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CORE DRILL

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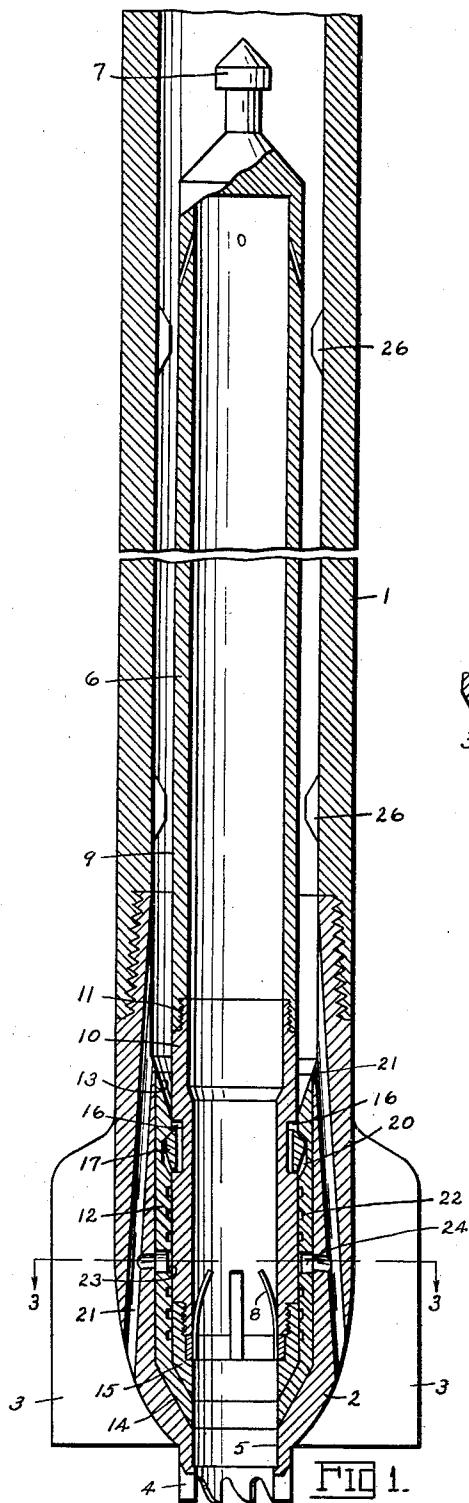
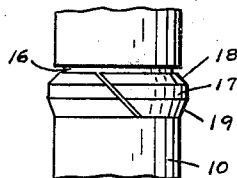


FIG 2.

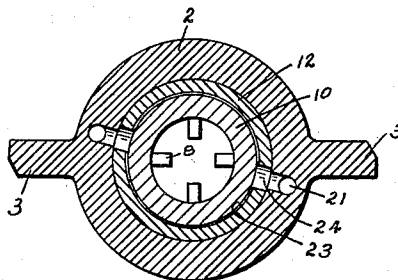


FIG 3.

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CORE DRILL

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12 Claims. (Cl. 255—72)

This invention relates generally to deep well drills and specifically to core drills.

It will be found particularly useful in that type of core drill in which cores or samples of the formation are taken at desired intervals as the drilling proceeds without removing the drill stem from the well, the core barrel being dropped into the drill stem to descend by gravity to its core-receiving position adjacent the bit at the lower end of the drill stem, and being removed upwardly thru the drill stem by means of a cable, known as a wire line, which has attached to the lower end thereof a device known as an overshot, to engage the core barrel.

In core drills of the type just referred to, the core barrel has heretofore been releasably connected to the drill stem by means of a latching device embodying various parts, the manufacture of which is costly and the operation of which is inefficient; and as the interengaging parts thereof are mounted in the stem and on the barrel to hold the latter at a point near the upper end thereof, it has been impossible to vary the length of the core barrel to obtain cores of different lengths without removing the drill stem from the well and repositioning such parts.

This invention has for its general object the provision of a core drill of the type just referred to, embodying a new and improved latching device characterized by simplicity and consequent low cost of manufacture, and efficiency in operation, and positioned in such a manner as to permit core barrels of various lengths to be used therewith for the purpose of taking cores of different lengths without removing the drill stem from the well.

