

Sept. 19, 1939.

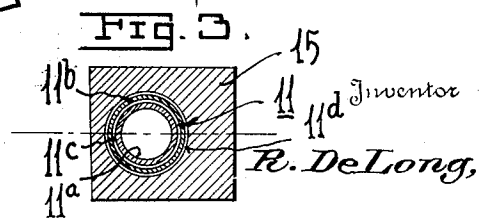
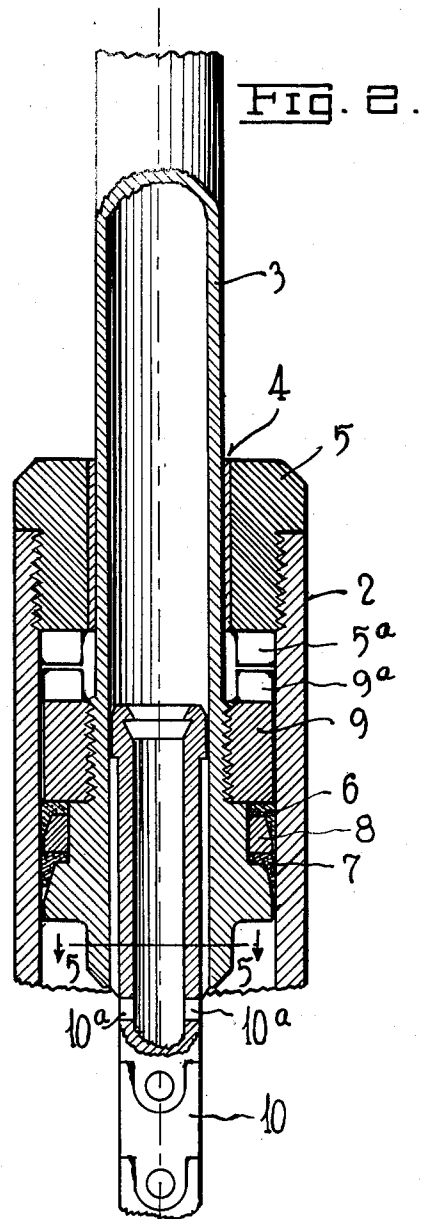
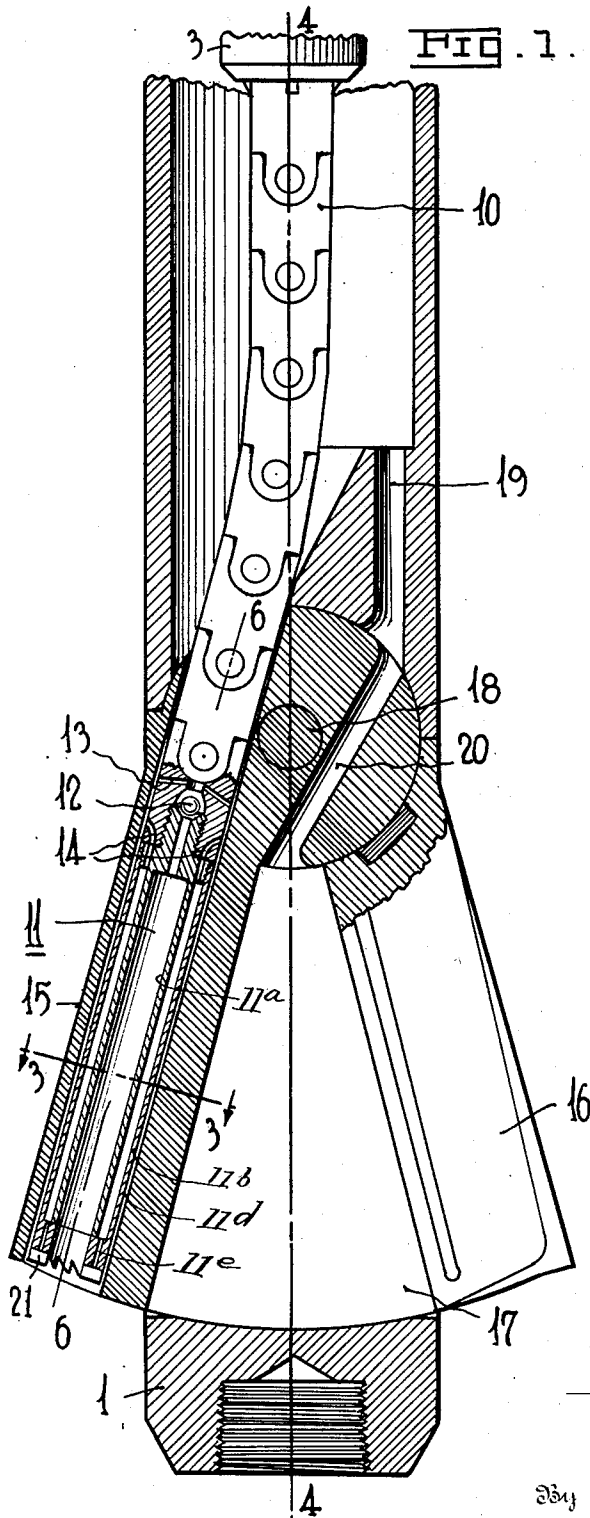
R. DE LONG

