Aug. 9, 1938. G. A. HUMASON ET AL 2,126,684

CONTAINER CORE BARREL

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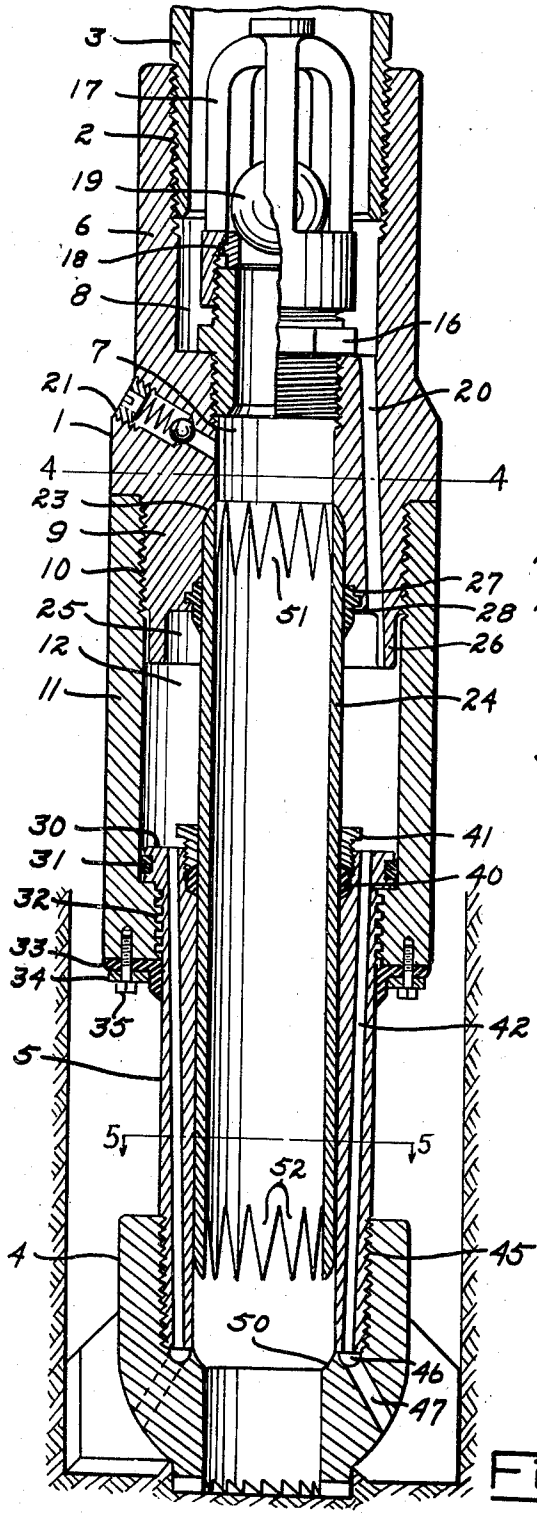

Fig. 1.

