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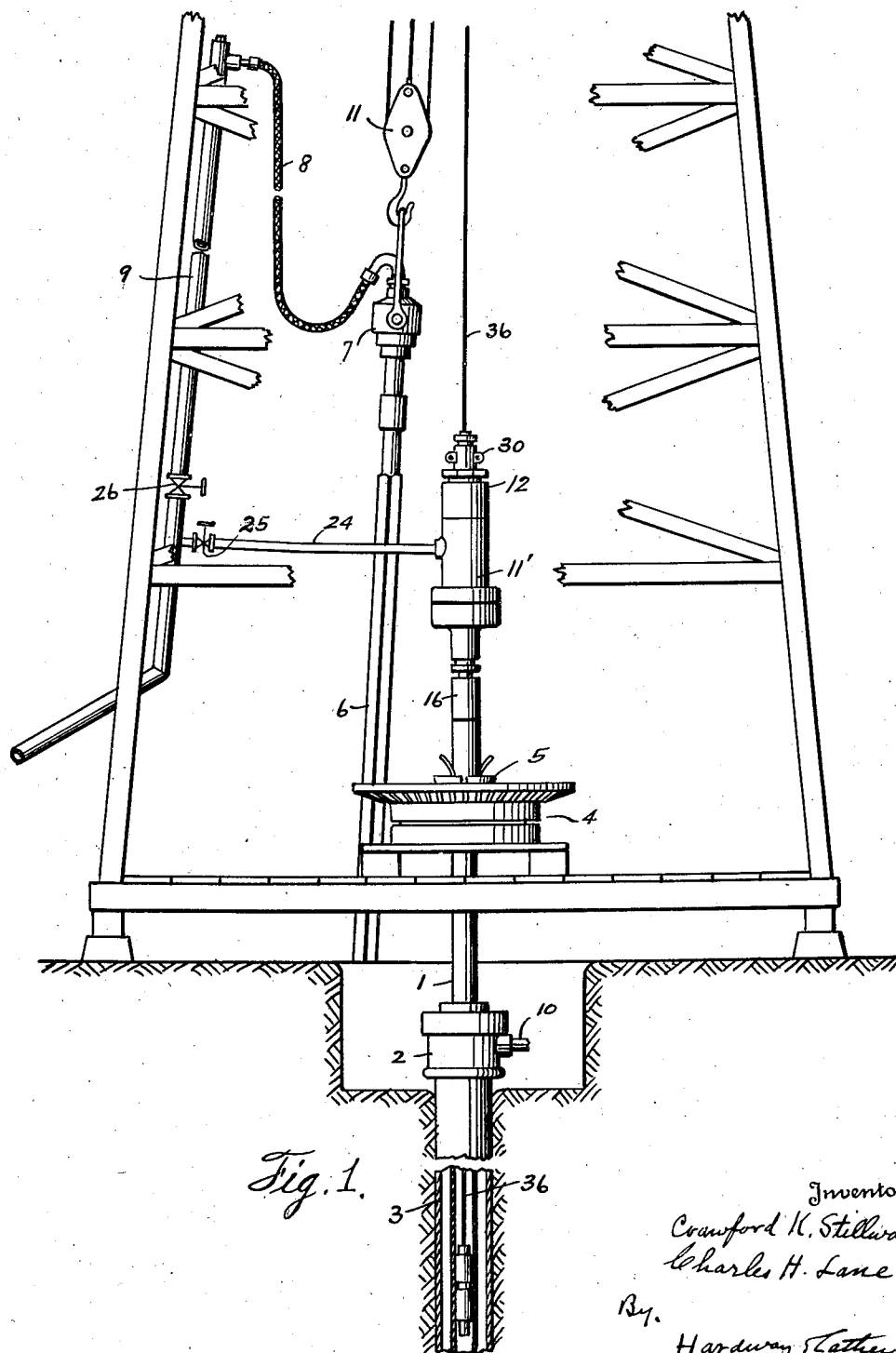
C. H. LANE ET AL