The preferred embodiment of the invention is illustrated by the accompanying drawing, wherein Fig. 1 is a fragmentary sectional elevation of the lower portion of the drill; Fig. 2, a detail fragmentary view of the lower portion of the core barrel with the snap ring thereon, and Fig. 3 a horizontal section on the line 3—3 of Fig. 1.

In the drawing the drill stem is indicated at 1. It has on its lower end a bit 2 of the conventional type which may include oppositely disposed blades 3 and an annular central cutter 4 forming an opening 5 for the reception of the core.

The core barrel is indicated at 6. It has a head 7 adapted to be engaged by the overshot for a purpose which will hereinafter appear, and a core catcher 8 that permits the entrance of the core into the barrel, and prevents the escape of the core therefrom. The core barrel 6 is made

in two sections 9 and 10 which may be connected by threads 11. The lower section 10 fits within a liner 12 which has a flared upper end 13 and a tapered lower end 14, the former serving to guide the lower end of the core barrel 6 into place, and the latter fitting snugly in the bottom of the bit 2. The liner 12 is pressed into the bit 2 and fits so tightly therein that it must be intentionally removed and is not disturbed by the removal of the core barrel 6 in the manner hereinafter set forth. On the lower end of the core barrel is a tapered shoe 15 which rests upon the lower end of the liner 14. Fitting in the annular groove 16 of the lower section 10 of the barrel 6 is a snap ring 17 having tapered upper and lower portions 18 and 19, the taper of the upper portion 18 being steeper than that of the lower portion 19; and for the reception of the ring 17 the liner 12 has an internal annular groove 20, the upper and lower walls of which are tapered as shown.

The numeral 21 indicates fluid passageways through which slush pumped downwardly into the drill stem 1 may pass to the bit blades 3 and cutter 4 to cool the same and remove the cuttings thereof in a manner well known to those skilled in the art. The numeral 22 indicates annular grooves in the liner 12 for the reception of foreign matter entering between the liner 12 and section 10 of the core barrel 6. The numerals 23 and 24 indicate, respectively, an annular groove and ports in the liner 12 to permit the escape of fluid that might otherwise be trapped between the liner 12 and core barrel, such fluid being permitted to escape through the ports 25 of the bit head 2. The numeral 26 indicates guides to center the core barrel 6 in the drill stem 1.

The drill may be used as follows:

If during the drilling of a well with the drill stem 1 and bit 2 attached thereto, it is desired to take a core, the core barrel 6 may be dropped into the drill stem at the surface of the earth. It will descend by gravity into the position shown by Fig. 1, the snap ring 17 being radially compressed by the liner 12 as the tapered bottom portion 19 of the ring 17 slides thereinto, and said ring expanding when it reaches groove 20 in liner 12 to releasably hold the core barrel in place. In view of the gradual taper indicated at 19 the ring 17 offers no objectionable resistance to compression as it enters the liner 12.

Rotation of the drill stem is then continued until the desired core has entered the barrel 6, whereupon the conventional overshot may be lowered by means of a cable (neither of which

is shown) until it engages the head 7, whereupon the core barrel may be pulled upwardly through the drill stem 1, the initial upward force exerted being sufficient to overcome the resistance offered to upward movement of the core barrel by the ring 17 because of the relative steepness of the taper 18.

Now, if it is desired to take cores of different lengths, the upper section 9 of the core barrel 6 may be disconnected from the lower section 10 thereof, and a longer or a shorter section corresponding to section 9 may then be connected to the lower section 10, in view of which it will be obvious that longer or shorter cores may be taken without altering in any way the elements of the latching device carried by the core barrel, or the elements of the latching device carried by the drill stem, because the lower section 10 of the core barrel and the liner 12 may be used with sections thereof of any length.

Various modifications and uses of the invention other than as hereinabove described will be apparent to those skilled in the art, all within the scope of the following claims.

I claim:

1. A core drill including a hollow drill stem; a drill bit secured to the lower end of said drill stem and having a central opening, the lower portion of the wall of said opening being tapered downwardly and inwardly; a liner in said opening and having a tapered lower end to fit the lower portion of the wall of said opening, and having a flared upper end and an internal annular groove, the upper wall of said groove being inclined upwardly and inwardly, and the lower wall of said groove being inclined downwardly and inwardly; a core barrel having upper and lower sections separably connected together, said core barrel being insertable downwardly in said drill stem until its lower section enters said liner; said lower section having a tapered lower end to fit the tapered lower end of said liner, and having an external annular groove; a split resilient latching ring in the groove in said barrel, and having a tapered upper portion and a tapered lower portion, the taper of said upper portion being steeper than the taper of said lower portion; said ring being automatically forced into said groove in said liner when said core barrel is moved downwardly, to releasably lock said core barrel in its core-receiving position, and being automatically forced out of said groove in said liner when an upward force is exerted on said core barrel, to permit said core barrel to be removed through said drill stem.