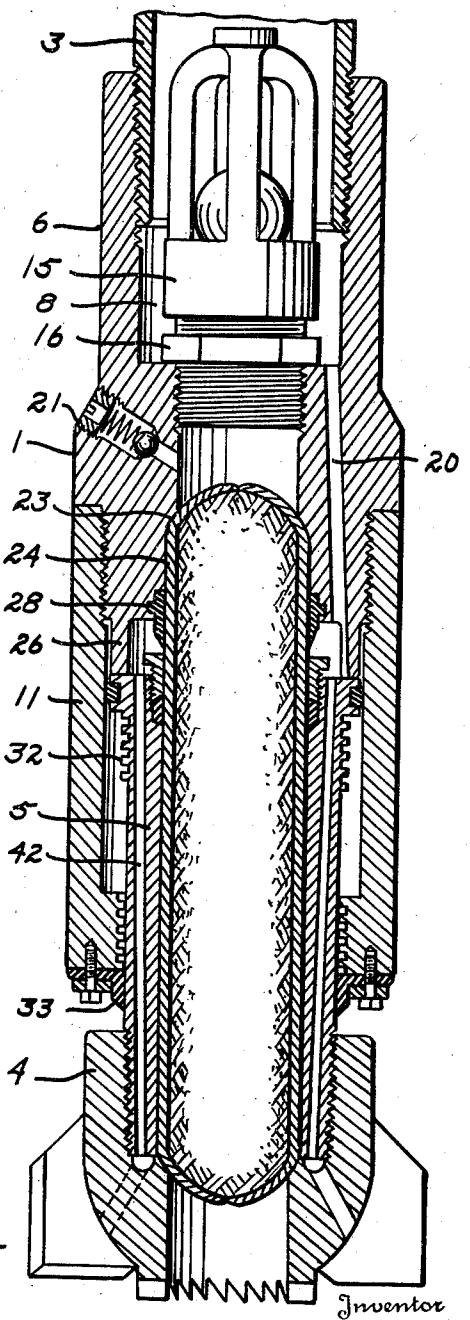

Fig. 2.

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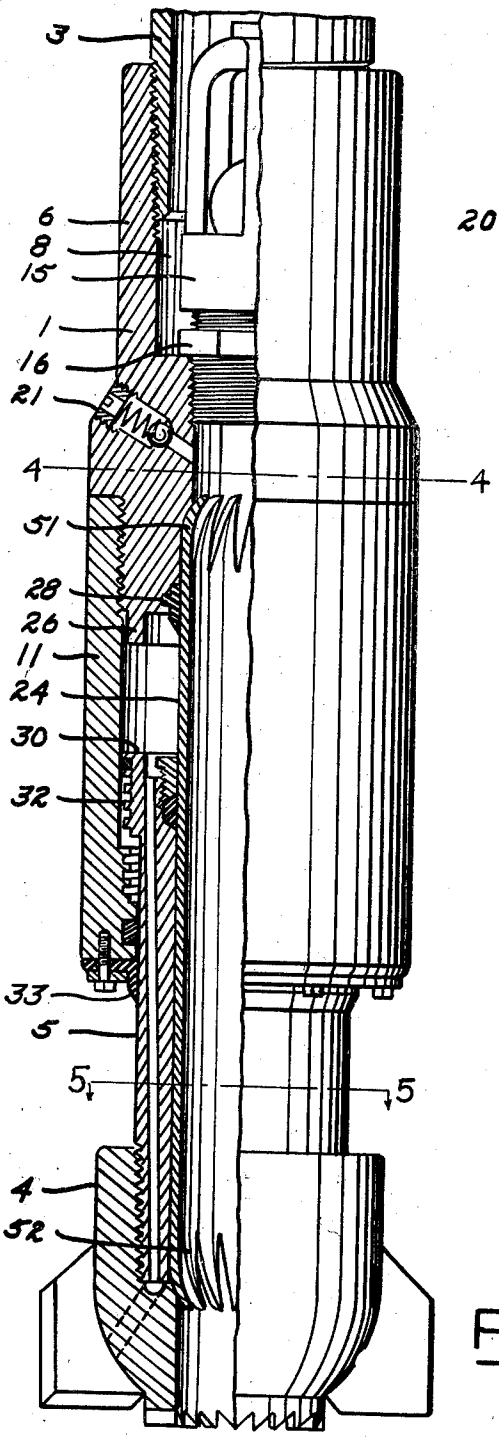

Fig. 3.

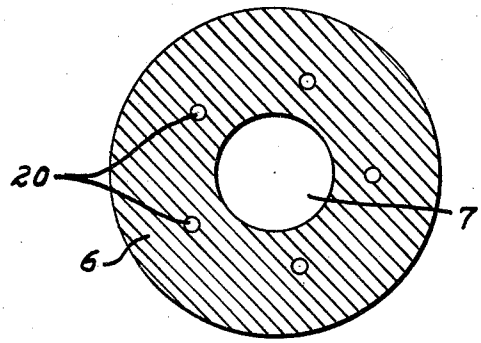

Fig. 4.

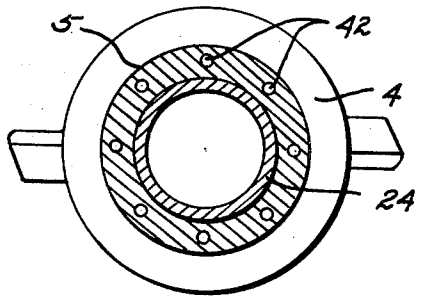

Fig. 5.

