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CORE RETAINER FOR CORE BARRELS

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Fig. 1.

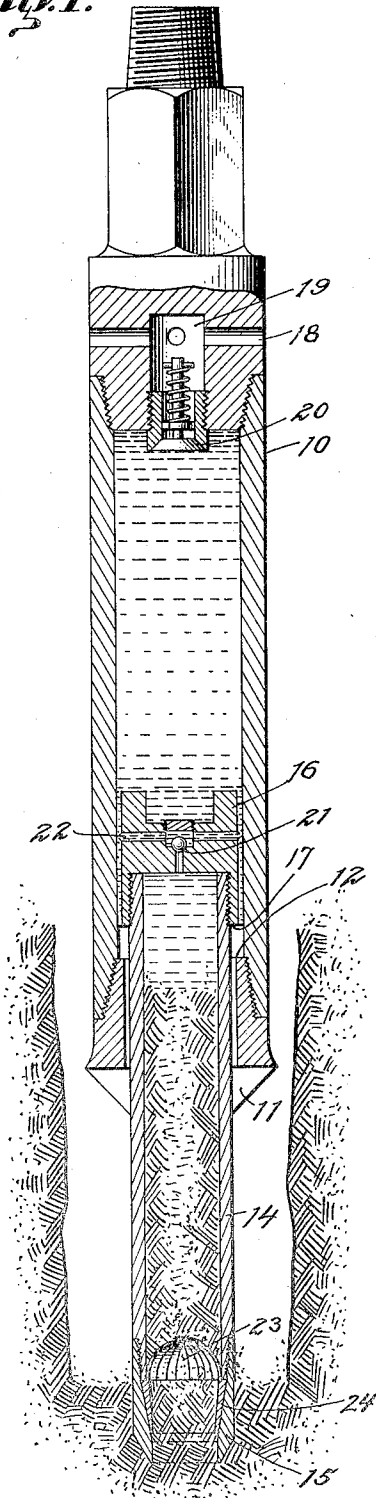


Fig. 2.

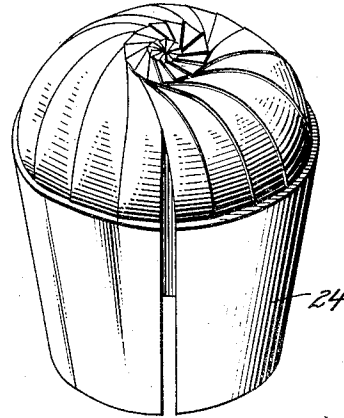
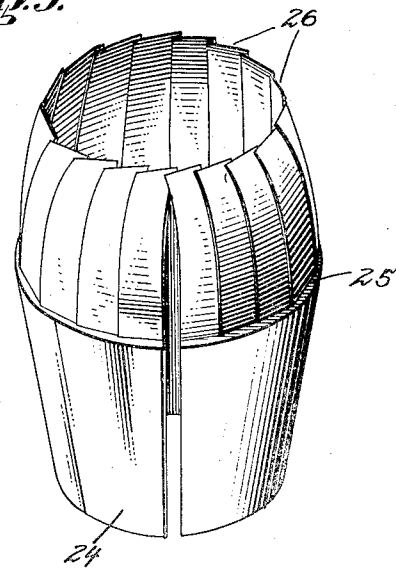


Fig. 3.



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CORE RETAINER FOR CORE BARRELS.

Application filed November 22, 1926. Serial No. 150,042.

This invention relates to well drilling equipment and particularly pertains to what I prefer to term a core retainer which is adapted for use in connection with devices used in obtaining formation samples or cores of the formation penetrated by the drill when drilling wells.

In a prior application entitled Core barrel, Ser. No. 75,499, filed by me on or about December 15, 1925, there is disclosed a device for efficiently obtaining accurate cores of a well. In this device a drill barrel is driven over the core so that a sample of the formation penetrated may be brought to the surface. At its lower end this drill barrel is fitted with a slip ring for retaining the core in the barrel, while the latter is elevated to the surface. This slip ring will not, however, retain all loose particles at the end of the core.

