Feb. 21, 1939. L. E. GARFIELD 2,148,373

RETRACTABLE CORE BARREL

Filed June 19, 1936

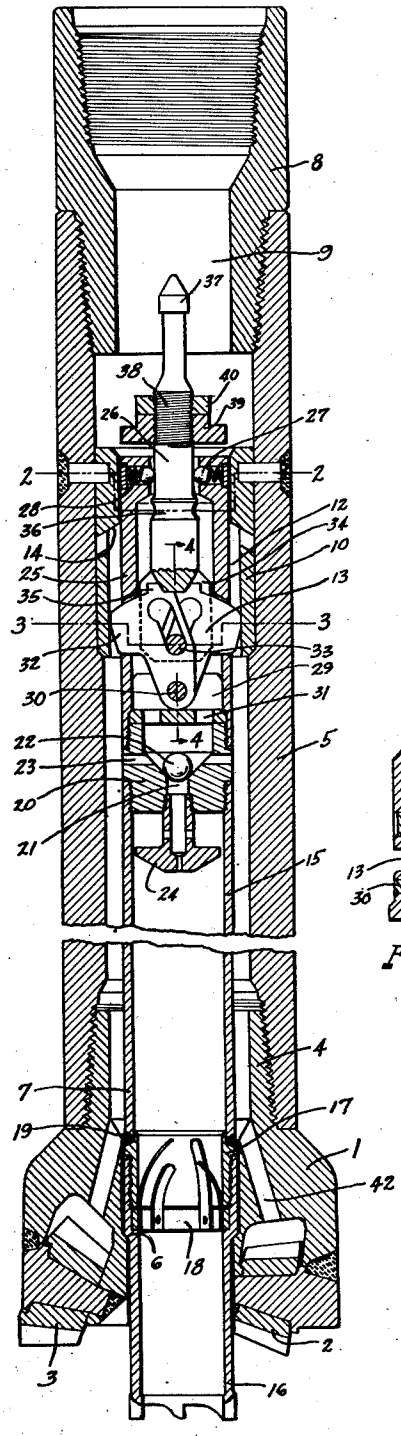


Fig. 1

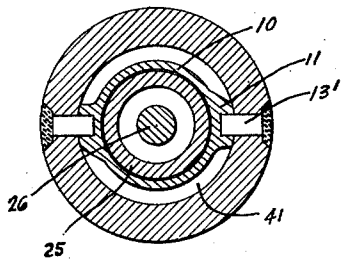


Fig. 2

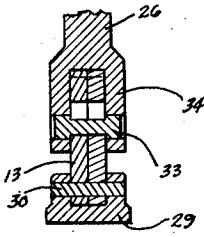


Fig. 4

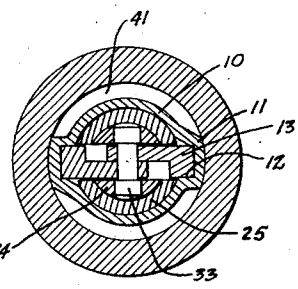


Fig. 3

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Patented Feb. 21, 1939

2,148,373

UNITED STATES PATENT OFFICE

2,148,373

RETRACTABLE CORE BARREL

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Application June 19, 1936, Serial No. 86,056

6 Claims. (Cl. 255—72)

My invention relates to retractable core barrels formed to be dropped from the surface through the drill stem into a seat in a core bit and to take a sample of the formation. The core barrel may then be withdrawn from the drill, leaving the drill stem and drill in the hole.

It is an object of the invention to provide a latch for the core barrel in the drill collar of the drill which will form a driving connection therewith and also allow the core barrel to recede upwardly when hard formations are encountered.

There is a core cutter at the lower end of the retractable core barrel which is designed particularly for soft formations. It projects in advance of the main drill and does not receive a large amount of flushing fluid. It is subject to overheating in hard formation on this account. To avoid burning of the drill and core the core barrel may move upwardly so that it does not project ahead. It thus gets more cooling from the flushing fluid and the main drill does more of the cutting.

