Jan. 17, 1950 C. O. DENNING ET AL 2,494,932

SIDEWALL CORING TOOL

Filed April 16, 1948 2 Sheets-Sheet 1

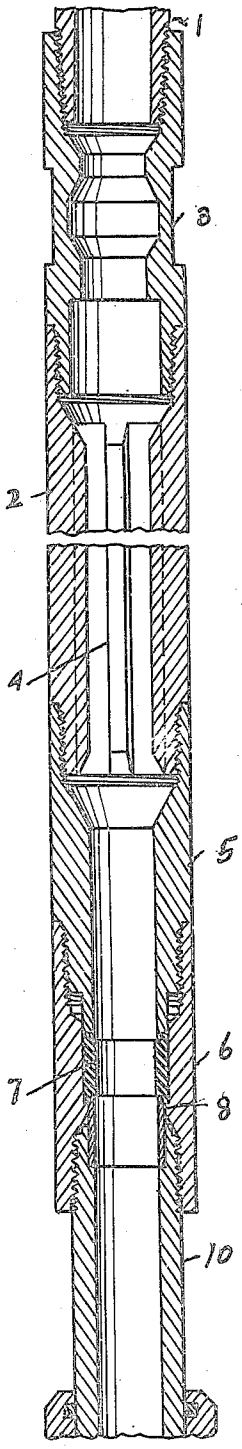

Fig. 1.

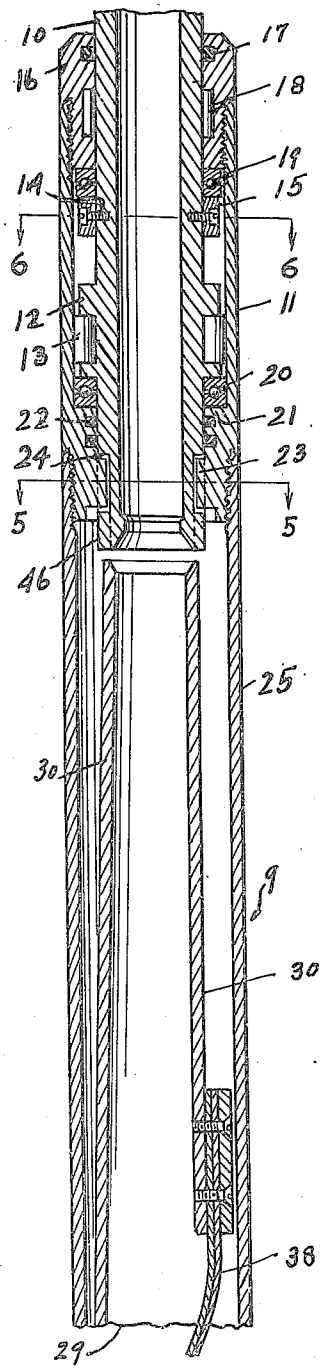

Fig. 2.

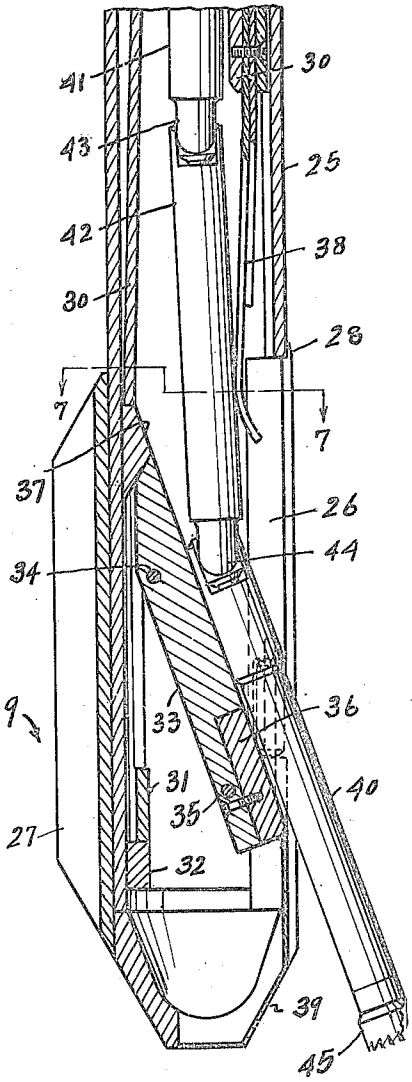

Fig. 3.