The present invention contemplates a mechanism which is substituted for the slip ring and which is capable of retaining the finest particles of formation within the barrel, and thus permit an exact core to be taken.

In carrying out the invention into practice, the lower end of the barrel is fitted with a plurality of yieldable retaining fingers of spring material, which are fixed at their lower ends to the inner periphery of the barrel. These fingers extend upwardly and inwardly and overlap so as to normally form a complete closure for the lower end of the barrel. These fingers, due to their inherent spring qualities, will yield upwardly and outwardly so that the barrel may be driven over a core, but will seek to assume their normal position when the barrel is withdrawn after taking the core, so as to close the lower end of the barrel and retain the loose particles of the core therein.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a view in vertical section through a core barrel disclosing my improved core retainer applied thereto.

Fig. 2 is a perspective view of the core retainer showing the retaining fingers in closed position.

Fig. 3 is a perspective view showing the retaining fingers in open position.

Referring more particularly to the accompanying drawings, 10 indicates a drill barrel having a threaded shank at its upper end by means of which the device may be connected with the drill stem. The lower end of the drill barrel 10 is fitted with a drilling shoe 11 which is capable upon vertical reciprocation of the device to drill through the strata encountered in drilling an oil well. The interior diameter of the shoe 11 is less than that of the barrel 10, so as to form an interiorly projecting annular shoulder 12 within the barrel 10 and adjacent its lower end.

Reciprocably mounted within the bore of the drill barrel 10 is a cylindrical core barrel 14 which is fitted at its lower end with a shoe 15 having a sharp lower end. The exterior diameter of the core barrel 14 and its shoe 15 is somewhat less than the interior diameter of the drilling shoe 11 and similarly drill barrel 10. This forms an annular passageway between the adjacent surfaces of the two barrels.

At its upper end the core barrel 14 is fitted with a head member 16 which is larger in diameter than the barrel 14, thereby forming an annularly projecting shoulder 17. This shoulder 17 is adapted to abut against the shoulder 12 when the core barrel 14 is in its lowermost position relative to the drill barrel 10, and thereby prevent removal of the core barrel from the drill barrel without removing the shoe from the latter.

The exterior surface of the core barrel head member 16 is formed with a plurality of longitudinal grooves to permit liquid lodged above the head 16 to pass downwardly through the passage between the barrels and discharge intermediate the cutting edges of the shoes.

It will be noticed that the lower end of the drill shoe 11 is formed with cutting teeth. Intermediate these cutting teeth the bore of the drill shoe is formed with a plurality of vertical passageways through which fluid passing downwardly through the passage between the barrels may discharge between the cutting edges of the shoes.

It will also be noticed that the core barrel 14 is guided both by its head member 16 and by reason of its mounting within the drill barrel shoe 11. This mounting of the

core barrel 14 will hold it in correct axial alignment relative to the drill barrel at all times.

To deliver fluid to the cutting edges of the shoes to clean away the cuttings, I provide radial passageways 18 in the head of the drill barrel 10. These passageways 18 extend inwardly from the exterior surface of the head to an interior chamber 19 which extends inwardly from the lower end of the head of the drill barrel. The lower end of the chamber 19 is normally closed by a spring-pressed back pressure valve 20, which opens downwardly. This valve is capable of admitting fluid to the upper end of the bore of the drill barrel when the drill barrel 10 is raised or elevated relative to the core barrel. When the drill barrel is lowered relative to the core barrel, the valve prevents return of the fluid through the head of the drill barrel, and the fluid is consequently forced downwardly through the passage between the barrels to a point intermediate the cutting edges of the shoes.

This fluid serves to wash away the cuttings. It will be also noticed that any liquid in the core barrel 14 may pass upwardly through a check valve 21 and through passages 22 to the passageway between the barrels and then discharge downwardly between the barrels.