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Patented Aug. 9, 1938 2,126,684

UNITED STATES PATENT OFFICE

2,126,684

CONTAINER CORE BARREL

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Application August 30, 1937, Serial No. 161,550

16 Claims. (Cl. 255—72)

The invention relates to a core taking device or tool such as is employed for removing from a well bore of cores or samples of the formation penetrated during the drilling of the well bore.

The primary object of the invention is to provide a simple and efficient device for obtaining intact and uncontaminated samples from formations penetrated when utilizing the rotary method of well drilling.

A more specific object of the invention is to provide a coring tool having a core barrel in which a core or sample is completely encased preliminary to its removal from the well bore.

Another object of the invention is to provide an apparatus of the class described in which novel means is provided for severing a section of core and encasing said section or sample for later analysis and observation.

Still another object of the invention is to provide a device of the class described in which, after the sample or core has been cut, the drill collar and bit may be moved longitudinally relative to each other, means being provided for operation by means of such relative movement for severing a section of the core and encasing such section within the core barrel.

Other objects and features will be best and more fully understood from the following detailed description of embodiments and application of the invention, reference being had to the accompanying drawings in which

Fig. 1 is a vertical sectional view of a tool embodying the invention, the parts being shown in position during the taking of a core or sample.

Fig. 2 is a vertical sectional view showing parts in relative positions after the taking of the core has been completed and the tool is ready to be withdrawn from the well bore.

Fig. 3 is an elevation partly in section showing the relative position of the parts in the early stage of closing of the ends of the sample encasing core barrel.

Fig. 4 is a sectional view taken on the line 4—4 of each of Figs. 1 and 3.

Fig. 5 is a sectional view taken on the line 5—5 of each of Figs. 1 and 3.

In the drawings, the drill collar 1 is of special construction which is attached at its upper end by means of threads 2 to an operating string or drill stem 3. The lower end of the collar 1 is attached to a core bit 4 having a shank 5.

The drill collar 1 is of a composite construction comprising a head 6, in which the axial bore 7 is counter-bored at 8, the counter bore 8 being provided with threads 2 whereby the operating string 3 is attached thereto. The lower end of the head 6 has a reduced portion 9 provided with peripheral threads 10, to which is attached a sleeve 11 having an axial bore forming a cylindrical chamber 12 therein.

Within the counter-bore 8 is positioned an upwardly opening check valve 15 threadably secured in the bore 7 by means of a flanged nipple 16. The check valve 15 comprises a valve cage 17, a valve seat insert 18, clamped between the cage 17 and the nipple 16, and the ball valve 19 resting upon the valve seat 18. It will be apparent that the construction just described will permit the movement of fluid upwardly from within the bore 7 but will prevent the movement of fluid downwardly therein from the operating string or stem 3. In order to provide downward movement of the drilling fluid from the stem 3 a plurality of passages 20 are provided in the walls of the head 6.

Below the check valve 15 in the head 6 is provided a supplementary check valve which is generally designated as 21 and which opens outwardly from within the bore 7. This valve together with the check valve 15 assures the discharge of fluid from within the bore 7 when the pressure therein exceeds the pressure upon either the check valve 15 or the supplementary check valve 21. Below the check valve 21 in the head 6 the bore 7 is enlarged to receive the upper end of the core barrel 24, such enlargement terminating at its upper end in a rounded shoulder 23 to engage a complementary end on the core barrel 24.

The lower end of the head 6 is counterbored at 25 and hence provides a skirt 26 which serves as a stop in a manner to be hereafter described. An annular recess 27 within the bore 7 is provided adjacent the counterbore 26 to receive a lipped sealing ring 28 to provide a seal between the head 6 and the core barrel 24.