Inventors
Charles O. Denning
John R. Yancey

By
E. V. Hardaway
ATTORNEY.

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SIDEWALL CORING TOOL

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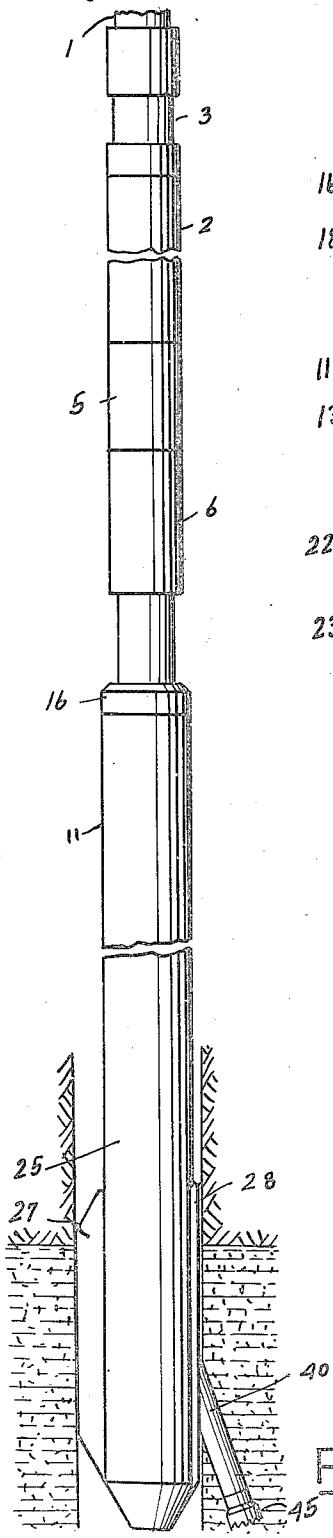

Fig. 8.

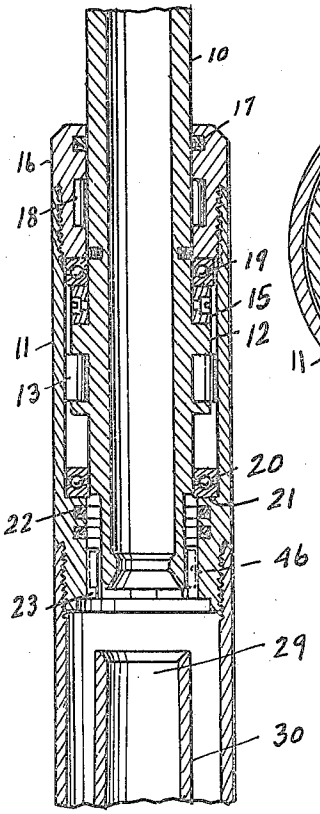

Fig. 4.

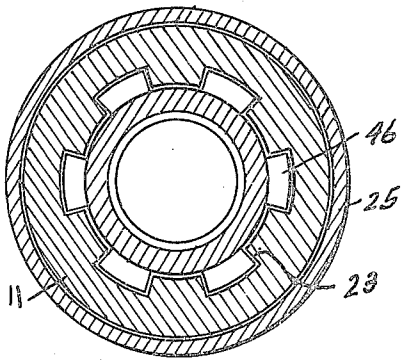

Fig. 5.

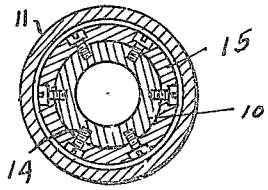

Fig. 6.

