Nov. 25, 1941. A. MUHLBACH 2,263,639

RETRACTABLE CORE BARREL

Filed July 25, 1939 2 Sheets-Sheet 1

Fig. 1

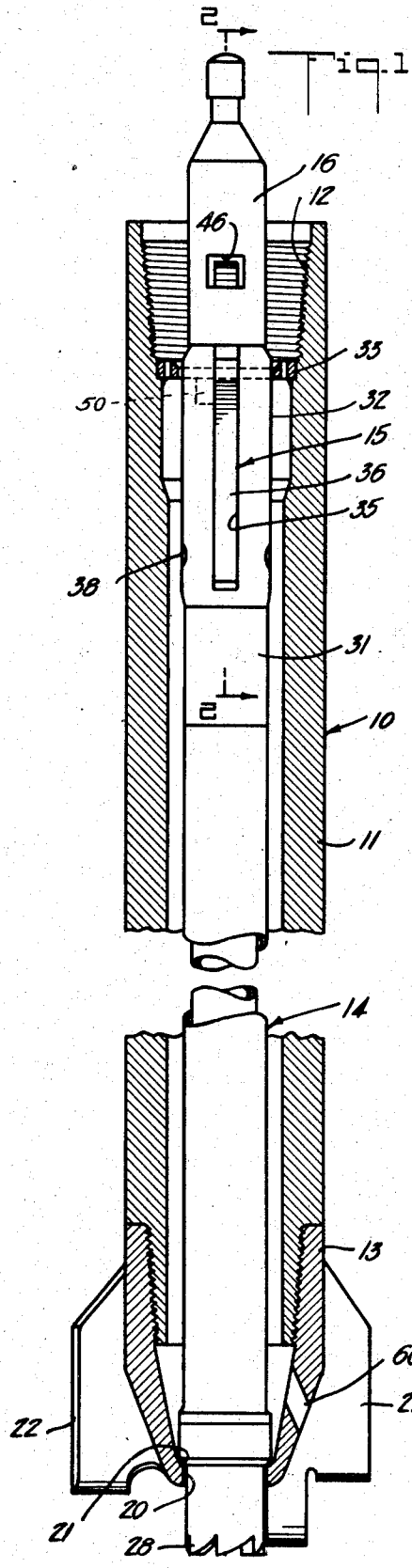


Fig. 2

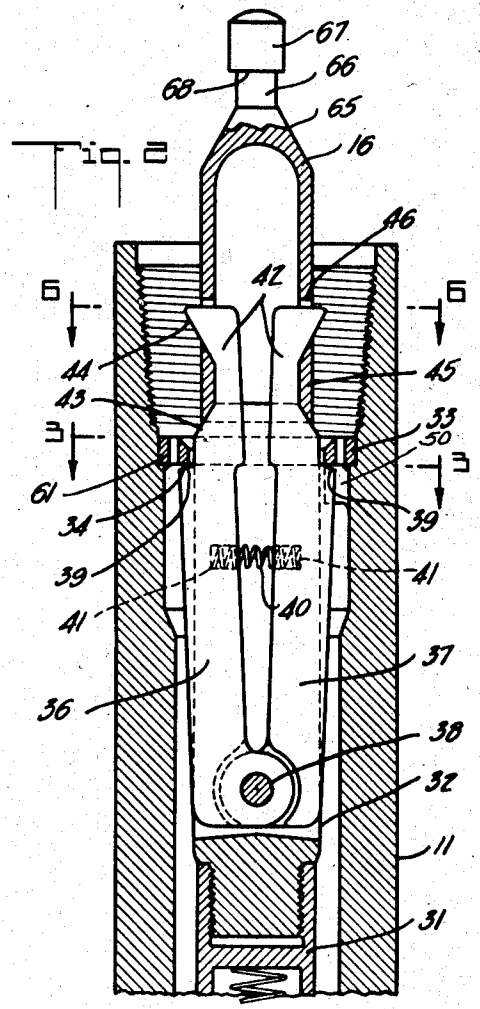
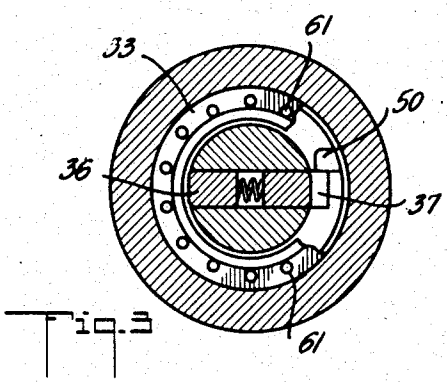


Fig. 3



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Filed July 25, 1939 2 Sheets-Sheet 2

