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W. I. McLAUGHLIN

CORE BARREL

Filed Feb. 21, 1924

FIG. 1.

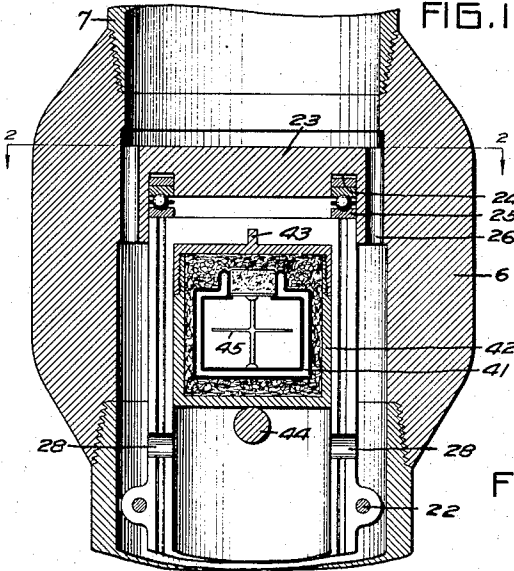


FIG. 2.

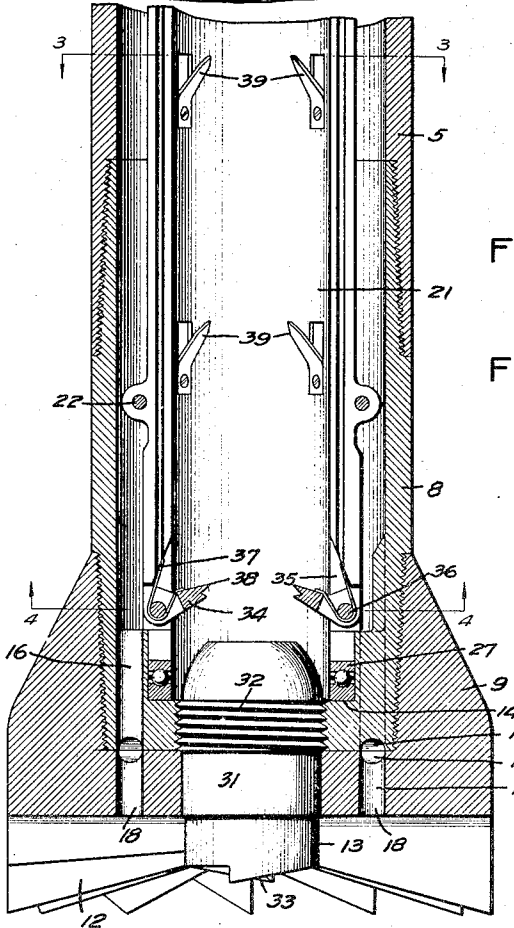
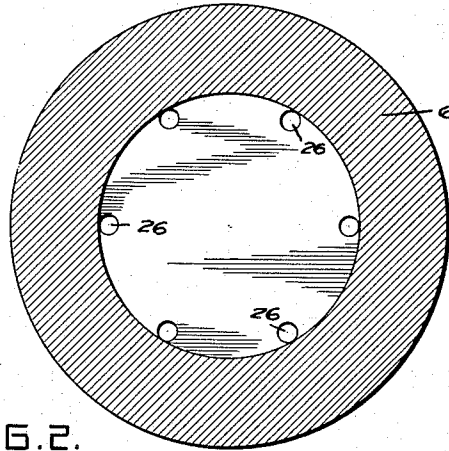


FIG. 3.

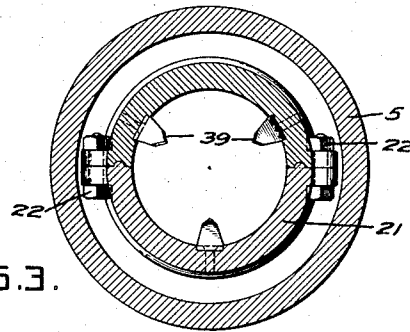
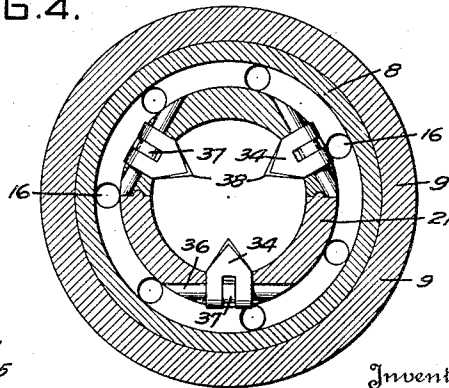


FIG. 4.



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CORE BARREL.

Application filed February 21, 1924. Serial No. 694,237.

The invention relates to a core barrel for forming and removing a core from a hole being drilled into the earth. Core barrels are used in prospecting unproven territory for the purpose of determining the nature and positions of the formation. The present invention relates particularly to a core barrel adapted to be used in prospecting for oil.