2,173,531

CORING DEVICE

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2 Sheets-Sheet 1



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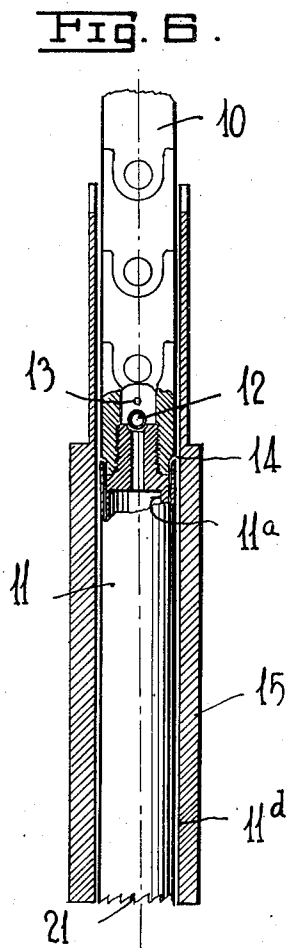
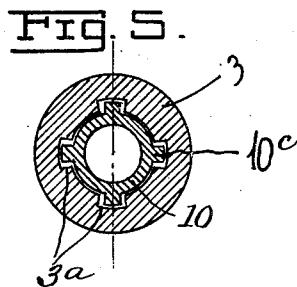
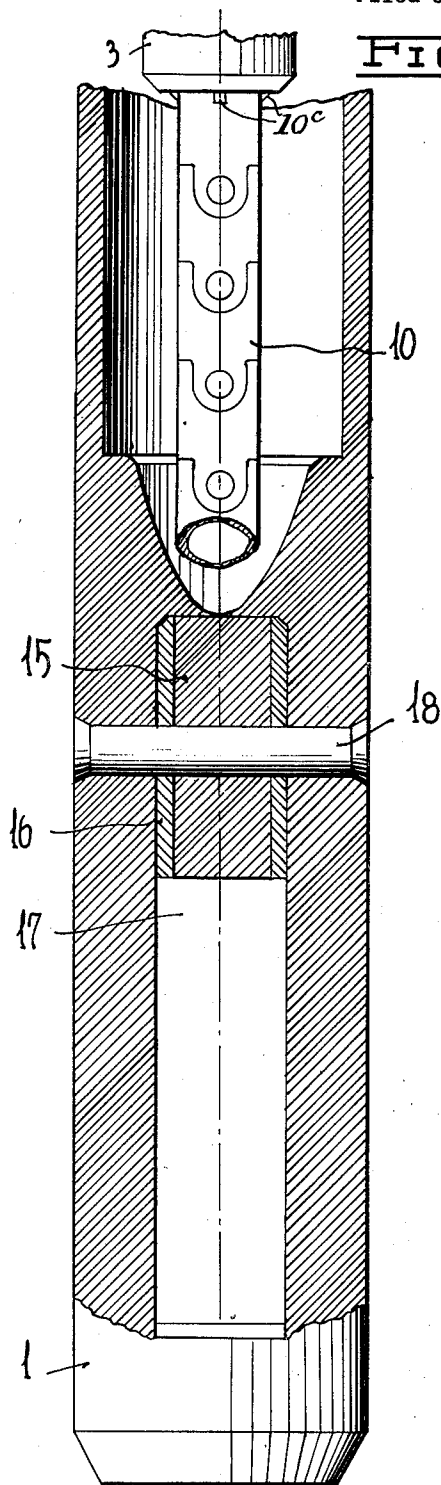
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,173,531

CORING DEVICE

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Application January 25, 1939, Serial No. 252,825

14 Claims. (Cl. 255—1)

This invention relates to a well boring tool, and more particularly to a coring device.

