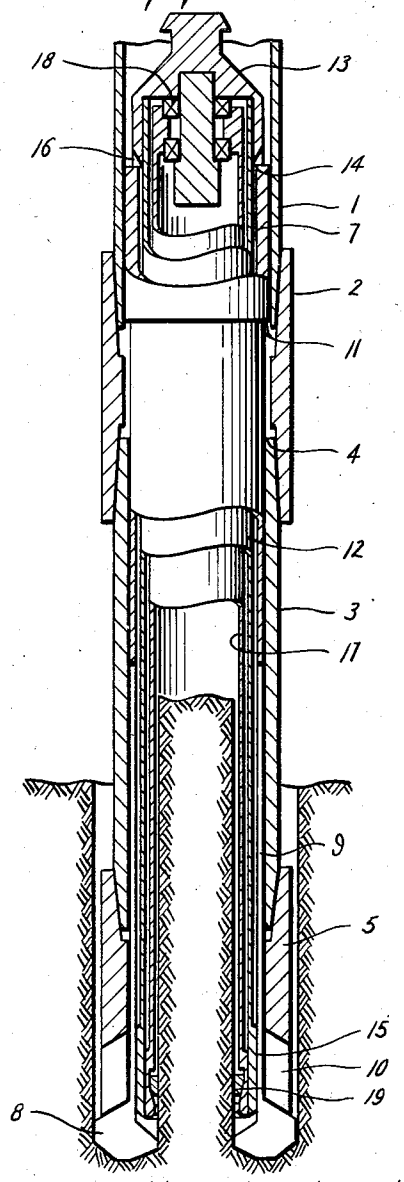


Fig. 2



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Fig. 3A

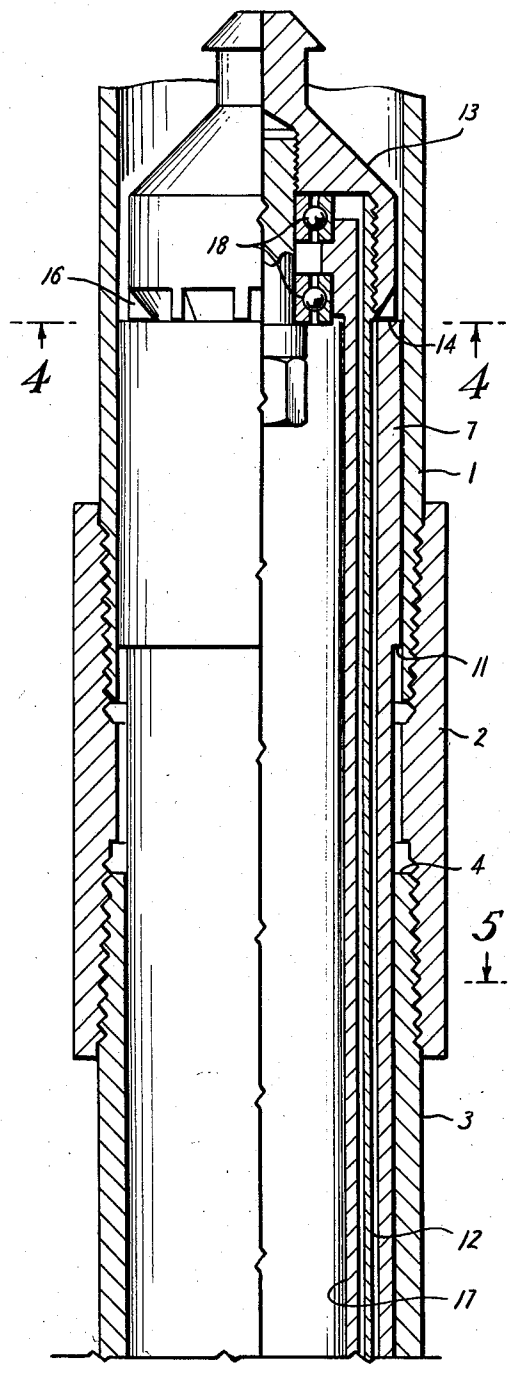
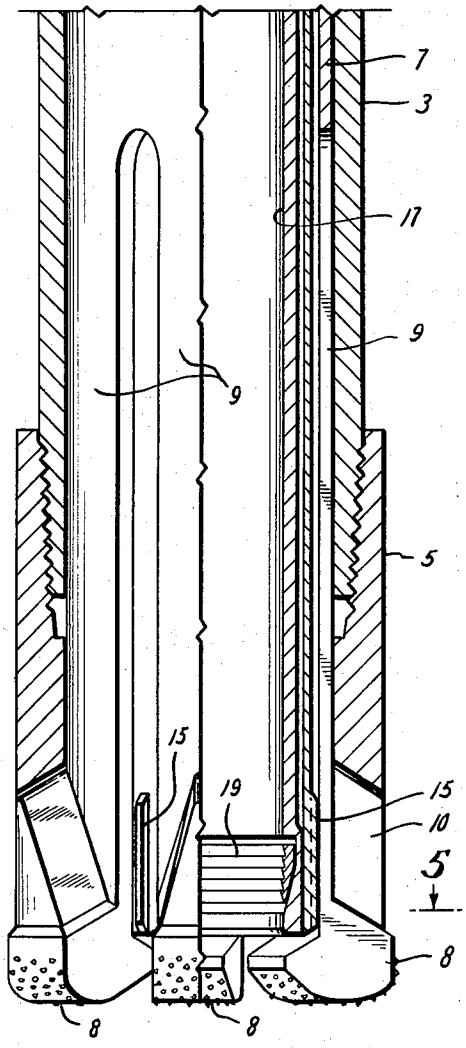