2,082,010

ROTARY SWIVEL FOR REMOVABLE WIRE LINE DRILLS

Filed March 19, 1935

2 Sheets-Sheet 1



Inventors
Crawford K. Stillwagon
Charles H. Lane

By.
Hardway T. Lathen
Attorney

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2 Sheets-Sheet 2

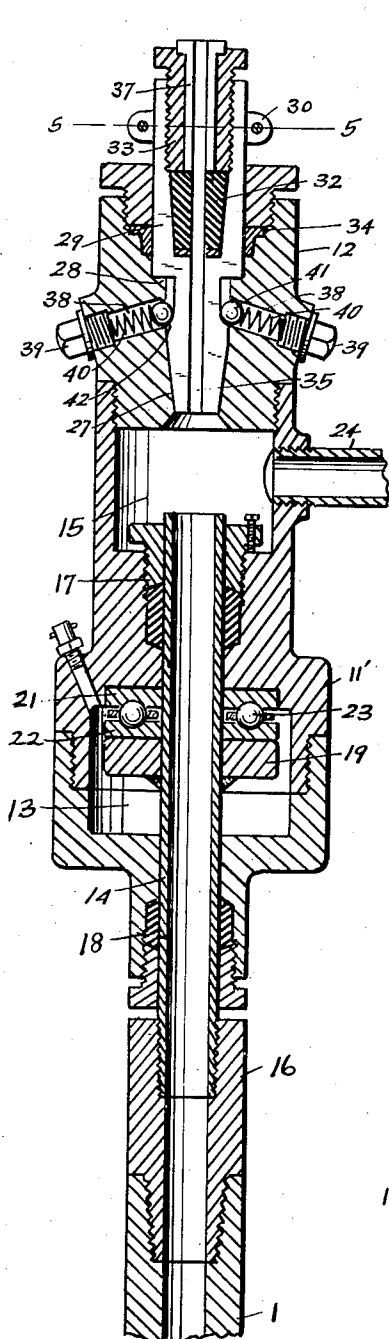


Fig. 2.

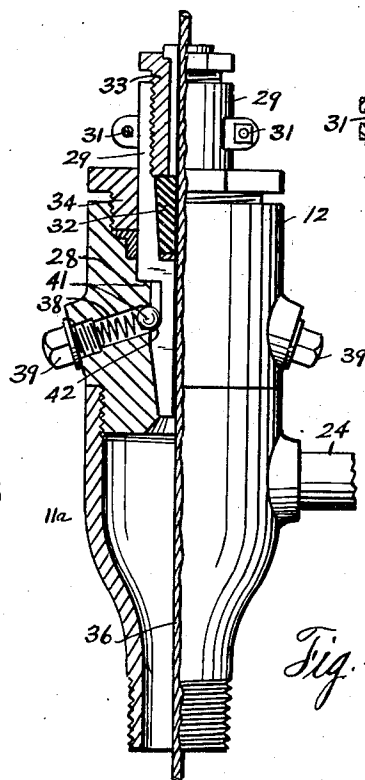


Fig. 4.

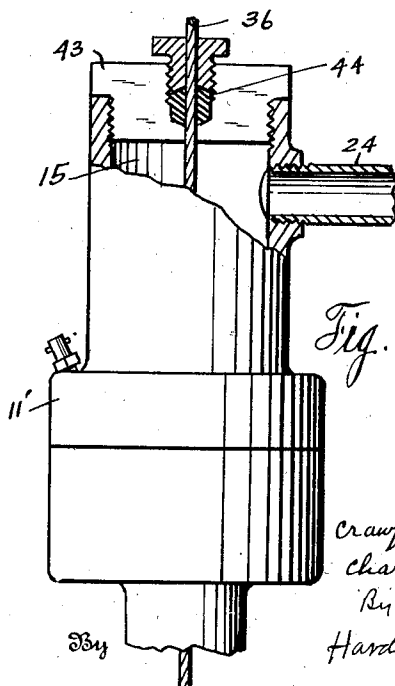


Fig. 3.

