Jan. 1, 1929. 1,697,590

R. D. DODDS

WELL DRILLING APPARATUS

Filed Aug. 21, 1922 2 Sheets-Sheet 1

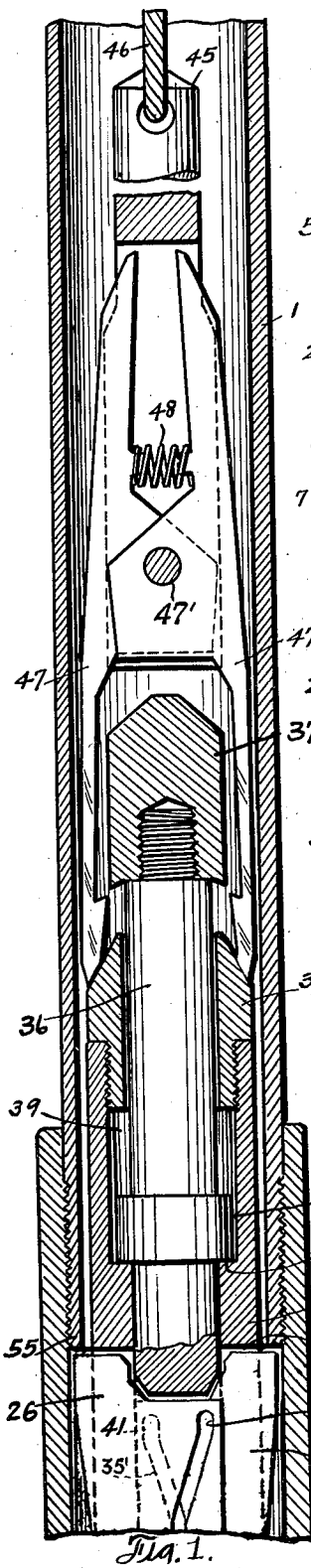


Fig. 1.

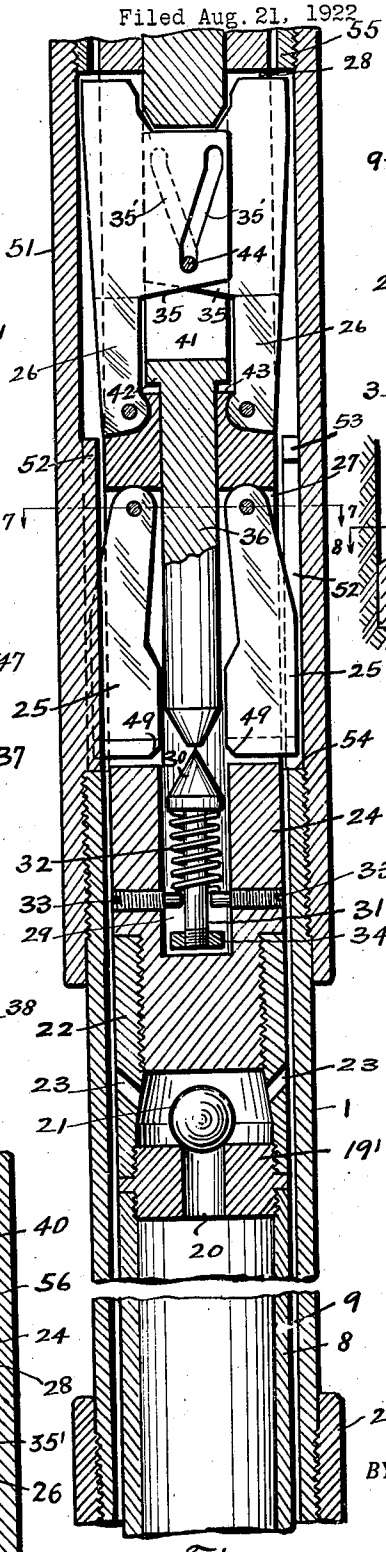


Fig. 2.