In operating the core barrel, the device is connected to the drill stem and run in the well. During the running in the core barrel will assume its lowermost position and will remain connected to the drill barrel due to the abutment of the shoulders 12 and 17. Upon reaching bottom the drill shoe will commence cutting and the lower end of the head of the drill barrel will pound on the upper end of the core barrel head 16 and drive it over the core. As the drill shoe is operated by the percussion method, the drill barrel will be constantly reciprocated relative to the core barrel, and at each stroke will simultaneously cut around the core and drive the core barrel over the core. As soon as a depth has been penetrated corresponding to the length of the core desired, the entire device is removed from the well and the core is extracted.

To retain the core in the core barrel 14, I provide a core retainer 23 with which this application is most particularly concerned. This core retainer is capable of admitting the core into the barrel, but acts to retain the core therein while the entire device is elevated to the surface.

Reference being had to Fig. 1 it will be noticed that the cutting shoe 15 at the lower end of the core barrel is threadedly connected to the barrel 14 proper. It is also formed with a tapered bore which diverges upwardly. The core retainer 23 is formed with a sleeve 24 which has a tapered outer

surface coinciding with the taper of the bore in the shoe 15. This sleeve 24 is split so that it may be tightly pressed within the shoe 15. The upper end of the sleeve 24 is formed with an annular shoulder 25 which abuts against the lower end of the core barrel 14 when the sleeve 24 is fitted within the shoe 15, and the latter threaded onto the lower end of the core barrel.

A plurality of spring fingers 26 are provided. The lower ends of these spring fingers 26 are formed integral with or secured to the upper end of the sleeve 24 at the inner periphery thereof. At their lower ends the width of these fingers is such that their combined width equals the circumference of the sleeve 24. The fingers 26 extend upwardly and inwardly, being arcuately bent as illustrated in the drawings. In closed position the fingers extend substantially radially from the center of the sleeve 24. Their outer ends, however, are turned slightly so that they are not directed exactly toward the center of the sleeve. This peculiar bending of the fingers permits their upper ends to overlap and unite to form a complete closure for the upper end of the sleeve 24.

It will be noticed from Fig. 3 that the side edges of the spring fingers overlap so that their upper ends may be brought together as illustrated in Fig. 2.

When the core barrel 14 is driven over the core, the spring fingers 26 are deflected outwardly so that the core may pass upwardly into the barrel. However, when the barrel 14 is withdrawn from the formation, the spring fingers will, due to their inherent spring qualities, seek to assume their normal positions and form a closure for the lower end of the core barrel. In this position they will retain all the loose particles of the core within the barrel so that it may be elevated to the surface. It will be noticed that the pressure of the core on the spring fingers will tend to close the latter more tightly.

While I have shown the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention, as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination with a core barrel having a shoe at its lower end, a sleeve frictionally held within the shoe, a plurality of members of spring material secured at their lower ends to the inner periphery of said sleeve at the upper end of the latter, said members being normally relatively positioned to form a closure at the lower end of the barrel, said members being yieldable upwardly and outwardly to permit the en-

try of a core into the barrel, said members having inherent spring qualities tending to return them to normal position to retain the core within the barrel.

5 2. In combination with a core barrel having a cutting shoe at the lower end thereof said cutting shoe being threaded onto the lower end of the barrel, said cutting shoe having an upwardly divergent bore, a split sleeve tapered to coincide with the bore of 10 the shoe, the inner diameter of the barrel being less than that of the shoe whereby the sleeve will be held between the barrel and the shoe, a plurality of spring fingers secured at their lower ends to the upper end 15 of the sleeve at the periphery thereof, said fingers extending upwardly and inwardly within the core barrel and overlapping to form a closure therefor, said fingers being

formed of spring material whereby they will 20 yield upwardly and outwardly and constantly tend to assume their normal positions.

3. In combination with a core barrel having a shoe at its lower end, of a sleeve adapted to be detachably secured within the shoe 25 contiguous to its inner periphery, a plurality of spring fingers connected at their lower ends to the upper end of the sleeve at the periphery thereof, said spring fingers 30 extending upwardly and inwardly and normally overlapping to form a closure for the upper end of said sleeve, said fingers being formed of spring material whereby they 35 will yield upwardly and outwardly but constantly tend to assume their normal positions.

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