10 An object of the invention is to provide a core barrel having a core retainer which is held against rotation by the core and which is provided with means for definitely indicating the direction of the plunge of the
15 formation from which the core is formed.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description, where I shall outline
20 in full that form of my invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of core barrel embodying my invention, but it is to be understood
25 that I do not limit myself to such form, since the invention, as set forth in the claims, may be embodied in a plurality of forms.

Reference is made to the applicant's co-
30 pending application Serial No. 714,668 filed May 20, 1924, which shows subject matter in common with this application.

Referring to said drawings:

35 Figure 1 is a vertical section through a core barrel embodying my invention, a portion thereof being broken away to reduce the size of the figure.

Figure 2 is a cross section taken on the line 2—2 Figure 1.

40 Figure 3 is a cross section taken on the line 3—3 Figure 1.

Figure 4 is a cross section taken on the line 4—4 Figure 1.

45 The device of my invention comprises a rotary core barrel 5, preferably composed of a plurality of cylindrical sections screwed together. The upper section is screwed into the coupling 6 which at its other end is screwed into a pipe 7 which may constitute an extension of the core barrel or the
50 lower section of the drill tube. Screwed to the lower section 8 of the core barrel is the drill bit 9 which is provided with cutting teeth 12, the teeth being arranged in the form
55 of an annulus so that a central aperture or

passage 13 is provided in the drill bit. At its lower end, the section 8 is thickened to form a shoulder 14 and the shoulder is provided with a central aperture which is alined with the passage 13 in the drill bit. On its lower edge the section 8 is provided with an annular groove 15, preferably semi-circular in cross section, and this groove communicates with the interior of the core barrel through the passages 16 formed in the thickened portion. The upper surface of the drill bit 12 is provided with an annular groove 17, preferably semi-circular in form and of the same diameter as the groove 15, so that when the bit is assembled on the core barrel, the two grooves 15—17 register and form an annular passage concentric with the axis of the core barrel. This passage communicates with the face of the drill bit by passages 18 extending downward through the body of the bit.

Disposed within and preferably arranged concentrically with the core barrel 5 is a core retainer 21 which is preferably divided longitudinally into two halves which are normally held together by the bolts 22. After the core has been formed and the core barrel has been withdrawn from the hole, the core retainer is removed from the barrel and the bolts 22 removed to open the container so that the core may readily be removed. This arrangement obviates the possible movement of the core with respect to the retainer after the retainer has been removed, so that it is possible to determine the direction of the plunge of the formation from which the core was formed, as will be set forth more completely hereinafter.

The core retainer is mounted within the core barrel in such a manner that the retainer may be held stationary during the rotation of the barrel. Formed in the coupling 6 is cross wall 23 provided with a seat 24 for the ball bearing assembly 25 on which the upper end of the core retainer is supported. The plate 23 is provided outside of the circumference of the bearing member 25 with a plurality of passages 26 through which the mud which is introduced into the drill tube may pass into the annular space between the core barrel and the core retainer. At its lower end, the core retainer is mounted on a ball bearing assembly 27 which is supported on the shoulder 14. By virtue of the ball bearing mounting of the retainer, only
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a small force is necessary to hold the retainer against rotation during the rotation of the core barrel. The core retainer is provided adjacent its upper end with a plurality of apertures 28 to permit the ready discharge of mud from the retainer as the core progresses into the retainer.

To prevent the drill cuttings from entering the core retainer, the aperture 13 in the drill bit is closed by a screw plug 31, screwed into the aperture in the lower end of the lower section 8. The plug is of lesser diameter than the internal diameter of the core retainer so that when it is unscrewed it may readily move up into the retainer. The direction of the screw thread 32 on the plug is opposite to the direction of rotation of the core barrel and the plug is provided on its lower face with teeth 33 which engage the formation being cut, thereby tending to hold the plug against rotation as the drill bit is rotated. This causes the plug to be unscrewed as the core is formed and the plug leads the core up into the core retainer thereby preventing the material of the formation being cut from entering the core retainer. The internal diameter of the retainer is greater than the diameter of the aperture 13 in the drill bit, so that the core is of less diameter than the interior of the retainer and readily moves into the retainer as the formation is cut by the drill.

The core is not broken or separated from the formation by the drilling operation so that the core remains stationary and means are provided for connecting or attaching the core to the retainer so that, as soon as the core reaches the contacting means, the retainer is held against rotation. The contacting means comprise a plurality of spring pressed dogs 34 arranged in apertures 35 formed in the retainer adjacent the bottom thereof. The dogs are mounted on pivots 36 secured in the retainer and the ends thereof are urged into the interior of the retainer by springs 37. The dogs are provided on their inner ends with a plurality of pointed teeth 38 which engage the core and hold the retainer fixed with respect to the core, so that the retainer does not rotate. Means are also provided for centering the core in the retainer and for producing marks or scratches on the face of the core to indicate rotational movement of the retainer with respect to the core, in the event that the retainer rotates with respect to the core. It is desirable that the inner core retainer should not rotate with respect to the core for the reason that the core is often made up of alternate hard and soft sections which may be fractured from each other and rotated relative to each other away from their natural positions. If it should happen that the core be fractured the spring fingers will mark the different portions so that their

original position with respect to each other may be determined. Disposed in the retainer are a plurality of resilient pointed fingers 39, the fingers being arranged in groups around the inner surface of the retainer and the groups being spaced apart vertically so that the fingers contact with the core at a plurality of places. In the event that the retainer should rotate with respect to the core, the fingers will scratch a line on the surface of the core and when the core is subsequently examined, these lines will indicate the extent of rotation of the retainer with respect to the core. These fingers thus cooperate with the means to be described hereinafter for definitely indicating the direction of the plunge of the formation from which the core has been formed.