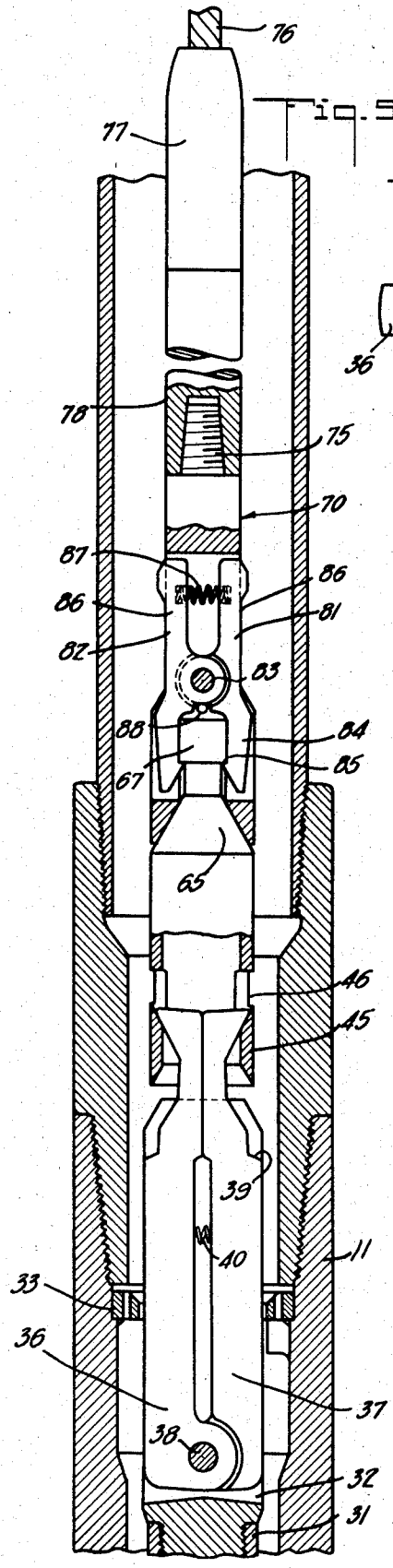


Fig. 5

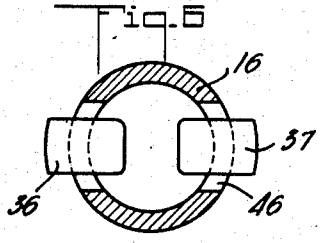


Fig. 6

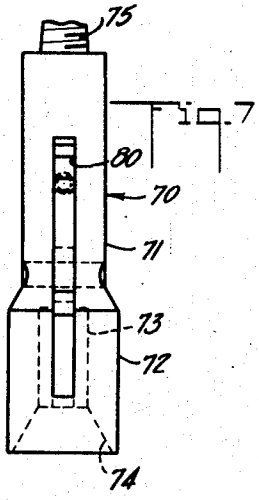


Fig. 7

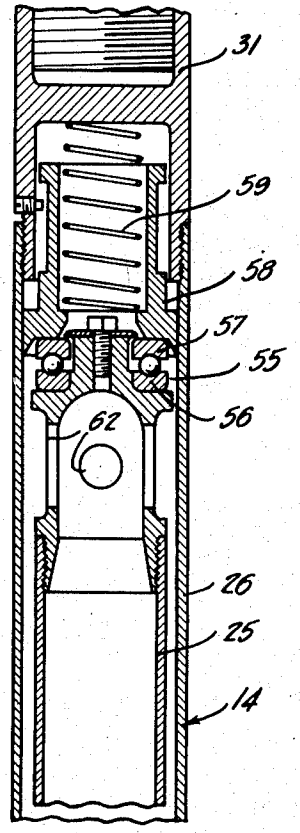
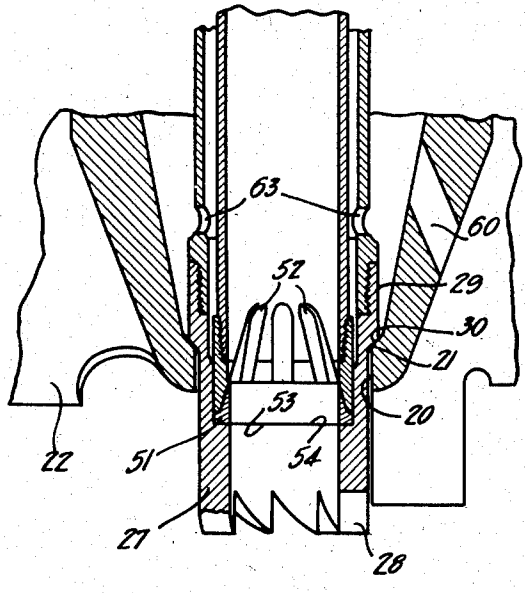


Fig. 4



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UNITED STATES PATENT OFFICE

2,263,639

RETRACTABLE CORE BARREL

Alfred Muhlbach, Los Angeles, Calif., assignor of five-eighths to Roland R. Crum, Whittier, Calif.

