Dec. 15, 1936. L. E. GARFIELD 2,064,255

REMOVABLE CORE BREAKER

Filed June 19, 1936

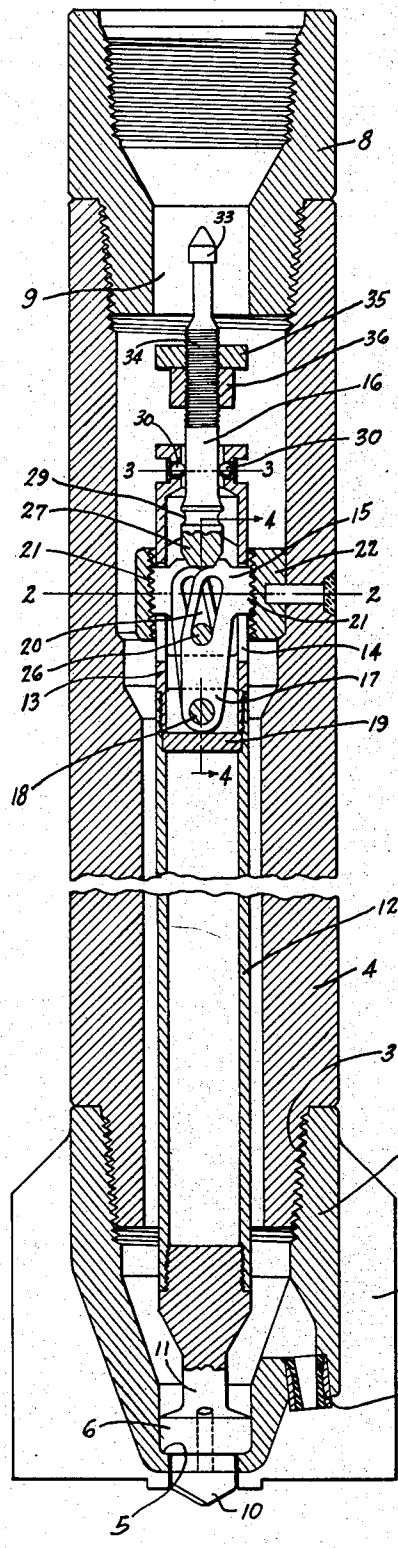

Fig. 1

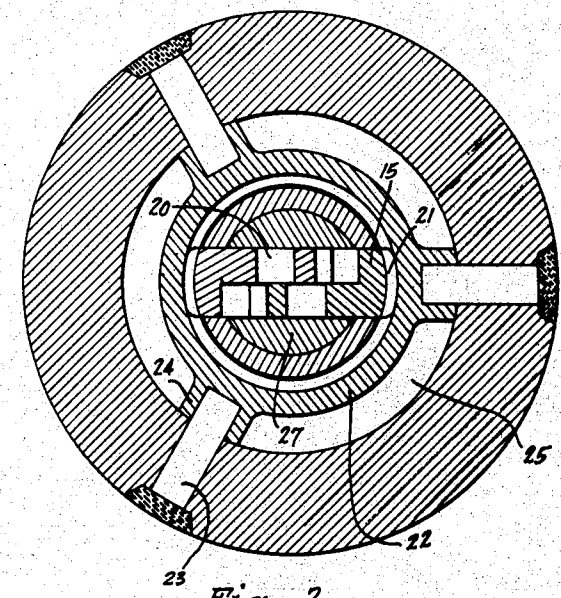

Fig. 2

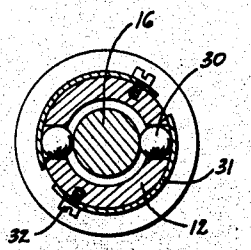

Fig. 3

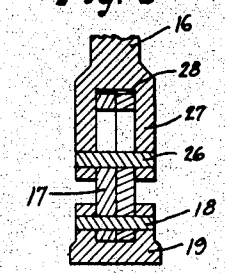

Fig. 4

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REMOVABLE CORE BREAKER

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7 Claims. (Cl. 255—61)

My invention relates to a device for use in breaking up cores which are formed by a core drill in well drilling. It is adapted particularly for use in place of a retractible core barrel such as is now sometimes employed.