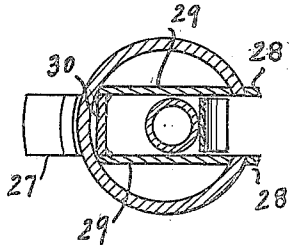

Fig. 7.

Inventors
Charles O. Denning
John R. Yancey

By
E. V. Hardway.
ATTORNEY.

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SIDEWALL CORING TOOL

Charles O. Denning and John R. Yancey, Houston, Tex., assignors to A-1 Bit & Tool Company, Inc., Houston, Tex., a corporation of Texas

Application April 16, 1948, Serial No. 21,516

6 Claims. (Cl. 255—1.4)

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This invention relates to a sidewall coring tool.

The invention includes certain improvements over that type of sidewall coring tool disclosed in our co-pending application Serial No. 4,124 filed by these applicants on January 24, 1948.

It is an object of the present invention to provide a sidewall coring tool of the character described of such construction that during the normal core taking operation the drill stem may rotate independently of the housing beneath and the whipstock connected to the lower end of said housing.

In core taking operations with equipment such as that disclosed in our co-pending application the whipstock and the housing to which it is connected may become stuck in the well bore and in such event no means have been provided for rotating the stuck portion of the equipment to effect the release of the same whereas in the present invention should the whipstock become stuck the drill stem may be adjusted and brought into clutched relation with the stuck portion of the equipment so that the latter may be rotated and thus released from the walls of the bore and recovered.

It is another object of the present invention to provide clutch means between the driving stem for the core drill and the housing connected to the whipstock which may be maintained in declutched relation during normal coring operations but which may be brought into clutched relation in case the whipstock becomes stuck so that the latter may be rotated from the stem.

Other objects and advantages will be apparent from the following specifications which is illustrated by the accompanying drawings, wherein:

Figure 1 is a vertical, sectional view of the upper portion of the driving connection between the drill stem and the coring tool.

Figure 2 is a vertical, sectional view of an intermediate portion of the core taking apparatus showing the drill stem declutched from the whipstock.

Figure 3 is a vertical, sectional view of the lower end thereof.

Figure 4 is a fragmentary, vertical, sectional view showing the drill stem clutched with the whipstock.

Figure 5 is a cross-sectional view taken on the line 5—5 of Figure 2.

Figure 6 is a cross-sectional view taken on the line 6—6 of Figure 2.

Figure 7 is a cross-sectional view taken on the line 7—7 of Figure 3, and

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Figure 8 is a side elevation of the complete tool.

Referring now more particularly to the drawings the numeral 1 designates a tubular drill stem which extends to the ground surface. The lower end of this drill stem is formed with a special tubular driving section 2 which is connected to the drill stem by means of the coupling 3. The section 2 has a plurality of inside longitudinal ribs 4 extending from the upper end to the lower end thereof and spaced apart.

Connected to the lower end of the driving section 2 there is an inwardly thickened reducing nipple 5 and connected to the lower end of this nipple there is a coupling 6 which contains an annular packing ring 7. This packing ring is clamped between the lower end of the nipple 5 and an internal annular shoulder 8 within the coupling 6. Therefore when the coupling 6 is screwed onto the nipple 5 the seal ring 7 will be placed under the required compression. The passageway through the above described assembly of the nipple 5 and coupling 6 is of substantially the same inside diameter throughout.

The whipstock, or deflector, is designated generally by the numeral 9. It has a swivelling connection with the drill stem. This connection is formed between the tubular nipple 10, whose upper end is connected to the coupling 6, and the tubular housing 11, whose lower end is connected to the whipstock 9.

The lower end of the nipple 10 extends into the housing 11 and has an external annular rib 12 therearound with radial roller bearings 13 countersunk into the nipple beneath said rib.

Spaced above said said rib 12 around the nipple 10 and secured thereto by frangible pins 14 there is a ring 15.