One of the objects of the invention is to provide a side wall coring device or tool capable of taking a core by the use of a rotating core barrel adapted to be attached to the lower end of a string of drill pipe, tubing or any other string of pipe suitable for drilling a well or operating the side wall coring tool or device.

Another object is to furnish a tool capable of taking a core from the side wall of a well or hole drilled or bored, or being drilled or bored at any specific or specified depth.

A further object is to supply a coring tool or device of relatively simple and inexpensive construction, and one which will be durable and not liable to get out of order.

A still further object is to provide a device capable of taking one or more clean samples or cores from the side wall of a well or bore by means of a deflecting rotary core barrel passing at an angle off from the vertical through one of the supporting lugs or blades of the tool, the blade acting in the capacity of an outer tube or guide for a rotating and axially movable core barrel.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a vertical sectional view of the lower end portion of my improved tool.

Fig. 2 is a similar view of the upper end portion.

Fig. 3 is a sectional view, taken on the line 3—3 of Fig. 1.

Fig. 4 is a vertical sectional view, taken on the line 4—4 of Fig. 1.

Fig. 5 is a horizontal sectional view of a detail, on the line 5—5 of Fig. 2.

Fig. 6 is a longitudinal sectional view, partly in elevation and taken on the line 6—6 of Fig. 1.

Referring to the drawings, 1 designates the lower end portion, and 2 the upper end portion of a sleeve or barrel adapted to be rotated by any suitable well string such as a tubing string 3. The latter is also rotatable in a bearing 4 arranged in a cap 5 that is threadedly connected to the upper end of the barrel.

The screw threaded socket in the bottom of lower end portion 1 is to receive a lengthening

foot or piece, such as shown by Figure 6 of the patent to Forker 131,263 of September 10, 1872, or B of Addison 449,459 of March 31, 1891, for the same purpose of spacing the underreaming operation at the desired height above the bottom of the drilled well bore. Several operations obviously may be performed in series using different lengths of lengthening feet to support the cutters 16 at a series of longitudinally spaced positions in the well bore, thus sampling the entire wall surface at such suitable intervals as may be desired.

The lower end of the tubing string is of substantially the same diameter as the internal diameter of the barrel 2, and is provided with packing rings 6 and 7, and a spacing ring 8, all held in place by a nut 9 having threaded engagement with the lower end portion of the drill pipe 3.

The collar 5 has downwardly extending clutch teeth 5a, and the nut 9 has upwardly extending complementary teeth 9a. When these teeth are in engagement with one another, it is obvious that the rotation of the pipe or tubing 3 will impart rotation to the barrel 1, 2.

A hollow flexible shaft 10 (which may be of the type disclosed in the U. S. patents to Stewart 729,694 and McCaskey 1,258,233) is splined to the lower end portion of the pipe or tubing 3, whereby when the pipe is lowered to disconnect the clutch 5a, 9a, the flexible shaft can be rotated by means of the tubing 3. The spline is formed by vertical ribs 10c which project from the upper portion of the flexible shaft and slidably engage vertical grooves 3a formed in the lower end portion of the drill pipe 3 (see Fig. 5).

A core barrel 11 (which may be of the type disclosed in the U. S. patents to Frisbee 168,010, Christian 1,379,170 and Stone 1,720,700) is secured to the lower end of the flexible drive shaft or tube 10 by screw threads or the like. The barrel is of tubular form and comprises an inner tube 11a and an outer tube 11b connected together at their upper ends and having a fluid space 11c between them. The core barrel is provided at its lower end with a core bit, mill or rotary shoe 21. At its upper end there is a ball check or relief valve 12 to prevent drilling fluid from entering the barrel from the top, and to permit drilling fluid entrapped in the inner tube 11a to escape as the core enters the lower end of that tube. The fluid passing out of the barrel through the valve into the shaft 10 then passes out through ports 13 drilled in the lower end of the shaft. This fluid enters the space between the outer tube 11b and the wall of the guide

passageway 11d in the blade or lug 15, and from here it passes down between the two into the well hole, or partly through ports 14 (in the lower end of the flexible shaft), into the space 11c between the inner and outer tubes of the core barrel, and finally out through the conventional water courses 11e in the core bit 21 into the well hole.