In well drilling where it is desirable to obtain samples of the formation at frequent intervals, a core drill is used. To avoid having to withdraw the drill stem to raise a sample of the formation to the surface at each test, it is becoming common to drop a core barrel from the surface down into the drill and, when a sample has entered the core barrel, to withdraw the core barrel only, leaving the drill stem and the main drill in the hole. Some difficulty is experienced in this procedure in keeping the interior of the core drill free of material from the well bottom which tends to clog the passage for the barrel. The central axial opening in the drill may become so clogged and the core barrel seat so caked over with mud, sand and detritus that the core barrel will not seat properly.

It is an object of my invention to provide a core breaker which can be dropped into the seat in the core bit and be secured in place therein, to prevent the entrance of material and to break up and disintegrate this material so that it may be washed away by the flushing fluid while the drill is in use and a core is not desired.

The invention includes the latching mechanism by means of which the core breaker is held in place while the drilling proceeds and it is an object to provide a strong and efficient latch which will automatically engage the drill collar and hold the device in operating position.

It is also an object to provide an automatic latch which will be capable of ready release when a grappling device is employed to withdraw the core breaker.

I desire to provide a latch which will automatically be forced into a rigid engagement with the drill and drill collar but which will release on an upward pull on the releasing mechanism.

In the drawing herewith Fig. 1 is a central longitudinal section through a core breaker shown in operative position in a core drill.

Fig. 2 is an enlarged section on the plane 2—2 of Fig. 1.

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

Fig. 4 is a vertical, broken section on the plane 4—4 of Fig. 1.

In Fig. 1 the invention is shown as employed in a common type of core bit such as is ordinarily employed in soft or semi-hard formations. It includes a drill having a head 1 with laterally and forwardly projecting blades 2. The head has an axial opening therethrough, the upper end of which has a threaded socket 3 for engagement with the tubular drill collar 4. The opening through the head diminishes in diameter downwardly and has a lower shoulder 5 to form a seat for the core breaker 6. There is a plurality of discharge nozzles 7 for the flushing fluid on the forward sides of the cutting blades of the drill. These nozzles are preferably formed with an interior lining of hard, wear resisting metal, as shown.

At the upper end of the drill collar is a short sub 8 for connection with the drill stem. This sub has a lower cylindrical passage 9 of an interior diameter sufficiently restricted to fit closely about the core breaker when it is inserted into position.

The core breaker 6 is shaped to fit within the lower end of the drill head and to engage closely with the shoulder 5. It has a forwardly extending blade 10 to engage the formation and cut the center of the hole. The core breaker has a neck 11 extending upwardly and its upper end is enlarged and screwed within a barrel 12 upon which the latching mechanism is mounted.

The upper end of the barrel 12 is connected with a housing 13 the side walls of which are slotted at 14 to allow lateral movement therethrough of the latching dogs 15. The upper end of the housing is reduced in diameter and has a reduced axial opening to allow the stem 16 of the latching mechanism to move longitudinally therein.

The latching dogs 15 are formed on arms 17 the lower ends of which are pivotally supported upon a pin 18 mounted transversely of a slotted plug 19 secured within the lower end of the housing 13. Each arm is formed with a slot 20 therein which inclines outwardly and upwardly. The outer side of each dog at the upper end is formed with a toothed jaw 21, the teeth being cut transversely and spirally to engage screw threads within an outer bushing 22. Said threads are left hand threads so that relative rotation of the bushing over the dogs will move said dogs downwardly.

The bushing 22 is, as seen in Fig. 2, secured to the inner wall of the drill collar by anchor pins 23 which extend through said wall and engage within openings within ridges 24 formed radially upon the bushing. Between said bush-

ing and the drill collar, between said ridges 24, are fluid passages 25.

Working in the slots 20 of the dogs is a cross pin 26. This pin, as seen in Fig. 4, is secured upon a head 27 at the lower end of the stem 16. Said head is slotted diametrically to receive the two latching dogs between the said walls of the slot shown at 28. It will be seen that the movement of the pin 26 upwardly in said slot will move said dogs inwardly out of engagement with said bushing.

The stem 16 is formed with a circumferential groove 29 which, when said stem is moved upwardly into the passage through the housing will receive therein latching balls 30 which tend to hold the stem elevated to maintain the dogs 15 in retracted position.

The latching balls 30 are shown best in Fig. 3. They are mounted in radial openings in the housing and are held resiliently inward by leaf springs 31 which are secured, at a point spaced from the balls, to the outer surface of the housing by set screws 32.