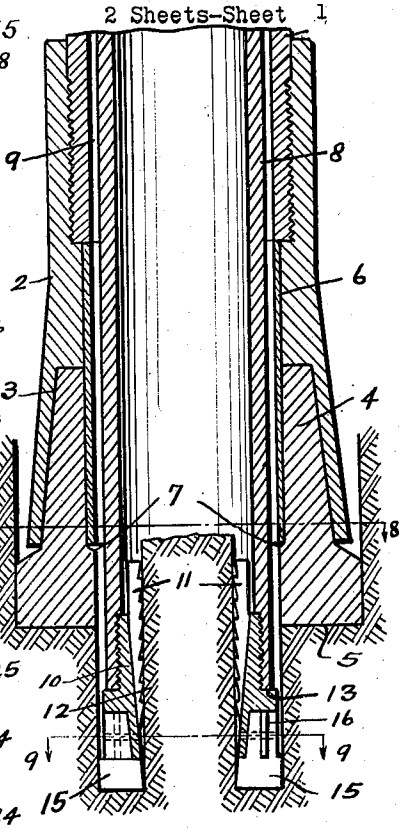


Fig. 3.

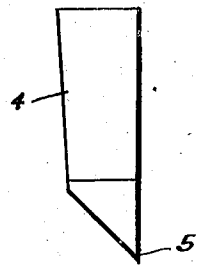


Fig. 4.

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Filed Aug. 21, 1922 2 Sheets-Sheet 2

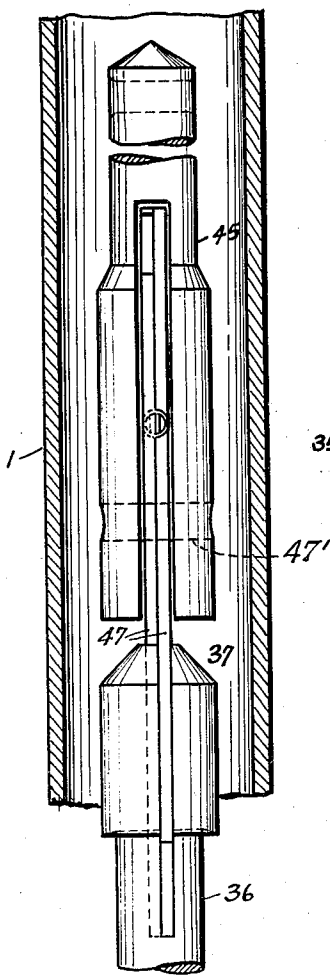


Fig. 5.

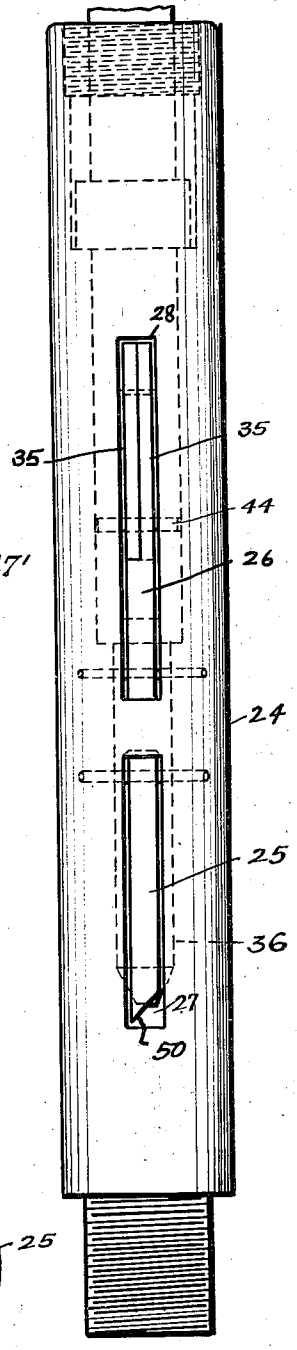


Fig. 6.

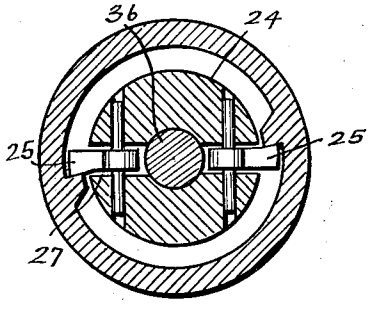


Fig. 7.

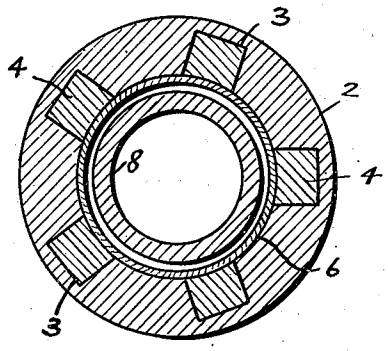


Fig. 8

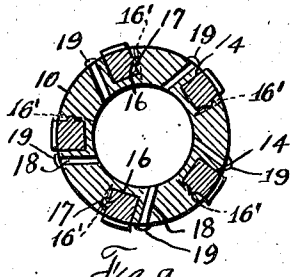


Fig. 9.