10 The ported expansion lug or blade 15 is dovetailed at its upper end into a companion solid expansion lug or blade 16, both lugs being arranged in a guide slot 17 of the casing or barrel 1, 2, and being pivotally suspended in the latter by means of a cross or hinge pin 18. The lugs 15 snugly fit together in the slot 17 so that their lower ends may move apart when drilling fluid is introduced into the slot.

20 Drilling mud passing down the tubing 3 can enter the barrel through ports 10a in the flexible shaft, and can then pass down through passageways 19 and 20 to a point between the blades 15 and 16 for the purpose of moving the lower ends of the blades away from one another.

25 In operation, when it is desired to obtain a core or sample from the side wall of a well bore, the tool is attached to the lower end of the drill pipe 3 or the like, and lowered into the well or hole to the desired depth. The string of pipe or drill stem is then rotated as in drilling a well, except that the tool is not allowed to change its position vertically unless it is desired to obtain a firmer ledge to support the expansion lugs or blades 15, 16. Drilling fluid is then pumped down through the pipe and ports 10a, 19 and 20 35 and between the blades, forcing the latter out against the wall of the well, and by rotating the tool by means of the drill pipe, and keeping fluid pressure against the blades, a ledge is cut or formed on which the tool is supported by means of the blades. Also, a clean surface is thus made in the formation, from which the core is to be taken, and the tool is in position for the rotating core barrel 11 to pass from the tool through the guiding blade 15 into the formation to be cored. 40 The drilling of the ledge is completed when the pressure drops on the drilling fluid due to the lower ends of the ledge cutting blades passing out of slot 17, as this releases the pumped drilling fluid into the well bore. The rotating string 3 is then stopped, and the drill pipe is lowered until the blades rest on the cutting ledge so as to support the tool. The lowering of the string releases the driving clutch 5a, 9a, and then rotation of the drill pipe will cause the core barrel 11 to rotate in the guide blade 15, while being fed downward by gravity a distance equal to the core being cut by the teeth of the bit 21. 45

50 While cutting the supporting ledge and taking the core, drilling fluid from the pumps passes down through the hollow shaft 10 and out through the ports 13; part of the fluid passing along the outer wall of the core barrel into the well hole, and part enters the port 14 and passes into the space between the inner and outer tubes 11a and 11b, and finally out through the water courses in the core bit 21 into the well hole. 55

60 After the shoulder or ledge has been cut and the body of the device is in position for coring, more than one core can be taken with the device in this position by re-inserting the core barrel 11 into the hole already made and going deeper into the formation with the same or a similar or another type core barrel for the purpose of taking deeper cores from the formation. 65

70 Several cores can be cut from the same ledge

by lifting up on the drill pipe and rotating the blades 15 and 16 to a new position on the supporting ledge.

The core thus obtained can be brought to the surface by means of a wire line or by reversing the flow of the drilling fluid in the well, or by pulling the entire string of drill pipe and tool. 5

While I have disclosed what I now consider to be a preferred embodiment of the invention in such manner that the same may be readily understood by those skilled in the art, I am aware that changes may be made in the details disclosed without departing from the spirit of the invention, as expressed in the claims. 10

What I claim and desire to secure by Letters Patent is: 15

1. In combination, a barrel, driving means including a clutch for rotating the barrel and for furnishing a drilling fluid to the barrel, said barrel being provided with a slot, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the 20 passageway, and means operatively connecting the core barrel to the driving means. 25

2. In combination, a barrel, driving means for rotating the barrel and for furnishing a drilling fluid to the barrel, said barrel having a slot extending transversely therethrough, blades pivotally suspended in the slotted portion of the barrel and adapted to have their lower ends moved away from one another by the pressure of drilling fluid introduced into the slot from the barrel, one of 30 said blades forming a guide passageway, a core barrel movably mounted in the passageway, and means operatively connecting the core barrel to the driving means. 35