At the upper end of the stem 16 is a spear head 33 of ordinary form to be engaged by a grapple or overshot. Below this head the stem is threaded at 34 to receive a disc 35 and lock nut 36. The disc is of a suitable exterior diameter to fit slidably within the cylinder formed by the passage 9 in the sub 8.

When the core drill is operating and no core is being taken, the core breaker is used. After the core barrel has been run to obtain a sample, the core breaker is dropped into position. When dropped, the latching stem is drawn upwardly into position with the balls 30 engaging in groove 29 of the stem, and thus holding the dogs retracted. When the core breaker engages the seat 5, the disc 35 will be in the cylindrical passage 9 and fluid pressure thereon will move the stem downwardly to the position shown in Fig. 1. This downward movement will throw the dogs outwardly to engage the threads on the bushing 22 and will lock the core breaker against upward movement. If the core breaker is not tightly locked, it will tend to resist rotation and the drill collar bushing will screw it downwardly to rigid engagement with the core breaker rotating with the drill.

When it is desired to remove the core breaker so that the core barrel may be run, an overshot of ordinary construction may be lowered and engaged about the spear head 33. An upward jerk on the stem will move the pin 26 upwardly and withdraw the latching dogs and release the device so that it may be pulled upwardly from the drill and drill stem. When the latching dogs are in latching position as shown in Fig. 1 the head 27 on the stem will fit between the upper ends of the dogs 15 as shown and thus tend to hold said dogs in latched position.

It will be noted that the construction here shown is simple and strong and has no parts liable to get out of order. The core breaker is moved into close engagement with its seat by the positive screwing engagement of the latching jaws with the drill collar bushing, so that the core breaker will keep the seat clear and assure that a place is available for the core barrel to seat when a sample is desired.

What I claim as new is:

1. A drill collar, a core drill thereon having an inner seat, a core breaker shaped to fit said seat, a bushing in said drill collar spaced above said seat, said bushing being internally threaded, a barrel on said core breaker, latching dogs supported at the upper end of said barrel, teeth on said dogs formed to engage within said threaded bushing and means to force said dogs into position engaging said bushing, said dogs being then adapted to be screwed downward by said bushing.

2. A drill collar, a core drill thereon having an inner seat, a core breaker shaped to fit said seat, a bushing in said drill collar spaced above said seat, said bushing being internally threaded, a barrel on said core breaker, latching dogs supported at the upper end of said barrel, teeth on said dogs formed to engage within said threaded bushing and means actuated by pressure of fluid pumped down from above to force said dogs into position engaging said bushing, said dogs being then adapted to be screwed downward by said bushing.

3. A drill collar, a core drill thereon having an internal seat, a core breaker formed to fit said seat and engage the well bottom, a bushing in said drill collar spaced above said seat and formed with an interior left hand thread, a barrel upon said core breaker, a pair of dogs pivoted at the upper end of said barrel, means to hold said dogs normally inwardly, but releasable by liquid pressure to move said dogs outwardly into threaded engagement with said bushing.

4. A drill collar, a core drill thereon having an internal seat, a core breaker formed to fit said seat and engage the well bottom, a bushing in said drill collar spaced above said seat and formed with an interior left hand thread, a barrel upon said core breaker, a pair of dogs pivoted at the upper end of said barrel, means to hold said dogs normally inwardly, but releasable to move said dogs outwardly into threaded engagement with said bushing.

5. A drill collar, a core drill thereon having an internal seat, a core breaker formed to fit said seat and engage the well bottom, a bushing in said drill collar spaced above said seat and formed with an interior left hand thread, a barrel upon said core breaker, a pair of dogs pivoted at the upper end of said barrel, means to hold said dogs normally inwardly, but releasable by liquid pressure to move said dogs outwardly into threaded engagement with said bushing and means to lock said dogs in engagement with said bushing.

6. A drill collar, a core drill thereon having an inner seat, a core breaker shaped to fit said seat, a bushing in said collar above said seat, means associated with said core breaker to engage said bushing and latch said core breaker on said seat, said latching means acting in response to rotation of said collar relative to said core breaker, to force said core breaker tightly into said seat.

7. A drill collar, a core drill thereon having an inner seat, a core breaker shaped to fit said seat, latching dogs mounted at the upper end of said core breaker to engage said bushing with a left hand threaded connection, means to hold said dogs normally retracted, and means actuated by fluid pressure to move said dogs into latching engagement with said bushing.

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