Inventors
Crawford K. Stillwagon
Charles H. Lane.
By
Hardway Lathrop
Attorneys

UNITED STATES PATENT OFFICE

2,082,010

ROTARY SWIVEL FOR REMOVABLE WIRE
LINE DRILLSCharles H. Lane and Crawford K. Stillwagon,
Houston, Tex.

Application March 19, 1935, Serial No. 11,762

2 Claims. (Cl. 255—25)

This invention relates to a circulating method and apparatus for wells.

One object of the invention is to provide a means and method for facilitating the taking of cores, or samples of strata being pierced by the use of a core barrel, or core-taking apparatus that may be lowered into, and withdrawn from, the well through the drill stem and for maintaining circulation of drilling fluid and rotation of the stem while the sample-taking apparatus is being lowered or withdrawn, or while withdrawing the cable, through which the core-taking apparatus is lowered, after it has been detached from the core-taking apparatus in the well; by the use of the present invention, the cable with core barrel attached, may be lowered into or withdrawn from the well, and the core barrel, or other core-taking apparatus may be lowered into the well into operative position and the cable detached and withdrawn while circulation of the drilling fluid is maintained down through the drill stem and back up around it to the ground surface, and while the drill stem is being rotated to prevent the drill stem from becoming stuck in the well.

It is common practice in taking cores or samples from wells to detach the driving Kelly joint and swivel at the upper end of the drill stem and stop the circulation of the drilling fluid down through and back up around the drill stem while the core-taking apparatus is being lowered into the well through the drill stem, as well as while the lowering cable, either with the core-taking apparatus attached or detached is being withdrawn from the well. According to this present practice, when the core barrel or other core-taking apparatus is locked in position at the bottom of the drill stem, the driving kelly is re-attached to the upper end of the drill stem and circulation is resumed and the drill stem is rotated, and the core or sample is thereby taken; then when the core has entered the core barrel, the driving kelly and swivel are again disconnected, and the cable, with a suitable grapple attached, is lowered into the well to engage and bring out the core-taking apparatus. The length of time the circulation of the drilling fluid is suspended under the above-mentioned conditions depends on the depth of the well, and with circulation so suspended, the heavy material suspended in the drilling fluid is liable to pack at the lower end of the hole about the drill stem, causing it to become stuck in the well.

The invention herein described eliminates this

possibility of the drill stem becoming stuck in the well while the core-taking apparatus is being lowered or withdrawn, or while the cable is being withdrawn after the core-taking apparatus is located in place, or while the cable is being lowered for the purpose of engaging the core-taking apparatus to withdraw it. The invention is made readily portable so that it can quickly be installed on a drill stem upon disconnection of the driving kelly therefrom so that circulation of the drilling fluid may be suspended only for a very short time, while such disconnection and connection are being accomplished.

Preparatory to taking a core or sample by methods now in common use, it is now common practice to cleanse the well, so far as the same can be done of the heavy drilling cuttings made by the drill bit by circulating mud-laden fluid down through the drill stem and back up out of the well. This circulating process requires a considerable length of time and is rendered unnecessary by the use of the present invention for the reasons hereinabove stated.

The invention is of such construction that, when attached to a drill stem, the core barrel or core-taking apparatus, which is manipulated through a cable, may be readily lowered there-through and a close seal then formed about the cable while the core-taking apparatus is being further lowered into place, and the seal with the cable will be maintained until the cable is withdrawn.

The invention comprehends the combination of a circulating head and an oil-saver, as will be hereinafter more specifically pointed out.

A still further object of the invention is to provide an apparatus of the character described that is particularly useful while swabbing a well.

A still further object is to provide an apparatus by means of which circulation may be maintained during the process of lowering the cable and/or the core-taking apparatus as well as while the cable and/or core-taking apparatus are being withdrawn, and is of such construction that the drilling fluid may be maintained under high pressure if desired during the aforementioned sample taking operations.

The apparatus is also useful when it is desired to run a straight hole guide into, and withdraw the same from, a well by the use of a cable, or when it is desired to run a measuring line into the well, and these objects may be accomplished during the rotation of the drill stem and while ordinary circulation is being maintained in the well. The invention is further useful as an oil

saver adapted for use while lowering or pulling pump sucker rods.