A gland 16 is screwed into the upper end of the housing 11 and closely surrounds the nipple 10 and has an internal seal ring 17 therein around said nipple. This gland 16 has the radial roller bearings 18 therein which surround the nipple 10 and between the ring 15 and the lower end of the gland 14 are the anti-friction bearings 19.

The lower end of the nipple 10 is supported on an anti-friction bearing assembly 20 which, in turn, is supported on an inside annular shoulder 21 which is formed by the inwardly thickened lower end of the housing 11 and beneath the bearing assembly 20 there are the inside seal rings, as 22, within the housing 11 and closely surrounding the nipple 10.

Within the lower end of the housing 11 it is formed with the inside clutch teeth 23 which, when the tool is in operative position, project into a relative wide external groove 24 in the lower end of the nipple 10 so that when the tool is in operative, or coring position, the drill stem 1 and the nipple 10 and the intermediate connections between them, may freely rotate.

An efficient swivel connection is thus formed between the drill stem and the whipstock whereby the latter is supported in the well by the former.

The whipstock is shown in Figures 2 and 3 and is identical with that type of whipstock shown in the co-pending application above referred to. It comprises a tubular shell 25 whose lower end is downwardly tapered and above said taper is provided with a longitudinal side slot 26 which extends to its lower end; the upper end of the shell 25 is connected to the lower end of the housing.

Secured on the outside of the shell, opposite said slot, there is a longitudinal rib 27 and on opposite sides of the slot there are the longitudinal ribs, as 28, which are secured to the outer side of the shell. These ribs 27 and 28 engage the formation of the well bore to hold the whipstock centered in the bore hole.

Within the shell 25 there is a guide which is rectangular in cross-section. This guide is fitted downwardly within the shell and is composed of side plates 29, 29 whose margins are beveled to fit within the shell and said guide also has the cross plates 30, 30; the plates 29 and 30 are secured together preferably by welding and the guide is preferably flared downwardly as is indicated in Figures 2 and 3. The plates 29 carry a transverse top 31 which rests on a corresponding transverse stop 32 to support the guide in the shell; said stop 32 being carried by the shell.

Within the guide, and arranged at the lower end thereof, there is a deflector plate 33. This plate is arranged opposite the slot 26 and declines forwardly. It is supported by the transverse upper and lower pins 34 and 35 which extend transversely through the deflector plate and whose ends are anchored to the respective side plates 29.

The upper face of this deflector plate, at its lower end, is provided with an insert of hard wear-resisting material 36, as shown in Figure 3. At the upper end of the deflector plate 33 the guide plate 30 is inwardly thickened and is of a general triangular shape in vertical cross-section and whose upper face is approximately flush with the upper face of the deflector plate 33 thus forming a guide 37.

Anchored to the front plate 30 of the guide, above the slot 26, there is a flexible guide 38 whose lower end is free and is outwardly turned. The slot 26 extends on down and partly across the lower end of the shell 25 for a purpose which is fully explained in the pending application above referred to and the lower end of the slot beneath the lower end of the deflector plate 33 is closed by thick metallic skirt 39, as shown in Figure 3, to prevent the entrance of foreign matter into the whipstock shell beneath said deflector plate assembly. The core taker proper comprises a core barrel 40 and a sectional driving stem consisting of the upper tubular section 41 and the lower tubular section 42. These sections are connected by a universal coupling designated generally by numeral 43 and the core barrel is connected to the lower end of the section 42 by similar universal coupling 44.

Only one intermediate section of the driving stem is illustrated, although it is apparent that the number may be varied if found practical.

The upper sections of the driving stem are not shown in the drawings but are identical with those shown in the co-pending application above referred to and are driven from the drill stem in order to drive the core barrel in a manner identical with that described in said co-pending application.

Secured on the lower end of the core barrel there is a core forming tool or drill 45.