The drill shank or sub 5 has a head portion 30 which is adapted to slidingly fit within the chamber 12 and which is provided with a peripheral sealing ring 31 to prevent the leakage of the drilling fluid into the coarse threads 32 on the drill shank below the head 30. The threads 32 on the drill shank 5 engage complementary threads in the lower end of the sleeve 11. In order to prevent leakage of the drilling fluid upwardly into the threads 32, a lipped sealing ring 33 is secured to the lower end of the sleeve 11 by means of a clamp ring 34 and cap screws 35. By means of this construction a lubricant may be retained about the threads 32 whereby relative movement of the threads may be readily effected.

The bore within the drill shank 5 is of such

diameter as to slidingly receive the core barrel 24. This bore is enlarged at its upper end to receive packing 40 and a packing gland 41 whereby a seal is formed between the barrel 24 and the drill shank 5. It is apparent from this construction that a fluid seal exists between the core barrel 24 and the surrounding elements whether all parts rotate as a unit or the core barrel 24 remains stationary while the remainder of the tool rotates thereabout.

The drill shank 5 is provided with longitudinal passages 42 for downward conduction of the drilling fluid to the core bit 4, which is attached to the drill shank by means of threads 45. An annular groove 46 is provided in the core bit 4, so that fluid from the passages 45 in the drill shank will be conducted to outwardly extending passages 47 in the bit 4. It is to be understood that the present invention is not confined to the use of the fish tail type of bit which is here described as an element of the preferred embodiment. On the other hand, it is apparent that a roller bit or other suitable type of bit may be utilized instead of the fishtail bit 4.

Within the bit 4 is provided a rounded shoulder 50 similar to the shoulder 23, which is provided in the head 6. This shoulder 50 is adapted to engage the complementary rounded lower end of the core barrel 24. While the shoulder 50 is shown as provided within the bit 4, it is to be understood that such shoulder may be provided as desired in either the core bit or within the shank 5.

The core barrel 24 is of special construction which is best illustrated in Fig. 1 where it may be clearly seen that the ends thereof are provided with serrations or fingers 51 and 52 at the upper and lower ends respectively. The fingers 51 and 52 are of such configuration and dimension that when they are flanged inwardly at a radius of curvature corresponding to the radius of curvature of the shoulders 23 and 50, they form a flange which completely encloses the section of the core which is severed as the flanging of the fingers takes place. As previously mentioned the ends of the core barrel 24 are rounded to cooperate with the shoulders 23 and 50 for this flanging operation. While the core barrel 24 is shown as having serrations or fingers at both the upper and lower ends and the core drill assembly is shown as provided with flanging shoulders 23 and 50, it is apparent that the serrations at either the upper or lower end of the core barrel 24 may be omitted with the omission of the function thereof and yet there will accrue advantages which are inherent in the present invention.

In the use of the device thus far described the parts are assembled as shown in Fig. 1 and ordinary coring operations are pursued, the device being rotated righthandedly, thus causing the threads 32 to tighten and to prevent relative movement between the collar 1 and the drill shank 5. Drilling fluid is pumped downwardly through the operating stem 3 and is discharged outwardly through passages 47 in the core bit 4 as is well known in the art. As the bit advances the core which is cut enters the core barrel 24. When the desired length of core is obtained the operating string is rotated lefthandedly whereby the threads 32 are unscrewed and the shank 5 is released for telescopic movement relative to the drill collar 1. When the threads 32 are released, downward pressure from the operating string will cause downward movement of the drill collar 1 whereupon the core barrel 24 is forced into contact with the shoulders 23 and 50 in the drill collar 1 and the core drill 4 respectively. Inwardly flanging of the fingers 51 and 52 on the core barrel 24 will then be initiated to cause severing of the core within the assembly. Continued movement will cause sufficient flanging of the fingers 51 and 52 so that the severed core will be completely encased within the core barrel 24, as is clearly shown in Fig. 2. The tool is then withdrawn from the well bore and the encased sample is removed therefrom. Information from the sample may be obtained by removing the core barrel therefrom in any suitable manner. If it is desired to keep the sample for any material length of time prior to analysis the ends of the core barrel may be coated with any suitable sealing material whereby the assembly is protected from gaseous contamination from without and at the same time any gaseous component of the sample is sealed within the core barrel. In order to obtain additional samples a new core barrel 24 is inserted within the core drill assembly and the operation above described is repeated.