With the above and other objects in view the invention has particular relation to certain novel features of construction operation and arrangement of parts, as well as to a novel method, examples of which are given in the specification, and illustrated in the accompanying drawings, wherein:—

Figure 1 shows a side elevation of a well drilling apparatus partly broken away showing the driving kelly disconnected from the drill stem, and one form of the invention installed thereon in its stead.

Figure 2 shows an enlarged vertical sectional view showing the circulating head and oil saver mounted on the upper end of the drill stem.

Figure 3 shows a side view partly in section of the circulating head with its upper end closed, and a stuffing box through which the cable may operate.

Figure 4 shows a modified form of circulating head and oil saver attached, and

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

Referring now more particularly to the drawings, wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates a drill stem or other inner pipe which works through the casing head 2 of the outer casing 3 in the well bore. The drill stem or pipe 1 may be rotated by conventional rotary drilling machinery 4, and while not being rotated, may be suspended from said drilling machine by conventional slips, as 5.

While drilling is in progress, the Kelly joint 6 is connected to the upper end of the drill stem, the slips 5 are removed, and a conventional drive bushing is substituted for the slips 5 in the well-known manner for driving the kelly. The kelly carries the usual swivel 7 at its upper end, into which the hose 8 is connected, leading from the standpipe 9. The standpipe is connected to the usual pump whereby drilling fluid under pressure may be forced down through the kelly and drill stem, and returned up around the drill stem and out through the outlet pipe 10. The kelly and drill stem may be handled through the conventional tackle block 11 which is connected to the bail of the swivel in the well-known manner.

As illustrated in Figure 1, the kelly has been detached for the purpose of swabbing the well, or for the purpose of lowering or withdrawing a core taking apparatus, and the circulating head 11' with the oil-saver 12 attached are shown connected to the upper end of the drill stem.

As clearly shown in Figure 2, the circulating head is formed with a housing 13 having the axial tubular spindle 14 extending therethrough. The upper end of this spindle terminates in the circulating chamber 15 in the upper end of said housing, and the lower end of the spindle is connected to a tool joint member 16 which in turn is connected to the upper end of the drill stem 1.

Suitable stuffing boxes 17 and 18 surround said spindle adjacent its upper and lower ends.

Within the housing 13 there is an annular supporting plate 19, welded, or otherwise, secured to the spindle 14, and on this supporting plate, and enclosed within the housing, are the upper and lower bearing plates 21, 22, having the anti-friction bearings 23 between them whereby the housing 11' and oil-saver 12 are supported so

that the drill stem may be rotated relative to the housing, if it be desired to do so.

The lower end of the body of the oil-saver 12 may be screwed into the upper end of the housing 11' so as to enclose the chamber 15. This chamber may be connected with the standpipe 9 by means of the pipe 24 which is controlled by the valve 25, and the standpipe has a valve 26 located above the pipe 24 which may be closed, when the kelly 6 is to be disconnected, and when the core-taking device is being lowered or withdrawn or other operations are being carried on through the drill stem, the valve 25 may be opened so as to maintain circulation down through the drill stem and up through the casing around it.

The body of the oil-saver has an axial passageway therethrough whose lower end is formed with a downwardly converging seat 27, and whose upper end is enlarged to form an inside annular shoulder 28. The seat 27 is of sufficient diameter to permit the passage of the core-taking apparatus or swab therethrough.

Within the body of the oil-saver are the clamp-jaws 29, 29, preferably formed of two sections fitted together and having the lateral lugs 30, 30, to receive the bolts 31, 31, by means of which the sections may be secured together as a unit. The lower end of the unit is reduced in diameter and tapered to seat within the seat 27, and to rest on the shoulder 28. There is a packing sleeve 32 within the upper end of the jaw unit and which is retained in place by means of the gland 33 which is screwed into the upper end of the assembled jaws against said packing. This jaw unit is fitted through a stuffing box 34, located in the upper end of the body of the oil-saver 12. The jaw unit has an axial passageway, or bearing, 35, to receive and closely surround the cable 36, and within the gland 3 and closely surrounding said cable, there is the liner 37.

