Dec. 26, 1939. W. B. NOBLE 2,184,361

CORE DRILLING APPARATUS

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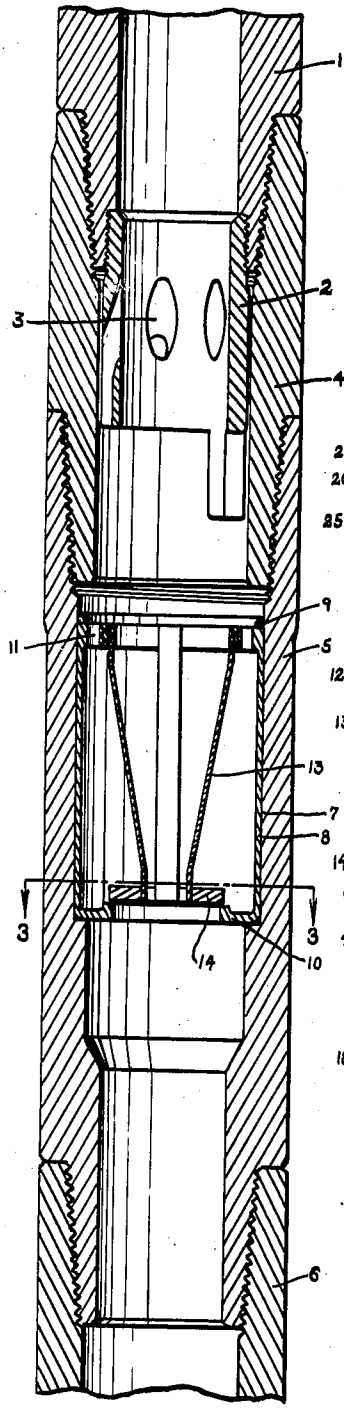


Fig. 1.

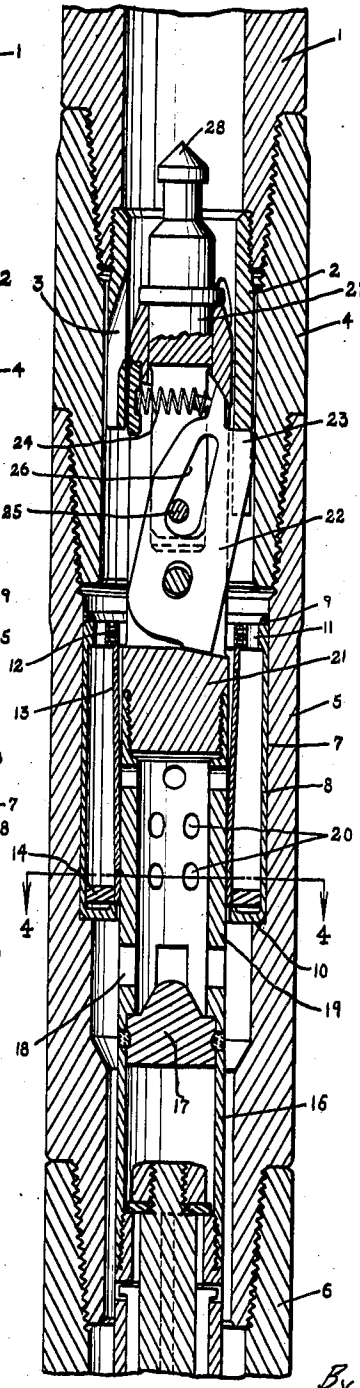


Fig. 2.

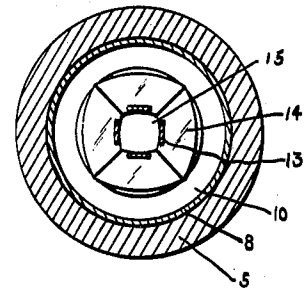


Fig. 3.

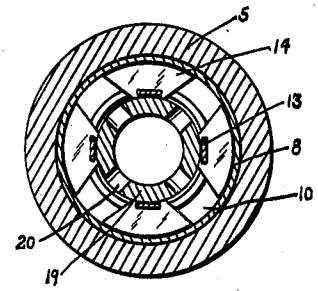


Fig. 4.

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CORE DRILLING APPARATUS

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10 Claims. (Cl. 255—72)

This invention relates to core drilling apparatus of the so-called wire line core barrel type and has for its general object the provision of a means whereby the operator or driller at the surface of the earth may tell whether or not the core barrel is properly seated in the bit so that he may proceed with his normal drilling operations.

