

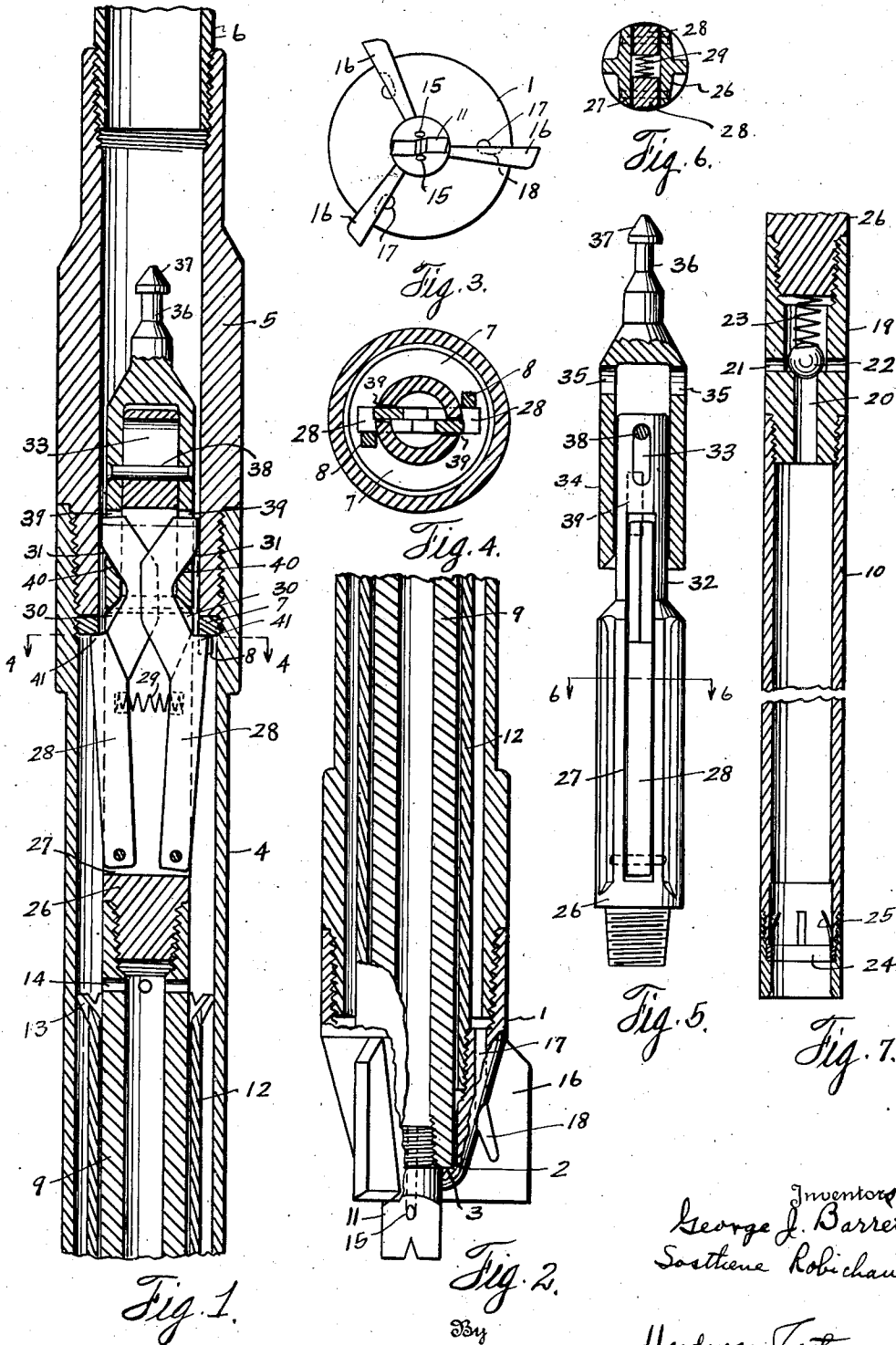
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DRILLING APPARATUS

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DRILLING APPARATUS

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7 Claims. (Cl. 255—78)

This invention relates to drilling apparatus.

An object of the invention is to provide drilling apparatus comprising a tubular driving member having a drill at the lower end thereof provided with novel discharge passageways for discharging the drilling fluid through the drill.

Another object of the invention is to provide, in drilling apparatus of the character described, a removable bit which is insertable into and withdrawable from the main drill with a novel type of head having means for locking the bit in place, said locking means being releasable to permit the withdrawal of the bit.