2. A core drill including a hollow drill stem; a drill bit secured to the lower end of said drill stem and having a central opening; a liner in said opening; and having a flared upper end and an internal annular groove; a core barrel having upper and lower sections separably connected together, said core barrel being insertable downwardly in said drill stem until its lower section enters said liner, said lower section having an external annular groove; a split resilient latching ring in the groove in said barrel, and having a tapered upper portion and a tapered lower portion, the taper of said upper portion being steeper than the taper of said lower portion; said ring being automatically forced into said groove in said liner when said core barrel is moved downwardly, to releasably lock said core barrel in its core-receiving position, and being automatically forced out of said groove in said liner when an upward force is exerted on said core barrel, to

permit said core barrel to be removed through said drill stem.

3. A core drill including a hollow drill stem; a drill bit secured to the lower end of said drill stem and having a central opening; a liner in said opening; said liner having an internal annular groove; a core barrel insertable downwardly in said drill stem until it enters said liner; said core barrel having an external annular groove; a split resilient latching ring in the groove in said barrel, said ring being automatically forced into said groove in said liner when said core barrel is moved downwardly, to releasably lock said core barrel in its core-receiving position, and being automatically forced out of said groove in said liner when an upward force is exerted on said core barrel, to permit said core barrel to be removed through said drill stem.

4. A core drill including a hollow drill stem; a drill bit secured to the lower end of said drill stem and having a central opening; a core barrel insertable downwardly in said drill stem; a resilient latching ring; and an element to be engaged by said ring, said ring being automatically forced into engagement with said element when said core barrel is moved downwardly, to releasably lock said core barrel in its core-receiving position, and being automatically forced out of engagement with said element when an upward force is exerted on said core barrel, to permit said core barrel to be removed through said drill stem.

5. A drill having a hollow drill stem; a bit connected to the lower end thereof; a core barrel insertable into and removable through said drill stem while the latter is in the well and having upper and lower separable core-receiving sections; and a latching device associated with said lower section to releasably hold said core barrel down in its core-receiving position independently of said upper section, said latching device being freely rotatable with respect to said lower section.

6. A drill including a drill stem; a core barrel; and a latching device to releasably hold said core barrel down in its core-receiving position in said drill stem, said device including a resilient ring and means automatically engageable and releasable by said ring when said core barrel is moved downwardly and upwardly, respectively, with respect to said drill stem.

7. A drill stem core barrel combination comprising a hollow drill stem, a core barrel arranged to move in said stem, and yieldable latching means including a split ring arranged to releasably lock said barrel in said stem.

8. A drill stem core barrel combination comprising a hollow drill stem, a core barrel arranged to move in said stem, and yieldable latching means carried by said barrel to engage said stem including a split ring.

9. A drill stem core barrel combination comprising a hollow drill stem, a core barrel arranged to move in said stem, and yieldable latching means including a split ring arranged to lock said barrel and stem in core-receiving position, said means positioned at the lower end of said barrel.

10. In a drill stem core barrel assembly the combination comprising a hollow drill stem having a drill bit on the lower end thereof and a core barrel arranged to move freely in said stem, of yieldable means freely rotatable with respect to said barrel for releasably locking said barrel to said bit in core-receiving position.

11. In a drill stem core barrel assembly the

5 combination comprising a hollow drill stem having a core drill bit at the lower end thereof and a core barrel arranged to move freely in said stem, of yieldable means freely rotatable with respect to said barrel for releasably locking said core barrel to said core bit in core-receiving position.

12. A drill stem core barrel combination comprising a hollow drill stem, a core barrel arranged

to move in said stem, and yieldable latching means adjacent the lower end of said barrel to releasably lock said barrel in said stem, said means having its downwardly facing projecting parts tapered at a relatively small angle to enable the core barrel in descending to move past obstructions in the wall of the drill stem without catching thereon. 5

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