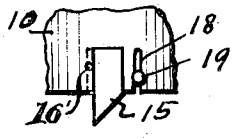


Fig. 10

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Patented Jan. 1, 1929. 1,697,590

UNITED STATES PATENT OFFICE.

REDUS D. DODDS, OF HOUSTON, TEXAS.

WELL-DRILLING APPARATUS.

Application filed August 21, 1922. Serial No. 583,104.

This invention relates to new and useful improvements in well drilling apparatus, and has particular relation to an apparatus for taking cores, or samples of the strata being pierced in well drilling operations.

One object of the invention is to provide a device of the character described specially designed for the purpose of drilling a well bore and at the same time forming and preserving a core of the strata being drilled through.

Another object of the invention is to provide, in well drilling apparatus, a core taking device which may be readily let down through the drill stem and locked for rotation therewith and which, when the core is formed, may be withdrawn through the drill stem, and which will withdraw the core with it to the surface of the ground for examination.

Another object of the invention is to provide, in well drilling apparatus of the character described, an improved type of well boring bit, as well as an improved form of core forming bit.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation, and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figures 1, 2 and 3 show a vertical sectional view of the complete apparatus, Figure 1 showing the upper end thereof, Figure 2 showing the intermediate part thereof, and Figure 3 showing the lower end thereof.

Figure 4 shows a diagrammatical view of one of the cutters of the well boring bit.

Figure 5 shows a side view of the tool for lowering the core taking apparatus into place within the drill stem.

Figure 6 shows a side view of the locking device for locking the core taking apparatus within the drill stem.

Figure 7 shows a transverse sectional view taken on the line 7—7 of Figure 2.

Figure 8 shows a transverse sectional view taken on the line 8—8 of Figure 3.

Figure 9 shows a transverse sectional view taken on the line 9—9 of Figure 3 and,

Figure 10 shows an enlarged fragmentary side view of the core forming bit.

In the drawings the numeral 1 designates the tubular drill stem, threaded onto the lower end of which there is a drill collar 2 whose lower end is flared and formed with downwardly flared internal grooves 3, whose upper ends are somewhat wider than their lower ends forming, in effect, dove tailed mortises into which are fitted the shanks of the cutters 4. The lower ends of these cutters are flared radially and formed with cutting edges 5. The shanks of the cutters are fitted into said mortises from the inside of the drill collar and are held therein by means of a sleeve 6, which is fitted down through said collar before it is screwed onto the drill stem. The lower end of said sleeve 6 abuts against internal shoulders as 7 of the cutters, and when the drill collar is screwed onto the drill stem the lower end of said stem abuts against the upper end of said sleeve and the sleeve is thereby locked in place and in turn secures said cutters against detachment. As the cutters become worn or broken they may be readily removed for repairs or replacements by detaching the drill collar 2 from the stem and then removing the sleeve 6.

The numeral 8 designates a core barrel which is of a diameter to readily pass through the stem leaving a space 9 between said stem and barrel for the passage of fluid. Threaded into the lower end of said core barrel there is an annular seat 10 whose inside wall converges downwardly forming a downwardly tapering seat for the core engaging dogs 11. These dogs are preferably arcuate in horizontal cross sectional view and their inner faces are serrated or toothed to engage with the core 12. The upper end of the seat 10 which is threaded into the core barrel is reduced forming an annular shoulder 13 against which the lower end of said barrel abuts, and the lower end of the seat is formed with mortises 14 into which the shanks of the cutters 15 are fitted from beneath. The front side of each shank has a vertical rib 16, and the mortises are provided with corresponding grooves 17 into which said ribs fit, and in rear of each cutter the seat 10 has a deep slot as 18 into which a dowel pin as 19 may be driven and also a pin 16′ through rib 16 to clamp the cutters against detachment in the seat. Threaded into the upper end of the core barrel there is a valve seat 19′ having a central passageway 20 which is controlled by a ball valve 21. This valve is confined by the tubular

cage 22 which is threaded onto said seat and which is formed with the fluid passageways 23. As the core is formed and passes into said barrel the fluid contained in the barrel will lift the seat 21 and pass out through the passageways 23.