I desire to so construct the device that the core barrel is seated through liquid pressure, and to thus provide for upward movement of the barrel under contact with the harder material.

The construction of the latching engagement between the core barrel and the drill collar forms an important feature of the invention.

Referring to the drawing herewith, Fig. 1 is a central longitudinal section through a core drill with my invention installed therein.

Fig. 2 is a transverse section on the plane 2—2 of Fig. 1.

Fig. 3 is a similar section on the plane 3—3 of Fig. 1.

Fig. 4 is a section on the plane 4—4 of Fig. 1 showing details of the latch.

The core barrel is shown as employed with a roller core drill having a head 1, with roller cutters 2 and 3 thereon to cut an annular hole in the formation. The head has an upper tapered shank 4 threaded to engage the drill collar 5. At a point near the lower end of the drill there is an inner annular seat or shoulder 6, presented upwardly to engage with the core barrel 7.

The drill collar 5 is of heavy tubular construction and is internally threaded at its upper end to engage a tool joint or sub 8. Said sub has an interior cylindrical passage 9 through which the core barrel may pass.

Adjacent the upper end of the drill collar the interior of the collar is slightly enlarged to receive a drive bushing 10. The bushing is tubular and of smaller diameter than the interior of the drill collar and has two opposite outwardly extending lugs or ridges 11 to contact with the interior of the drill collar. It is locked in position by anchor pins 13' engaging through the walls of the drill collar and into the lugs 11 of the bushing as will be seen in Fig. 2. The interior face of the bushing has two opposed grooves 12 therein to receive latching dogs 13 on the core barrel. Said grooves extend from the lower end upwardly a predetermined distance and have shoulders 14 at the upper ends thereof.

The core barrel 15 has a core cutter 16 at the forward end thereof. The core cutter has a threaded connection with a locking sleeve 17 which serves to clamp the core catcher 18 in position in the barrel. The body of the core barrel 15 is welded to the collar 17 at 19.

The upper end of the core barrel is secured to a vent plug 20 which has an axial passage 21, the upper end of which is closed by an upwardly opening ball valve 22. A tubular stop piece 24 is screwed within the lower end of the passage 21 to contact with the core and guard against the stopping of the passage. Above the valve 22 are lateral vent passages 23 opening into the interior of the drill collar.

Secured to the upper end of the core barrel is a latch housing 25. At the upper end of this housing the walls thereof are extended inwardly to provide a somewhat constricted axial opening to fit loosely about the stem 26 of the latching device. Within this constricted opening are a plurality of latching balls 27 fitting within radial recesses in the housing and held resiliently toward the stem by springs 28.

Latching dogs 13 are mounted pivotally at their lower ends upon a base plug 29 which fits against the upper end of the vent plug 20. It is slotted to receive the dogs and a transverse pin 30 serves as a pivot for the dogs. The plug 29 has openings 31 therethrough to allow passage of fluid. The dogs have outwardly presented latch members 32 which may be extended through lateral slots in the housing to engage in the grooves 12 in the drive bushing. There are upwardly diverging slots in each latching dog to receive a transverse pin 33.

The pin 33 is extended transversely of a slot in the head 34 formed on the lower end of the stem 26. The upper ends of the dogs 13 have spaced ears 35 between which a downward projection on the head 34 may engage when the dogs are in latched position and act to retain the dogs thus latched.

The stem 26 has an annular groove 36 to receive the latching balls 27 and hold said stem releasably in raised position with the dogs retracted. The upper end of the stem has a knob 37 thereon to be engaged by an overshot. Below the knob the stem is threaded at 38 to engage with a circular disc 39 and a lock nut 40. The disc is of a suitable outside diameter to fit slidably within the cylindrical passage 9 when the stem is elevated.

The core barrel and latching mechanism thereon may be dropped into the drill stem from the surface downwardly to engage within the seat 6 in the drill head. When thus dropped, the latching stem 26 will be raised to retract the dogs, the balls 27 engaging in groove 36 to retain them in that position. When the barrel is in seated position the disc 39 will be positioned in the lower end of the passage 9 and fluid pressure may be exerted thereon to force it downwardly to the position shown in the drawing and thus latch the barrel in driving engagement with the drive bushing.