An important advantage of the present invention resides in the fact that the sample or core which is taken thereby is sealed prior to removal of the sample from the well. Hence the secrecy which surrounds drilling operations may be more effectively maintained and at the same time definite knowledge may be had of the nature of the formations penetrated during the drilling operations.

What is claimed is:

1. A core drill assembly including a core drill and a drill collar telescopically connected thereto, an operating string connected to said drill collar, a threaded connection between said drill and collar whereby the drill and collar are held in extended relation when the bit is driven by the operating string, a core barrel within said assembly, and means for flanging the ends of said core barrel upon relative movement of the drill and collar when said threaded connection is released.

2. A core drill assembly including a core drill and a drill collar telescopically connected thereto, a core barrel disposed within said assembly, means within the assembly for flanging and closing the ends of said core barrel upon relative longitudinal movement of said drill and collar, and a releasable connection between the drill and collar so that telescopic movement thereof may be effected whereby said means will close the ends of the barrel and confine the core therein.

3. A core drill assembly including a core drill, a drill collar, and a core barrel disposed within said assembly, means in said assembly to engage the ends of said core barrel, a releasable connection between said drill and collar so that said collar may telescope along said drill and said means will inwardly flange the ends of said barrel to confine the core therein.

4. A core drill assembly including a core drill, a drill collar, a core barrel within said assembly, means in said assembly for engaging and inwardly flanging the ends of said core barrel upon relative longitudinal movement of the drill and collar, and releasable means comprising a threaded connection between said drill and collar for maintaining the drill and collar in extended relation during the cutting operation.

5. In a core drill assembly including a core drill and a drill collar telescopically connected thereto, a core barrel disposed within said assembly, means within the assembly for flanging

and closing the upper end of the core barrel upon relative longitudinal movement of said drill and collar, and a releasable connection between the drill and collar so that telescopic movement therebetween may be effected.

6. A core drill assembly including a core drill and a drill collar having co-axial bores, a core barrel slidably fitting within the chamber provided by said bores, and means in said bores adapted to collapse the ends of said core barrel inwardly, whereby a section of core is severed and encased within said core barrel.

7. A core taking device comprising a core drill, a drill collar telescopically connected to said drill, an axial bore in said drill and collar, a core barrel slidably fitting within said bore, and shoulders in said bore adapted to bend the ends of said core barrel inwardly upon relative longitudinal movement of said drill and collar whereby a section of core is encased within said core barrel.

8. A core taking device comprising a core drill, a drill collar telescopically connected to said drill, an axial bore in said drill and collar, a core barrel slidably mounted in said bore, means for releasably connecting said drill and collar against relative longitudinal movement, and means in said axial bore for flanging the ends of the core barrel when said first mentioned means is released.

9. A core taking device comprising an operating string, a core drill assembly attached thereto, a core barrel in said assembly and having oppositely extending fingers on the ends thereof, and means within said assembly for forcing said fingers inwardly upon downward movement of the operating string.

10. In a core drill and core barrel construction, a core barrel, spaced means to engage the ends of said core barrel, and additional means for producing relative movement of said first mentioned means to collapse the ends of said core barrel.

11. A core barrel of the character described, a core drill assembly to receive said barrel, and means on said assembly to engage and collapse the ends of said barrel to confine a core therein.

12. The combination of a core and container comprising a cylindrical tube, a core therein, the ends of said container being flanged inwardly to enclose the container and confine the core therein.

13. The combination of a core and container comprising a cylindrical tube, a core therein, and means comprising fingers on each end of the container adapted to be flanged inwardly to completely enclose the core within the container.

14. A core barrel for receiving and completely encasing a core or sample therein while in a well bore comprising a tubular member, and means comprising fingers forming an integral part of the ends of the tubular member and adapted to be flanged inwardly to completely enclose the ends of the member.

15. In a core drill assembly a tubular core barrel comprising an annular shell having axially directed fingers on the ends thereof, said fingers being so constructed that they may be flanged inwardly to completely enclose the ends of the core barrel and encase a core therein.

16. A core barrel to receive a sample of the formation being penetrated by the core drill, and means to inwardly flange and close the ends of said barrel so that such closed core barrel will thereafter serve as a container for the core.

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