The body 12 of the oil-saver is provided with the upwardly converging bores whose outer ends are closed by the plugs 39, and within these bores are the coil springs 40, which press inwardly against the balls 41 and hold said balls seated in the annular groove 42 around the assembly of jaws 29 so as to hold said assembly seated securely in place while the cable is being lowered or elevated therethrough.

When the core-taking device, or swab, is being lowered through the body of the oil-saver, the jaw assembly is, of course, removed, but when said core-taking apparatus or swab has cleared the lower end of the oil-saver body, the jaw assembly, as above-described, is clamped about the cable and lowered into place on the seats 27, 28.

Circulation need be stopped only while the kelly 6 is being detached and the housing 11' is being attached to the drill stem or other inner pipe, and this can be very quickly done so that there will be very little liability of the drill stem becoming stuck in the bore while making this change.

With the valve 25 open, and the valve 26 closed, circulation may be maintained down through the drill stem and back up on the outside of the drill stem through the well bore while the core-taking apparatus is being lowered and located in its operable position, and while the cable is being detached and withdrawn, and likewise, circulation may be so maintained while the cable is being lowered and engaged with the core barrel, after the core has been taken, and the core

barrel withdrawn so that there will be very little liability of the drill stem becoming stuck while operations incident to the taking of a core or sample are being carried on.

5 In withdrawing the core-taking apparatus from the well, when said apparatus strikes the lower end of the jaws 29, the jaw assembly will be unseated and carried out with the cable and the core-taking apparatus pulled on out for in-
10 spection of the core or sample. The tool-joint member 16 may then be unscrewed from the drill stem and the kelly 6 re-attached and ordinary drilling operations then resumed with very little delay. The valve 25 should then be closed, and
15 the valve 26 opened to permit a continuation of the circulation through the well.

The parts of the jaw assembly are all made sectional, as indicated in Figure 5, so that they may be readily assembled about the cable.

20 A modified form of the apparatus is shown in Figure 3 wherein a sectional plug 43 may be substituted for the oil-saver 12 and screwed into the upper end of the circulating head 11' to close the chamber 15. This plug has a central stuffing
25 box 44 through which the cable 36 passes. This stuffing box should also be made sectional in the same manner as indicated in Figure 5 so that it may be readily assembled about the cable. This form of the apparatus may be used in the
30 same manner and for the same purpose as that form of the apparatus illustrated in Figure 2.

In the form shown in Figure 4, the circulating head 11a is in the form of a bell-shaped nipple whose lower end is outwardly threaded to be
35 screwed into an ordinary coupling at the upper end of a pipe in a well bore, and the type of oil-saver illustrated in Figure 2 may be attached to

the upper end of the circulating head 11a and the well pipe then swabbed through the instrumentality of a conventional type of swab attached to and operated by the cable 36, or this type of the apparatus shown in Figure 4 is es-
5 pecially adapted for use in lowering or removing pump sucker rods.

What we claim is:

1. Apparatus of the character described comprising a circulating head having a housing at the lower end thereof, a tubular spindle extended
10 axially into the housing, said head having a circulating chamber into which the upper end of the spindle extends, a drill stem attached to the lower end of the spindle, antifriction means support-
15 ing the circulating head on the spindle, an inlet line entering the chamber, a packing unit closing the upper end of said chamber, a stuffing box in the packing unit to permit the operation of a cable therethrough and yieldable means for re-
20 leaseably holding the packing unit in place.

2. Apparatus of the character described comprising a circulating head having a housing at the lower end thereof, a tubular spindle extended
25 axially into the housing, said head having a circulating chamber into which the upper end of the spindle extends, a drill stem attached to the lower end of the spindle, antifriction means supporting the circulating head on the spindle, an
30 inlet line entering the chamber, a packing unit closing the upper end of said chamber, and having packing therein shaped to form a fluid tight seal about an operating cable and coil springs mounted through the side of said head and
35 adapted to hold the packing unit in place.

CHARLES H. LANE.
CRAWFORD K. STILLWAGON.