The drill may then be rotated to drill and obtain a core. Flushing fluid may circulate around the drive bushing through passages 41 and outside the core barrel and through passages 42 in the drill. The core barrel will be held resiliently downward by the hydrostatic pressure from the stream of flushing fluid. When hard formation is encountered tending to overheat the core cutter, the said cutter will be pushed upwardly by the formation against the pressure of the fluid until the lower end of the cutter is above the bit cutters 2 and 3. This movement moves the latching dogs 32 upwardly against the shoulders 14 where the movement upwardly is stopped. The core cutter itself is housed within the drill head to such an extent that it does not receive so large a portion of the weight of the drill stem but such pressure is sustained largely by the main drill. Injury to the core cutter is thereby avoided. It will be obvious that the core barrel may be rotated by its driving connection of the dogs 13 in the grooves 12 in any position of the barrel 15 relative to the bushing. When the hard formation has been drilled through the core cutter will be again advanced by the fluid pressure to the position shown in Fig. 1.

The core barrel may be removed by an upward pull on the knob 37 by means of an overshot in the usual manner. My device is capable of modification without departing from the invention as set out in the claims hereto included.

What I claim is:

1. A core drill, a drill collar thereon, an inner seat in said drill for a core cutter, a drive bushing in said drill collar, said bushing having longitudinal drive grooves therein, a core cutter adapted to fit in said seat and project normally in advance of the core drill, a core barrel on said cutter, and latching dogs supported on and movable vertically with said barrel and adapted to swing outwardly to engage said grooves to communicate rotative movement from said bushing to said barrel, said dogs being vertically slidable in said grooves to permit upward movement of said cutter and fluid operated means to retain said dogs in latched position.

2. A core drill, a drill collar thereon, an inner seat in said drill for a core cutter, a drive bushing in said drill collar, said bushing having longitudinal drive grooves therein, a core cutter adapted to fit in said seat and project normally in advance of the core drill, a core barrel on said cutter, and latching dogs supported on said barrel and movable outwardly, in response to fluid pressure from above, to engage said grooves to communicate rotative movement from said bushing to said barrel, said dogs being vertically slidable in said grooves to permit upward movement of said cutter.

3. A core drill, a drill collar thereon, a retractable core barrel in said drill collar, a core cutter thereon adapted to extend in advance of said drill, a drive member in said drill collar having longitudinal vertical grooves therein, latching dogs at the upper end of said barrel engaging slidably in said grooves, an operating stem engaging said dogs, fluid pressure operated means to move said stem and said dogs to latch said dogs in said grooves, said barrel and core cutter being held yieldably in advanced position by fluid pressure.

4. A core drill, a drill collar thereon, a retractable core barrel in said drill collar, a core cutter thereon adapted to extend in advance of said drill, a drive member in said drill collar having longitudinal vertical grooves therein, latching dogs at the upper end of said barrel engaging slidably in said grooves, an operating stem engaging said dogs, means releasable by fluid pressure to retain said stem in position to retract said dogs, means controllable at will to move said stem and said dogs to latch said dogs in said grooves, said barrel and core cutter being held yieldably in advanced position by fluid pressure.

5. A core drill, a drill collar thereon, a retractable core barrel adapted to engage in said drill, a core cutter thereon projecting normally in advance of said drill, said core barrel being held yieldably in advanced position by fluid pressure, means engaging the upper end of said barrel in slidable but nonrotatable engagement with said drill collar, and means operable by an upward pull thereon to release said barrel from said collar.

6. A core drill, a drill collar thereon, a retractable core barrel adapted to engage in said drill, a core cutter thereon projecting normally in advance of said drill, said core barrel being held yieldably in advanced position by fluid pressure, driving dogs on said core barrel movable by fluid pressure to engage slidably in said drill collar to communicate rotation from said collar to said barrel, and means whereby said dogs may be released and retracted from engagement with said collar.

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