Fig. 3B



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Fig. 4

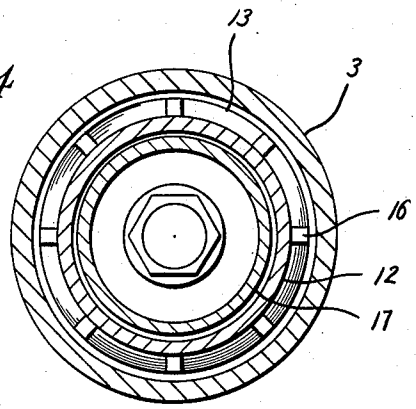


Fig. 5

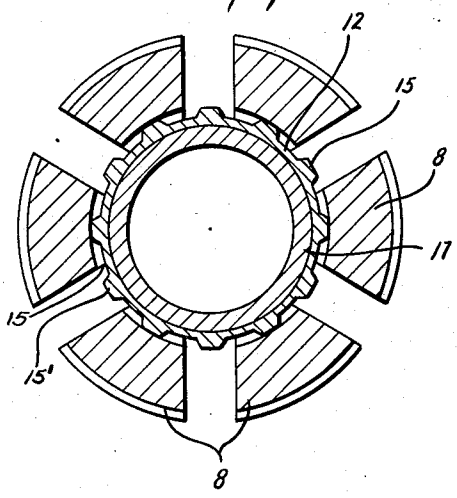
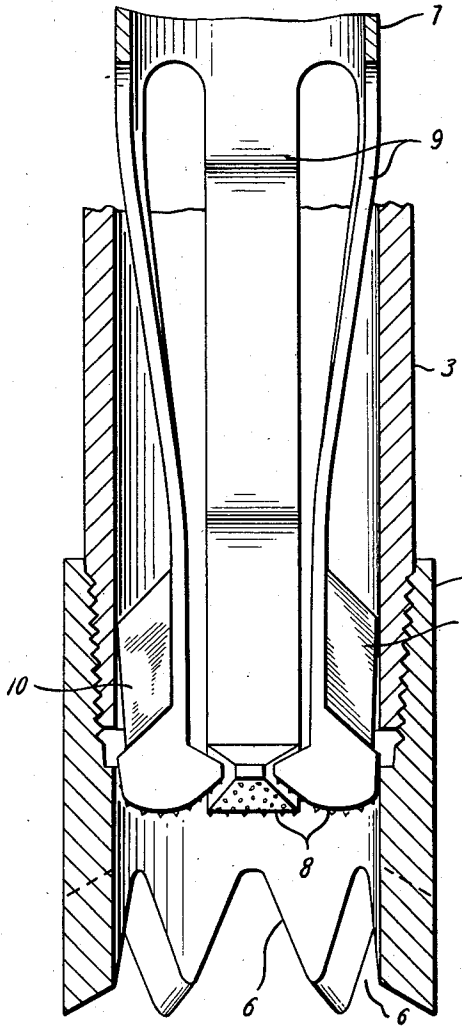


Fig. 6



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United States Patent Office 2,842,343 Patented July 8, 1958

2,842,343

RETRACTIBLE BIT

Walter L. Church and Carroll E. Church, Houston, Tex.

Application November 19, 1954, Serial No. 469,986

3 Claims. (Cl. 255—72)

This invention relates to new and useful improvements in a retractible bit.

It is an object of this invention to provide a bit for drilling, as in oil well drilling, that may be passed through and withdrawn from the well drill stem without the necessity of removing the drill stem from the bore.

It is another object of the invention to provide a bit that may be used in conjunction with a bore barrel and that will make a ring-like cut through hard formations, preserving a core of the cut.

It is still another object of the invention to provide a drill bit of the type known as a diamond head drill, having its drilling head in segments and having novel means for mounting same on a drill stem.

It is still a further object of the invention to provide a method of drilling a well bore having novel means for mounting and recovering a drill bit.

With the above and other objects in view, the invention has relation to certain novel features of construction and operation more particularly defined in the following specifications and illustrated in the accompanying drawings, wherein:

Figure 1 is an elevational sectional view.

Figure 2 is an elevational sectional view, showing the tool in cutting relation.

Figure 3A is an enlarged elevational sectional view.