The numeral 24 designates a cylindrical anchor block whose lower end is reduced and threaded into the cage 22. This anchor block carries two pairs of blades as 25, 25 and 26, 26 located within the respective transverse slots 27 and 28 cut through said block, the latter being above the former. The blades 25, 25 are pivoted at their upper ends in the slot 27 and the blades 26, 26 are pivoted at their lower ends in the slot 28.

Beneath the slots 27, and forming an extension thereof there is a deep socket 29. Within said socket there is a conical shaped head 30 and integral with it there is a depending shank 31. Surrounding said shank there is a coil spring 32 on which the head rests and the spring is seated on the inwardly projecting ends of the set screws 33, 33, carried by the anchor block. Beneath said inwardly projecting ends there is a nut 34 threaded onto the shank 31 which is adapted to contact against the projecting ends of said set screws to limit the upward movement of the head 30 under the influence of said spring 32 and the range of the movement of said head may be varied by varying the adjustment of said nut.

The lower ends of the blades 25 are transversely aligned and inwardly widened and the upper ends of the blades 26 are inwardly widened forming the overlapping wings 35, 35. Said wings are formed with the respective slots 35′, 35′ which diverge.

There is an actuating rod 36 which works through a central bore in the anchor block. The upper end of this rod has a head 37, preferably screwed thereon, and whose upper end is conical shaped. Beneath the head the rod works through a gland 38 which is threaded into the socket 39 provided in the upper end of said block and within this socket the rod is formed with an annular rib 40 which contacts against the lower end of said gland, when the rod is elevated, and sustains the weight of the core taking apparatus and when in its lowered position rests on the bottom of the socket 39. This rod also has a transverse slot 41 through which the overlapping wings 35 work and beneath said slot the rod is reduced forming an annular shoulder 42 aligned above a similar shoulder 43 of the anchor block. There is a pin 44 whose ends are anchored to the rod 36 which passes through the slots 35′. The reduced lower end of the rod 36 works between the blades 25 and is aligned above the conical shaped head 30.

The core taking apparatus is let down into the drill stem by any suitable appliance. A grappling tool as shown for this purpose consists of the slotted head 45 which is attached to the lower end of the cable 46, and pivoted in the slot of this head, on the pin 47′, are oppositely disposed grappling hooks 47, 47, between whose upper ends a coil push spring 48 is interposed. These hooks are anchored underneath the head 37, and the device is lowered by said cable into the drill stem. While being lowered the anchor block 24 and the appendants thereof are suspended by means of the rib 40 through the instrumentality of the gland 38. While in suspended position the pin 44 will rest in the upper ends of the slots 35′, thus holding the blades 26 withdrawn inwardly within the slot 28. While in suspended position the spring 32 will hold the conical shaped head 30 elevated into position so that the conical surface thereof will rest against the beveled faces 49, 49 at the lower ends of the blades 25 thus holding said blades projecting outwardly beyond the anchor block. The lower ends of these blades are beveled as at 50 and the section 51 of the drill stem has opposing vertical ribs 52 whose upper ends are beveled as at 53. The blades 25 and ribs 52 have said ends beveled so that the blades will not hang on the upper ends of said ribs, but will pass on down until they engage against the upper end 54 of the drill stem section beneath, and the core taking apparatus will thus be stopped against descending further into the drill stem. Meanwhile the upper ends of the blades 26 will have passed beneath the lower end 55 of the drill stem section above. The weight of the rod 36, however, will carry it on downwardly into the position shown in Figures 1 and 2 until the rib 40 is stopped by the annular shoulder 56 of the anchor block, and the pin 44 passing downwardly through the slots 35′ will spread the blades 20 causing them to engage underneath the lower end 55 of the drill stem section above. The extreme lower end of the rod 36 will pass between the inwardly flared lower ends of the blades 25 and lock them in projecting position, at the same time contacting with and depressing the head 30. The core taking device will thus be locked in position in the drill stem and the hooks 47 of the grappling tool having been spread by the conical shaped upper end of the gland 38, as shown in Figure 1, said grappling tool may be withdrawn.