During the coring operation the parts will be in the position shown in Figures 1, 2 and 3 with the clutch teeth 23 in the groove 24 of the nipple 10 so that the drill stem may freely rotate to drive the core barrel; however, it may happen that the whipstock will become stuck in the bore hole so that it cannot be withdrawn. In such case a grappling tool may be lowered into the drill stem and engaged with the core taker and the core taker pulled upwardly so as to withdraw the core barrel into the whipstock and the drill stem may then be pulled upwardly shearing the pins 14. The drill stem will move on upwardly until the rib 12 engages the bearing assembly 19.

The lower end of the nipple 10 is provided with external clutch teeth 46 which will now intermesh with the clutch teeth 23, as is indicated in Figure 5 and the drill stem may then be oscillated back and forth or rotated to release the whipstock from its stuck position in the bore hole and if and when said whipstock is released it may be withdrawn from the bore hole or relocated therein.

The drawings and description are illustrative merely while the broad principle of the invention will be defined by the appended claims.

What we claim is:

1. A core taking apparatus comprising, a whipstock; an operating string of pipe to the lower end of which the whipstock has a swivelling connection; means for maintaining the string against longitudinal movement relative to the whipstock; interconnecting means between the string and whipstock normally maintained disconnected by said maintaining means; said maintaining means being displaceable by the longitudinal movement of the string relative to the whipstock to allow said interconnecting means to interengage to cause the whipstock to rotate with the string.

2. A core taking apparatus comprising, a whipstock; an operating string of pipe to the lower end of which the whipstock has a swivelling connection; means for maintaining the string against longitudinal movement relative to the whipstock; interconnecting means between the string and whipstock normally maintained disconnected by said maintaining means; said maintaining means including shear pins arranged to be sheared by the longitudinal movement of the string relative to the whipstock to displace said maintaining means and to allow said interconnecting means to interengage to cause the whipstock to rotate with the string.

3. A core taking apparatus comprising, a whipstock; an operating string of pipe to the lower end of which the whipstock has a swivelling connection; means for maintaining the string against longitudinal movement relative to the whipstock to maintain said swivelling connection; gearing carried by the whipstock and string, respectively, and normally maintained out of mesh by said maintaining means; said maintaining means in-

cluding a shear pin arranged to be sheared by the longitudinal movement of the string relative to the whipstock to displace said maintaining means to allow said gearing to intermesh to cause the whipstock to rotate with the string.

4. In a core taking apparatus, a whipstock, swivelling connecting means connected to the whipstock and adapted to connect the whipstock to the lower end of an operating string of pipe, means for maintaining the string against longitudinal movement relative to the whipstock, inter-connecting means adapted to be connected to the string and whipstock and normally maintained disconnected by said maintaining means, said maintaining means being displaceable by the longitudinal movement of the string relative to the whipstock to allow said inter-engaging means to inter-engage to cause the whipstock to rotate with the string.

5. In a core taking apparatus, a whipstock, a swivelling connection on the whipstock adapted to connect it to a string of pipe, means for maintaining the string against longitudinal movement relative to the whipstock, inter-connecting means located between the string and whipstock and normally maintained disconnected by said maintaining means, said maintaining means including shear pins arranged to be sheared by the longitudinal movement of the string relative to the whipstock to displace said maintaining means

and to allow said inter-connecting means to inter-engage to cause the whipstock to rotate with the string.

6. In a core taking apparatus, a whipstock, means arranged to connect the whipstock to the lower end of an operating string to swivel thereon, means for maintaining the string against longitudinal movement relative to the whipstock to maintain said swivelling connection, gearing carried by the whipstock and string, respectively, and normally maintained out of mesh by the maintaining means, said maintaining means including a shear pin arranged to be sheared by the longitudinal movement of the string relative to the whipstock to displace said maintaining means to allow said gearing to intermesh to cause the whipstock to rotate with the string.

CHARLES O. DENNING.
JOHN R. YANCEY.

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