After the core has been formed the core barrel is raised slightly in the hole, causing the teeth 38 of the dogs 34 to bite into the core, thus fracturing the core in a substantially horizontal plane and separating the core from the formation.

Means are provided for definitely determining the direction of the azimuth of the plunge of the formation from which the core has been formed. Secured to the core retainer so that it is immovable with respect thereto, is a casing 41, which preferably comprises a double walled vessel having the space between the walls vacuumized so that the interior of the vessel is thermally insulated from the core retainer. The vessel 41 is disposed in a casing 42, the space between the vessel and the casing being packed with a yielding material, such as cotton, to yieldingly support the vessel 41 and relieve it from shock. The casing 42 is provided with a key 43 fitting into a slot in the upper wall of the retainer and is held in position by a removable bolt 44 set in the retainer and engaging the lower wall of the casing. Pivotaly supported within the vessel 41 is a magnetic needle 45 which is normally free to swing to indicate direction. The vessel 41 is filled with a liquid material which has the property of setting at the end of a predetermined time to fix the needle in position. While the material is in liquid form, the needle is free to swing and the liquid is of such nature that it will not set until after the lapse of a predetermined time. Assuming that it requires three and a half hours to enter the core barrel into the hole and form the complete core, the liquid is preferably of such character that it will set after four hours, so that after the core has been formed, the core barrel is allowed to remain stationary for about an hour, to insure the setting of the material to fix the needle in position and then the core barrel is raised to break the core from the formation. After the core barrel has been removed from the hole and the core retainer opened, the needle is examined

to disclose the position occupied by the core in the hole and the core is oriented until it lies in such position, so that the direction of the azimuth of the plunge of the formation may be definitely determined. Since the core did not move with respect to the formation while it was being formed, and since the core retainer did not rotate with respect to the core, and since the vessel 41 was secured to the core retainer, the needle will indicate the exact position of the core in the earth, so that the azimuth of the plunge may be definitely and accurately determined. In the event that the core retainer rotated with respect to the core, during the formation of the core, the amount of such rotation will be evidenced by the scratches made on the surface of the core by the fingers 39, so that by measuring the amount of this rotation, the position of the needle may be taken as a basis for the calculation to determine the exact direction of the plunge with respect to the earth. When the magnetic needle is employed for determining the direction of the plunge, the core barrel 5, the core retainer 8, the coupling 6, the length of tubing 7 and all other parts of the structure with the exception of the drill bit and the bearings, should be made of paramagnetic material, such as bronze, so that the needle will not be deflected from its proper position by the influence of the material of the core barrel and its structural parts. When the magnetic needle is not used, the entire structure may be made of steel.

I claim:

1. In a core barrel, a core retainer and a plurality of resilient fingers secured to the retainer at vertically spaced points and extending into the core retaining space adapted to center the core in the retainer as it progresses into the retainer.

2. In a core barrel, a core retainer rotatable with respect to the core barrel, means adapted to prevent rotation of the retainer with respect to the core and means carried by the retainer for indicating the direction of the azimuth of the plunge of the strata of which the core is formed.

3. In a core barrel, a core retainer, means tending to prevent rotation of the retainer with respect to the core, means for indicating the amount of rotation of the retainer with respect to the core and means for indicating the oriented position of the retainer with respect to the earth when the core is broken from the formation.

4. In a core barrel, a core retainer, means for determining the position of the retainer relative to the earth, and means for indicating the amount of relative rotation between the retainer and a fractured core within the same.

5. In a core barrel, a core retainer, means for indicating the position of said retainer relative to the earth, and means for marking on the core within the container to indicate the amount of relative rotation between the retainer and the core.

6. A core retainer comprising a cylindrical member, and means for centering the core comprising a plurality of yieldable fingers projecting from the inner wall of said cylindrical member at longitudinally spaced points.

7. In a drilling device of the rotary core type, the combination of means for severing the core, and means applied to the core at a plurality of longitudinally spaced points for centering the core within the device.

8. In a device of the class described, a core barrel, a core retainer freely rotatable within said barrel, means for causing said retainer to remain substantially stationary with respect to a core during rotation of the barrel, and direction indicating means carried by the retainer and adapted to be fixed with respect to the retainer after the lapse of a predetermined period of time.

9. In a drilling device, a core retainer, means for determining the position of the retainer relative to the earth, and means for indicating relative angular movement between the core and said retainer with respect to a vertical axis.

In testimony whereof, I have hereunto set my hand.

WILLIAM I. McLAUGHLIN.