The device is now in position for operation. The drill stem is rotated from the surface of the ground by a suitable rotary and as it turns the ribs 52 engaging against the blades 25 will force the core taking device to rotate with the stem and as boring progresses the core 12 will be formed which will pass out into the barrel 8 through the dogs 11. When it is desired to withdraw the core for inspection a suitable grappling or fishing

tool is let down into the drill stem and engaged over the head 37, and an upward pull is exerted on the rod 36. As the rod moves upwardly the pin 44, operating in the bearings 35′ will contract the blades 26 and permit them to pass up within the joint of the drill stem above them, and as a further pull is exerted on the rod 36 the annular rib 40 thereof will engage against the gland 38, and the lower end of said rod will be released from between the blades 25, thus permitting the entire core taking device to be pulled upwardly through the stem. Meanwhile the wedge shaped dogs 11 will ride downwardly on the tapering walls of seat 11 and will thus be contracted against and sever the core and the same will be withdrawn to the ground surface.

What I claim is:—

1. Well drilling apparatus including a drill stem having spaced internal shoulders, a boring bit attached thereto and including a collar formed with mortises and cutters detachably anchored in said mortises, a core barrel within the stem, an annular member attached thereto and formed with detachable cutters and a downwardly converging internal seat, core engaging dogs fitted in said seat, releasible blades adapted to engage against said shoulders to lock said barrel against longitudinal movement in the stem, some of said blades also interlocking with the stem to prevent the independent rotation of the barrel relative to the stem.

2. Well drilling apparatus including a drill stem having inside annular shoulders, spaced apart, a collar attached to the lower end thereof and formed with inside mortises, separate cutters whose shanks are fitted into said mortises, a sleeve within the collar securing said cutters against detachment, a core barrel in said stem, an annular core forming bit attached to the lower end of the barrel and formed with an internal downwardly tapering seat, core engaging dogs slidably mounted on said seat, and means for interlocking said barrel and stem, said means including blades pivotally connected to the barrel and whose free ends abut against said respective shoulders, some of said blades also interlocking with the stem to prevent the independent rotation of the barrel in the stem.

3. Well boring apparatus including a drill stem, having spaced annular internal abutments, a drilling bit attached to the lower end thereof, a core barrel within the stem and extending through said bit, a core forming bit attached to the lower end of said barrel, core engaging means within said barrel, an anchor within the stem to which the barrel is attached, releasible blade-like members pivoted to the anchor and adapted to interlock with the shoulders, an actuating rod through which said blades may be actuated into engaged or released position, some of said blades, when in engaged position also interlocking with the stem to prevent the rotation of the barrel relative to the stem.

4. Well boring apparatus including a drill stem having spaced internal shoulders, a drilling bit attached to the lower end thereof, a core barrel within the stem and extending below the bit, core forming means attached to the lower end of the barrel, core retaining means within the barrel, an anchor within the stem to which the barrel is attached, interlocking means carried by the stem and anchor respectively, through which the rotation of the stem is imparted to the barrel, said interlocking means also engaging said shoulders and fixing the stem against longitudinal movement in the barrel, and an actuating rod through which said means may be actuated into engaged or released position.

5. Well boring apparatus including a stem having inside abutments spaced apart, one above the other, a core barrel in the stem, an anchor attached to the barrel, outwardly projecting means pivoted to the anchor and adapted, when in active position, to engage with one of said abutments, an actuating rod having an operative connection with said means and adapted to actuate the same into engaged or released position, other projecting means pivoted to the anchor and disposed to be actuated by said rod into active position in engagement with the other abutment.

6. Well boring apparatus including a stem having inside abutments spaced apart, one above the other, a core barrel in the stem, an anchor attached to the barrel, outwardly projecting means pivoted to the anchor and adapted, when in active position, to engage with one of said abutments, an actuating rod having an operative connection with said means and adapted to actuate the same into engaged or released position, other projecting means pivoted to the anchor and disposed to be actuated by said rod into active position in engagement with the other abutment, and means carried by the stem and disposed to interlock with one of said projecting means to lock the barrel against rotation relative to the stem.

7. In a well drilling apparatus means for securing a core barrel in a drill stem, said means including an anchor, engaging means pivoted to said anchor and when in active positions, diverging upwardly and downwardly therefrom, respectively, an actuating rod operatively connected with the upwardly diverging actuating means and adapted to operate the same into active or inactive position, said rod also being operable against the other actuating means to operate the same into active position.

In testimony whereof I have signed my name to this specification.

REDUS D. DODDS.