Another object of the invention is to provide, in drilling apparatus of the character described, a core barrel which may be substituted for the bit when the latter is withdrawn and which may be releasably anchored and locked in the driving member by the same head employed for securing the bit therein.

Another object of the invention is to provide in drilling apparatus a head having a novel type of locking means mounted therein.

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 drawing, wherein:

Figure 1 shows a fragmentary vertical sectional view of the apparatus.

Figure 2 shows a fragmentary vertical sectional view of the lower end thereof.

Figure 3 shows a bottom end view.

Figure 4 shows a cross sectional view taken on the line 4—4 of Figure 1.

Figure 5 shows a side elevation of the head.

Figure 6 shows a cross sectional view thereof taken on the line 6—6 of Figure 5, and

Figure 7 shows a vertical sectional view of the core barrel.

In the drawing the numeral 1 designates the drill which has a central axial bore 2 whose lower end is reduced forming the annular inside seat 3.

The drill is attached to the lower end of the tubular driving member comprising a drill collar 4, the coupling 5 and the drill stem 6, said stem being of a length to extend to the ground surface.

The upper end of the drill collar 4 is internally threaded and a driving ring 7 is screwed therein, said ring having the depending driving lugs 8, 8. The coupling 5 is screwed into the upper end of the drill collar and abuts said driving ring 7, and has a smaller inside diameter than that of the drill collar 4.

There is a tubular barrel 9 whose lower end may be seated on the seat 3 and which may be used interchangeably with the core barrel 10 herein-after more specifically described. When the barrel 9 is employed a bit 11 may be attached to the lower end thereof and will project down through the bore 2 beneath the drill as shown in Figure 2 and as drilling progresses the bit 11 will remove the formation at the center of the bore. The bit 11 may be of the form of a pilot bit as shown.

There is a tubular housing 12 whose lower end is screwed into the drill 1, said housing surrounding the barrel 9 and its upper end terminating beneath the upper end of said barrel and being flared and serrated or notched as at 13 to provide passageways for the drilling fluid.

The upper end of the barrel 9 has a fluid inlet 14 and the pilot bit has discharge channels 15 therethrough providing for the discharge of the drilling fluid on opposite sides of said bit. The drill 1 may be formed with radiating blades 16 and is provided with discharge channels 17 through which the drilling fluid passing down between the housing 12 and the drill collar 4 may be discharged at the bottom of the bore. The channels 17 through the drill head terminate in elongated trough like depressions 18 in the forward faces of the blades 16 and diverge relative to the axis of the drill. While drilling, particularly in sticky formation, the formation will pass up the forward sides of the blades and the drilling fluid will emerge beneath said formation and will force the formation off of said blades and will keep the blades freed from the formation being drilled.

When it is desired to take a core the bit 11 may be withdrawn and the core barrel 10 substituted and when in place the lower end of the core barrel will rest on the seat 3 so that the core or sample may readily enter said barrel. The upper end of the core barrel 10 has a cage 19 attached thereto provided with the outlets 20, 21 normally closed by the upwardly opening valve 22 which is normally maintained seated by the pressure spring 23. In the lower end of the core barrel there is a core catcher which, in the present illustration, is shown as a ring 24 having the upstanding inwardly curved flexible fingers 25. As the core enters the barrel the fingers will spread apart to permit its passage and the air or water in the barrel above the core will pass out through the passageways 20, 21 the valve lifting to permit this.

Means are provided for anchoring the barrel 9,

or the core barrel 10, as the case may be in the driving member which will now be described:

This anchoring means comprises a head 26 whose lower end is reduced and outwardly threaded to be screwed into the upper end of the barrel 9 or the cage 19. This head is provided with a transverse slot 27 which extends lengthwise relative to the head and mounted in this slot are the driving arms 28, 28 whose lower ends are pivoted in said slot and interposed between the arms above said pivots is the pressure spring 29 whose ends are seated in sockets in the inner sides of said arms as shown in Figure 1. The upper ends of said arms are inwardly offset and reduced in thickness and overlap as shown in Figures 1, 4 and 5 and the outer sides of the overlapping ends have the V-shaped notches 30, 30 forming the upwardly diverging bearing faces 31, 31. The upper end of the head 26 is reduced forming a cylindrical neck 32. The upper end of this neck has a transverse longitudinally elongated slot 33. Fitted over the neck 32 there is a hood 34 having the side outlets 35 at its upper end and whose upper end carries a stem 36 which terminates in a conical shaped anchor 37. A pin 38 has its ends anchored to the hood 34 and works through the slot 33. The hood has the side slots 39, 39 through which the upper ends of the locking arms 28 project. The lower ends of the slots 39 are formed with the upwardly flared bearing faces 40 adapted to work against the corresponding faces 31 of the locking arms.