It is a known fact that when a core barrel is withdrawn from a drill pipe at high speed, long pieces of hard shale or the like drop from the lower end and may lodge on some tool joint shoulder or on some upset. This means that when the next core barrel is dropped in, it will not reach bottom but will lodge on top of this piece of lost core and never reach bottom to seat properly in the bit. The operator is unaware of this and therefore goes forward in his usual way to take the core, the result being that the drill collar and bit will, in all probability, be plugged full of formation which should have entered the core barrel and no core will be obtained. Instead, it will be necessary to withdraw the drill stem from the hole with the consequent danger and great delay, so that the formation may be cleared out of the bit and drill collar.

It is, therefore, an object of this invention to provide a means whereby the driller or operator at the surface of the earth may tell definitely whether or not a core barrel is seated in its proper position within a core bit, and which will enable him to tell whether the code barrel has become lodged or stalled at some higher point in the drill stem.

Other objects and advantages will hereinafter appear.

In the drawing:

Fig. 1 is a longitudinal cross section through the lower portion of a drill stem constructed in accordance with this invention.

Fig. 2 is a similar view of a core barrel properly seated within such drill stem.

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a similar view taken along the line 4—4 of Fig. 2.

In accordance with this invention, there is screwed into the lower end of the drill stem 1 a bushing 2 having slush passages 3 therein adapted to conduct slush downwardly past the upper end of the core barrel assembly and into the annular space about this assembly. Secured to the lower end of the drill stem 1 is also the sub 4 which surrounds the lower portion of the bushing 2 and is exteriorly threaded at its lower end to receive the second sub 5. The drill collar 6 is threaded to the lower end of the sub 5.

For a portion of its length, preferably within its upper end, the sub 5 is formed with an enlarged internal diameter 7 for the purpose of receiving a sleeve 8 which is secured therein by welding around its upper end, as shown at 9. The lower end of this sleeve is provided with an internal flange 10 having an opening therethrough of a size to receive the core barrel but adapted to substantially close the annular space about the core barrel when the same is in place therein. At its upper end, this sleeve 8 is provided with inwardly extending arms 11 forming a spider-like portion supporting an inner ring 12. Secured to this inner ring and extending downwardly therefrom at circumferentially spaced points are a plurality of resilient arms or springs 13. These springs 13 are secured at their lower ends to a plurality of complementary segments 14 which are adapted, when in their outermost position, to leave a sufficient clearance for the core barrel to pass therethrough with a snug engagement, and when in their innermost position, to contact with each other so as to reduce the area available for flow of fluid to a relatively small opening, as shown at 15 in Fig. 3. The core barrel is constructed in the usual manner except that the sleeve 16, which is secured to the upper end thereof, is provided with a plug 17 at a position spaced above the upper end of the core barrel and above this plug it has a series of perforations 18. An imperforate zone 19 in this sleeve separates the first set of perforations from a second set of perforations 20, and the parts are so proportioned that when the core barrel is fully and properly seated, the imperforate zone 19 will lie within the opening through the flange 10 and the perforations 18 will be positioned below this flange while the perforations 20 will be positioned above the segments 14. Secured to the upper end of the sleeve and closing the same is the body element 21 in which is pivotally mounted the latch member 22 having a part 23 adapted to engage below the bushing 2 to latch the core barrel in place. This latch is urged into latching position by means of a spring 24 and is retracted from this position by means of the pin 25 riding in the slot 26 and carried by the plunger 27 having the spear head 28 at its upper end.

In operation, when no core barrel is in place for the coring operation, the parts occupy the position shown in Figs. 1 and 3. When in this position, flow of fluid downwardly through the drill stem is obstructed by the flange 10 and the

segments 14, the only space available for flow being that designated at 15 in Fig. 3. This restriction of flow will cause the pumps which produce the flow to operate at a relatively slow speed when no core barrel is seated within the drill stem in the proper position for coring.