Application July 25, 1939, Serial No. 286,356

6 Claims. (Cl. 255—72)

This invention relates to a retractable core barrel and is a continuation in part of an application filed in the name of Alfred Muhlbach, on December 24, 1938, Serial No. 247,625, entitled "Core barrel."

In the art of deep well drilling, particularly oil wells, it is known to provide core drills with a detachable core barrel which may be removed by means of a wire line after a full core has been taken, and to be replaced by an empty core barrel, thus enabling drilling to continue without removing the drill string until the bit becomes dull or other exigencies require it.

It is a principal object of this invention to provide an improved core barrel of such retractable type.

It is another object of this invention to provide a core barrel for use with a core drill, having relatively rotatable inner and outer shells, whereby the outer shell may rotate with the core drill and the inner shell which receives the core may remain stationary so as not to injure the core.

It is another object of this invention to provide a core barrel of the retractable type, in which the cutter carrying the core forming teeth are carried by the barrel so as to be retractable therewith. Since these teeth are subject to severe wear, it is of advantage to be able to remove and replace the cutter which carries them without pulling the drill string. By this means, the intervals between such replacement operations are substantially increased.

It is still another object of this invention to provide improved latch means for anchoring the core barrel in the stem of the core drill.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

In the drawings:

Figure 1 is an axial section of a core drill including the improved core barrel;

Fig. 2 is an axial section through the upper part of the core drill, on an enlarged scale, as seen on plane 2—2 of Fig. 1;

Fig. 3 is a cross section as seen on plane 3—3 of Fig. 2;

Fig. 4 is an axial section through the core barrel on an enlarged scale;

Fig. 5 is a section similar to Fig. 2 but showing the means by which the cable for moving the core barrel is attached to the core barrel;

Fig. 6 is a cross section as seen on plane 6—6 of Fig. 2; and

Fig. 7 is an elevation of the overshot used for gripping the upper end of the core barrel assembly.

Referring to the drawings, the core drill is generally indicated by 10, and includes a tubular drill stem 11 arranged to be secured to the lower end of a drill string in the conventional manner, as by a threaded connection, one member of which is indicated by 12 on the drill stem 11. The drill stem carries an appropriate cutter or bit 13 of any preferred form at its lower end.

A core barrel 14 is mounted in the drill stem 11 for receiving the core. The core barrel 14 seats in bit 13 and is detachably held thereon by means of latch mechanism generally indicated by 15. Latch mechanism 15 includes a releasing member 16 (Figs. 1 and 2) which is arranged to connect with a suitable tool attached to the end of a wire line or cable. When an upward force is exerted on this member, the latches are retracted. Thus with the cable conected to member 16, an upward pull will first disengage the latches, and then lift the barrel out of the drill stem. Or a barrel may be lowered into place; as soon as it seats, the latches engage; the cable may then be disconnected and withdrawn.

As previously mentioned, the bit 13 may be of any preferred form, but it must have an axial opening 20, through which the lower end of the barrel 14 extends. This barrel seats on a seat 21 surrounding the opening. In the present instance, the outer annulus of the bore is cut by a bit, shown of the wing type, and having a number of fixed cutting blades 22.

By referring to Fig. 4 it will be seen that the core barrel 14 has an inner shell 25 and an outer shell 26, these shells being relatively rotatable. The outer shell 26 has an extension 27 threadedly secured to its lower end. This extension or cutter 27 extends through opening 20 in bit 13 and terminates in cutting teeth 28 which cooperate with blades 22 for cutting the core. The upper end of cutter 27 has an enlarged portion or collar 29 into which shell 26 screws and which provides a shoulder 30 which rests on seat 21. This serves to support barrel 14 on bit 13. The upper

end of shell 26 is closed by cap 31 threadedly engaging the shell 26 and having an upper extension 32 (Fig. 2) threadedly secured to it.

Appropriately secured in an extension of the threaded box 12, as by welding, is a ring 33 which closely embraces the upper part of extension 32 and serves to maintain barrel 14 substantially coaxial with stem 11. Ring 33 provides a downwardly directed shoulder 34 which cooperates with latch means 15 to hold barrel 14 against movement in the drill stem 11.

The upper extension 32 is provided with a transverse slot 35 for accommodating latch members 36 and 37, forming the latch means 15. Members 36 and 37 are substantially identical and are supported in member 32 by a pin 38 near their lower ends. Each member has an upwardly directed shoulder 39 adapted to pass under ring 33 and engage the shoulder 34 when the members are in their outer or engaging position. Members 36 and 37 are urged apart to their outer engaging position by a compression spring 40 confined between them in suitable recesses 41 (see Fig. 2).