3. In combination, a barrel, driving means including a clutch for rotating the barrel and for furnishing a drilling fluid to the barrel, said barrel being provided with a slot, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of 40 drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and hollow means operatively connecting the core barrel to the driving means. 45

4. In combination, a barrel, driving means including a clutch for rotating the barrel and for furnishing a drilling fluid to the barrel, said barrel being provided with a slot, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of 50 drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and valved hollow means operatively connecting the core barrel to the driving means. 55

5. In combination, a barrel, driving means including a clutch for rotating the barrel and for furnishing a drilling fluid to the barrel, said barrel being provided with a slot, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the 60 passageway, and flexible means operatively connecting the core barrel to the driving means. 65

6. In combination, a barrel, driving means including a clutch for rotating the barrel and for furnishing a drilling fluid to the barrel, said bar- 70

rel being provided with a slot, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, hollow flexible means operatively connecting the core barrel to the driving means, and a check valve closing toward the core barrel and controlling the passage of drilling fluid from the hollow means into the core barrel.

7. In combination, a barrel, driving means including a clutch for rotating the barrel and for furnishing a drilling fluid to the barrel, said barrel being provided with a slot, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and a hollow flexible shaft operatively connecting the core barrel to the driving means.

8. In combination, a barrel having an upper clutch member and a lower slot, driving means including a clutch member adapted to engage the first mentioned clutch member for rotating the barrel, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of the drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and means operatively connecting the core barrel to the driving means.

9. In combination, a barrel having an upper clutch member and a lower slot, driving means including a clutch member adapted to engage the first mentioned clutch member for rotating the barrel, blades pivotally suspended in the slotted portion of the barrel and adapted to be swung apart by the pressure of the drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and means operatively connecting the core barrel to the driving means, the connecting means being splined to the driving means.

10. In combination, a barrel having an upper clutch member and a lower slot, driving means including a clutch member adapted to engage the first mentioned clutch member for rotating the barrel, said driving means having a tubular lower end portion provided with a packing device snugly engaging the inner surface of the barrel, blades pivotally suspended in the slotted portion of the barrel and adapted to have their lower ends swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and connecting means operatively connecting the core barrel to the driving means.

11. In combination, a barrel having an upper clutch member and a lower slot, driving means

including a clutch member adapted to engage the first mentioned clutch member for rotating the barrel, said driving means having a tubular lower end portion provided with a packing device snugly engaging the inner surface of the barrel, blades pivotally suspended in the slotted portion of the barrel and adapted to have their lower ends swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and connecting means operatively connecting the core barrel to the driving means, the connecting means being of flexible formation and being splined to the driving means.

12. In combination, a barrel having an upper clutch member and a lower slot, driving means including a clutch member adapted to engage the first mentioned clutch member for rotating the barrel, said driving means having a tubular lower end portion provided with a packing device snugly engaging the inner surface of the barrel, blades pivotally suspended in the slotted portion of the barrel and adapted to have their lower ends swung apart by the pressure of drilling fluid introduced into the slot from the barrel, one of said blades forming a guide passageway, a core barrel movably mounted in the passageway, and connecting means operatively connecting the core barrel to the driving means, the connecting means being in the form of a hollow flexible shaft and being provided with a check valve to control communication between the shaft and the interior of the core barrel.

13. In a device of the character described, a barrel, a hinged blade connected to the barrel and provided with a guide passageway, a core barrel movably mounted in said passageway and comprising inner and outer tubes spaced apart to provide a fluid conduit, ported means at the upper end of the core barrel for admitting drilling fluid to said conduit from said passageway, a shoe at the lower end of the core barrel, a hollow flexible shaft secured to the upper end of the core barrel, and means comprising a telescopic joint at the upper end portion of said shaft by rotating the core barrel.

14. In a device of the character described, a main barrel, a blade pivotally suspended in the barrel and having a passageway therethrough, a core barrel rotatably and axially movable in said passageway, a hollow shaft having its lower end detachably secured to the core barrel, a second passageway placing the interior of the core barrel in communication with the hollow shaft, a check valve controlling said second passageway to prevent fluid from the shaft passing into the core barrel but permitting fluid from the core barrel to flow toward the hollow shaft, ported means placing the lower end of the interior of the hollow shaft in communication with the first mentioned passageway, and means comprising a telescopic joint at the upper end portion of the hollow shaft for rotating the core barrel.

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