When a core barrel is dropped into the drill stem, the pumping is continued and as will be apparent, the restriction of flow will continue so long as the core barrel occupies any point above the segments 14. When the lower end of the core barrel enters the bushing 2, any further flow of fluid will result in forcing the core barrel further down into the drill stem and if, for some reason, the core barrel will not move down, the flow of fluid will not only be restricted but will be substantially stopped. When the lower end of the core barrel approaches the segments 14, it will strike against the inner surfaces of the springs 13 and force them radially outwardly. This will move the segments 14 outwardly and enlarge the space therebetween until it is possible for the core barrel to pass therethrough. The core barrel will then pass on downwardly until it is seated and the latch 23 engaged beneath the bushing 2, as above mentioned. When this point has been reached, the perforations 18 will occupy a position below the flange 10 and the perforations 20 will occupy a position above the segments 14. As soon as this condition exists, flow may then take place downwardly through the passageways 3 and space about the core barrel assembly, between the springs 13 and through the perforations 20, thence through the interior of the sleeve 16 and out through the perforations 18, and thence in the usual manner to the bit at the lower end of the drill collar. The parts are so proportioned that this flow may be substantially unrestricted and the area available for flow much greater than that afforded by the opening 15. Consequently, as soon as the core barrel actually seats in its proper position, the restriction on flow will at once be removed and this will be communicated to the operator by an immediate speeding up of the pumps producing the flow. He will then know that everything is in proper position for the coring operation and that the coring may proceed. It will be apparent that there is no way for this indication to be given to the operator before the core barrel has seated in its proper position and that, therefore, there will be no danger of the operator proceeding in an effort to obtain a core when the core barrel has not properly seated.

It will be apparent from the foregoing that the objects and advantages sought by this invention will be accomplished by the device set forth. It is to be understood that the same is given by way of illustration and example, however, and not by way of limitation and that this invention is to be considered as limited in scope only by the prior art and by the terms of the appended claims.

Having described my invention, I claim:

1. In combination, a drill stem having a part adapted to receive a core barrel, and means for normally restricting flow through said drill stem, said means being movable laterally to permit substantially unrestricted flow through said drill stem during the time that a core barrel is in place therein.

2. In combination, a drill stem having a part adapted to receive a core barrel, and means for normally restricting flow through said drill stem when said core barrel is not in place, said means being movable to permit comparatively unrestricted flow through said drill stem during the time a core barrel is in place therein.

3. In combination, a drill stem having a part adapted to receive a core barrel, and means for normally restricting flow through said drill stem when said core barrel is not in place, said means being movable to permit comparatively unrestricted flow through said drill stem during the time a core barrel is in place therein, a core barrel adapted to be positioned in said drill stem, and means on said core barrel for holding said first means in open position and for providing a by-pass passageway for fluid past said first means when said core barrel is in place in said drill stem.

4. In combination, a drill stem having a part adapted to receive a core barrel, and means for normally restricting flow through said drill stem, said means comprising a plurality of segmental parts movable inwardly and outwardly and when moved inwardly serving to substantially restrict passage through said drill stem and when moved outwardly to substantially clear said passage.

5. In combination, a drill stem having a part adapted to receive a core barrel, and means for normally restricting flow through said drill stem, said means comprising a plurality of segmental parts movable inwardly and outwardly and means for urging said parts toward their inner positions, said parts when moved inwardly serving to substantially restrict passage through said drill stem and being movable outwardly to substantially clear such passage.

6. In combination, a drill stem having a part adapted to receive a core barrel, and means for normally restricting flow through said drill stem, said means comprising a plurality of segmental parts movable inwardly and outwardly, and downwardly, and normally inwardly extending resilient arms each secured to said drill stem at its upper end and to one of said segments at its lower end and serving to urge said segments inwardly at all times.

7. In combination, a drill stem having a part adapted to receive a core barrel, means for normally restricting flow through said drill stem, said means being movable laterally to permit substantially unrestricted flow through said drill stem during the time a core barrel is in place therein, and a hollow part on said core barrel adapted to extend through said first means and hold the same in a laterally outward position, said hollow part being open to receive fluid above said first means and open to discharge the same below said first means.

8. In combination, a drill stem having a part adapted to receive a core barrel, means for normally restricting flow through said drill stem, said means being movable laterally to permit substantially unrestricted flow through said drill stem during the time a core barrel is in place therein, and a hollow part on said core barrel adapted to extend through said first means and hold the same in a laterally outward position, said hollow part having lateral openings therein above and below said first means.

9. In combination, a drill stem having a part adapted to receive a core barrel and means for normally restricting flow through said drill stem said means comprising a plurality of segmental parts movable inwardly and outwardly and when moved inwardly serving to substantially restrict passage through said drill stem and movable outwardly to clear said passage, resilient means for

urging said parts toward their inner positions, a core barrel adapted to be positioned in said drill stem, and a hollow part on said core barrel adapted to extend between said segmental parts and hold them in their outer position, said hollow part having lateral openings therein above and below said segmental parts.

10. In combination, a drill stem having a part adapted to receive a core barrel, a core barrel adapted to seat in said part and to be spaced from the walls thereof to provide a passageway for the flow of fluid thereabout, means intermediate the ends of said passageway for dividing the same into two parts when said core barrel is in place in said drill stem, and means cooperating with said first means for partially closing the space occupied by said core barrel when said core barrel is not in position in said drill stem.

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