With the driving member and drill 1 attached thereto, in the bore the head 26 may be connected to the upper end of the barrel 9 or 10 as desired and said barrel let down into the drill stem. When the barrel lands on the seat 3 the external shoulders 41 of the arms 28 will have passed beneath the ring 7 and the arms 28 will be forced outwardly by the spring 29 into the paths of the driving lugs 8 and said shoulders will engage underneath the ring 7 to lock the barrel in place and the driving lugs 8 will engage the arms 28 to cause the barrel to rotate with the tubular driving member. It is to be noted that the arms 28 fit snugly in the slot 27 and are thus supported by the sides of said slot so that said arms will not be twisted or broken off under the torsional strain to which they are subjected.

As above indicated the barrel 9 carrying the bit 11 may be lowered into place when it is desired to prosecute ordinary drilling and when it is desired to take a core this barrel 9 and the bit 11 may be withdrawn and the core barrel 10 substituted.

When it is desired to withdraw the barrel 9 and bit 11, or the core barrel 10 a suitable overshot may be lowered by means of a cable down through the drill stem and engaged with the anchor 37. An upward pull on the cable will first elevate the hood 34 into the position shown in Figure 5 and the bearing faces 40 operating against the bearing faces 31 will cause the arms 28 to move inwardly into the position shown in Figure 6 so as to clear the ring 7 and the head 26 and barrel carried thereby may then be readily withdrawn from the well.

The drawing and description disclose what is now considered to be a preferred form of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What we claim is:

1. In drilling apparatus a head having a transverse slot, locking arms in said slot whose lower

ends are pivoted to the head, an actuator which works over the upper end of the head, and has a limited movement relative to the head, yieldable means between the arms and normally holding the arms outwardly, said actuator and arms having coating parts effective to move the arms inwardly upon movement of the actuator upwardly.

2. Well drilling apparatus comprising a drill having a central axial bore, a tubular driving member to the lower end of which the drill is attached, a pilot bit within and extended beneath the bore, said drill and bit having separate channels therethrough through which drilling fluid may pass from within the driving member into the well bore, said pilot bit being insertable downwardly into, and withdrawable upwardly from, the bore and releasable means for locking the bit in place in the drill.

3. In a drilling apparatus, a head having a transverse slot, locking arms in said slot whose lower ends are pivoted to the head, an actuator which works over the upper end of the head and has a limited movement relative to the head, yieldable means normally holding the arms outwardly, said actuator and arms having co-acting parts effective to move the arms inwardly upon movement of the actuator upwardly.

4. A well drilling apparatus comprising a drill having a central axial bore, a tubular driving member to the lower end of which the drill is attached, a pilot bit in the bore, said drill and bit having separate channels therethrough through which drilling fluid may pass from within the driving member into the well, said pilot bit being insertable downwardly into and withdrawable upwardly from the bore, and releasable means for locking the bit in place in the drill.

5. A well drilling apparatus comprising a drill having an approximately axial bore, a tubular driving member to the lower end of which the drill is attached, a separate bit in the bore of the drill, said bit having a channel through which drilling fluid may pass from within the driving member into the well bore, said bit being insertable downwardly into and withdrawable upwardly from the drill bore and releasable means for locking the bit in place in the drill.

6. A well drilling apparatus comprising a drill having an approximately axial bore provided with an inside seat adjacent its lower end, said drill having cutters, a tubular driving member to the lower end of which the drill is attached, central drilling means including a bit at its lower end and insertable downwardly through the driving member to land the central drilling means on the seat with the bit in the drill bore, and withdrawable upwardly through the driving member, while the drill is in the well, said drill and said central drilling means having separate channels through one of which drilling fluid may pass from within the driving member to the drill cutters, and through the other of which drilling fluid may pass from within the driving member to the central bit, and releasable means for securing the central drilling means in place in the apparatus.

7. A well drilling apparatus comprising a drill having an approximately axial bore provided with an inside seat adjacent the lower end of the drill, said drill having cutters, a tubular drill stem to the lower end of which the drill is attached, central drilling means including a boring member at its lower end and insertable downwardly through the drill stem to land the central

drilling means on said seat with the boring member in the drill bore, and withdrawable upwardly through the drill stem, while the drill is in the well, said drilling apparatus having separate channels, one through the drill through which drilling fluid may pass from within the drill stem to the drill cutters, and the other being arranged

to conduct drilling fluid from within the drill stem to the central boring member, and releasable means for securing the central drilling means in place in the apparatus.

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