Figure 3B is an enlarged elevational sectional view in continuation of the view shown in Figure 3A.

Figure 4 is an end sectional view taken on the line 4—4 of Figure 3A.

Figure 5 is an end sectional view taken on the line 5—5 of Figure 3B, and

Figure 6 is an enlarged elevational sectional view, showing the bit being retracted from drilling position.

Referring now more particularly to the drawings, the numeral 1 designates the bottom section of a well tubing, such as the casing or the drill stem, having the usual union 2 and having a sub 3 which has the same outside diameter as the casing 1, but which has a decreased inside diameter, forming an enlarged stop 4. Secured to the lower end of the sub 3 is a guide 5 having its lower end provided with a series of tapered grooves 6, 6.

The drill bit consists of a shank 7 having an annular shoulder 11 and the series of depending legs 9, 9, which may be formed by cutting longitudinal slots in the shank 7, and the cutting segments 8 which are preferably convex on their bottom surface and are tapered inwardly, and are provided with cutting abrasives, such as embedded diamonds. On the outside surface of each leg 8, adjacent the segments 9, is an upwardly extending and inwardly tapered anchor member 10.

The legs 9 are bent inwardly and the segments 8 will thus be held closely together within the bore of the tubing or casing 1. The bit, formed by the shank 7 and legs 9, may be dropped into the bore until the shoulder 11 contacts and is stopped by the shoulder 4 of the sub

3. The legs 9 being longer than the sub 3 and the guide 5, will extend below the guide 5. A core taking apparatus may then be lowered into the tubing until the shoulder 14 of the core taking apparatus head member 13 abuts against the top of the shank 7. On the lower periphery of the core barrel housing 12 is the vertical tubular extension as 15 which bears against the legs 9.

The head 13 of the core taking apparatus is provided with inwardly tapered slots 16 to permit the passage of washing fluid therethrough. The core barrel 17, which is mounted in the core taking apparatus head 13 by suitable bearings, as 18, in the usual manner, has the vertically movable slips 19 in the lower end of said barrel to catch the core as it is formed.

When it is desired to drill with the bit herein described, the bit is dropped into the casing 1 and will be stopped when the shank 7 contacts the shoulder 4. The length of the legs 9 extend the segments 8 well below the bottom of the guide 5, the casing having first been raised off of the bottom of the bore. The core taking apparatus is then lowered into the casing, until the head 13 rests on the top of the shank 7, and the extension 15 bears against and moves the legs 9 outwardly. The casing is then lowered, the anchor members 10, 10 adjacent the cutting segments, 8, being received by the slots 6 in the guide 5, and being wedged tightly therein. The tubing 1 is then rotated, and the cut made, the washing fluid passing through the passageways 16 and between suitable flutes as 15' on the extension 15, and the core passing into the core barrel 17 as shown in Figure 2. When it is desired to remove the bit, the core taking apparatus is removed in the usual manner, the slips 19 catching and breaking off the core, and as the core taking apparatus is removed, the legs 9 will be relieved and will move inwardly, moving the anchor members 10 out of the guide slots 6 and a fishing tool may be employed to engage the shank 7 of the bit and the bit removed from the tubing 1.

In drilling through extremely hard formations, where diamond bits are usually employed, the cutting away of all of the formation within the radius of the bit is very difficult and usually very slow. By employing the method of coring, using a retractible bit, the area being cut is decreased and the speed of the cut increased, and the usual delay in drilling operations caused by the necessity for pulling the drill stem is eliminated.

While the foregoing is considered a preferred form of the invention, it is by way of illustration only, the broad principle of the invention being defined by the appended claims.

What we claim is:

1. In a retractible drilling means, a tubular drill stem, a tubular sub mounted on the lower end of said drill stem, an integral stop means in said sub, a guide on said sub, a bit having a tubular shank and a plurality of integral inwardly turned yieldable legs depending therefrom, drilling segments on the free ends of said legs, outwardly extended anchor means on said segments, retractible means for urging said legs outwardly and slots in the lower end face of said guide for engaging said anchoring means with said drill stem.

2. In a retractible drilling means, a tubular drill stem, a tubular sub mounted on the lower end of said drill stem, a guide means on the lower end of said sub having upwardly and inwardly tapered slots on the lower end face thereof, a bit having a tubular shank and integral legs depending from said shank, cutting members on the lower ends of said legs, and anchoring means on the outer side walls of said legs adjacent said cutting members, said anchoring means being upwardly and inwardly tapered to be received by said slots.

3. In a retractible drilling means, a tubular drill stem, a tubular sub mounted on the lower end of said drill stem, a guide means on the lower end of said sub having upwardly and inwardly tapered slots in the lower end face thereof, a bit having a shank and legs depending from said shank, cutting members on the lower ends of said legs, and anchoring means on the outer side walls of said legs adjacent said cutting members, said anchoring means being upwardly and inwardly tapered to be received by said slots, a core taking apparatus movable into and out of said drill stem having means for moving said legs into position to be anchored on said drill stem.

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