The upper part of each latch member is reduced in width as indicated at 42 and has portions of its outer surface oppositely inclined as at 43 and 44. The release member 16 has a hollow cylindrical portion 45 which embraces the upper ends 42 of the latch members. It is provided with slots 46 inclined on their lower surfaces to cooperate with the inclined surfaces 44. The arrangement is such that with member 16 in its normal position, that is with no upward pull on it, the parts occupy the position of Fig. 2, member 16 acting to limit the outward movement of latch members 36 and 37.

When an upward pull is exerted on the release member 16, the inclined surfaces 44 slide on the inclined lower surfaces of slots 46, the latch members 36 and 37 swinging toward each other about pin 38 until the backs of extensions 42 contact, checking the movement of the members. This movement has disengaged surfaces 39 from ring 33, and a continued upward pull will lift the barrel 14 upwardly, as shown in Fig. 5.

Since the outside shell 26 of the core barrel carries a cutter for forming the core, it must be rotated along with the drill stem 11 and bit 13. For this purpose, ring 33 is provided with a downwardly depending lug 50 arranged to contact one of the latch members, as 37 (Fig. 3). To prevent damage of the core, which is non-rotating, by the rotation of shell 26, an inner shell 25 is provided which remains stationary with the core to protect it. This inner shell carries a core catcher 51 (Fig. 4) at its lower end provided with spring fingers 52 for retaining the core in a well understood manner. The core catcher 51 provides an annular surface 53 which rests on a shoulder 54 formed in cutter 27 for supporting shell 25. Since the thrust on the inner shell 25 is mostly upward, due to the downward travel of the core barrel over a stationary core, an anti-friction thrust bearing 55 is provided at the upper end of shell 25. The lower race 56 of this bearing is secured on the upper end of the shell, the upper race 57 being in contact with a cage 58 slidably supported in the outer shell 26. A compression spring 59 in cap 31 urges cage 58, bearing 55, and shell 25 downwardly and is effective to maintain surfaces 53 and 54 resiliently in contact. By this arrangement, the need of adjustments to maintain proper clearance between these surfaces is eliminated. Further, ability to absorb shocks due to the entering core, is provided.

To permit the usual circulation fluid to reach the cutting surfaces of bit 13, this is provided with several ports, as indicated by 60 (Figs. 1 and 4), the circulation reaching these through the annular space between core barrel 14 and drill stem 11. To allow the circulation freely to pass ring 33, this may have a plurality of holes 61 (Fig. 3).

Any fluid which may be trapped in the inner shell 25 above the entering core can pass out of this shell through holes 62 provided at its upper end into the space between shells 25 and 26, from where it can pass into the space within the tubular stem and bit through openings 63.

By referring to Figs. 2 and 5, it will be noted that the releasing member 16 has a frusto-conical portion 65 terminating in a neck 66 provided with a head 67 forming a downwardly directed shoulder 68. In Figs. 5 and 7 an overshot 70 is shown which is especially arranged for use with member 16 to provide means for coupling a wire line or cable to it, as well as for releasing it at will.

This overshot 70 has a cylindrical body 71 with a lower portion 72 of enlarged diameter having a bore 73 to accommodate head 67. The lower end of bore 73 is tapered as at 74 to fit conical surface 65. The upper end of body 71 has a threaded pin 75 by which the overshot may be connected to a cable 76, it being understood that a suitable rope socket 77, sinker bar 78, or other suitable apparatus may be interposed between the overshot and the cable.

Body 71 is provided with a long transverse slot 80 in which are mounted a pair of similar arms 81 and 82 on a pivot pin 83. Each of arms 81, 82 has a depending hook 84 provided with a barb 85 and upward extension 86. A compression spring 87 is confined between these extensions and serves to urge the hooks 84 together. A stop pin 88 is provided to prevent the hooks approaching each other too closely.

When the overshot 70 is lowered over the release member 16, the conical surface 74 will serve to center the overshot by contacting head 67, spreading the hooks until the barbs 85 pass below it, when spring 87 will be effective to urge the barbs under shoulder 68. Release member 16 is now attached, by means of the overshot to line 76, an upward pull on which will release the latch means 15 as previously described so that the core barrel 14 can be pulled to the surface. When desired, the core barrel 14 can be detached from the overshot 70 by pressing the upper ends 86 of arms 81 and 82 together by means of a suitable tool. This spreads barbs 85 so that head 67 can pass between them. Another core barrel can then be dropped or otherwise lowered in the well, circulation fluid being utilized if necessary to properly seat it in the core drill. Obviously, a core barrel can be removed and replaced as often as desired without disturbing the drill string.

What is claimed is:

1. A core drill including a tubular drill stem adapted to be secured to a drill string, an annular cutter on said stem, and a core barrel having means cooperating with said cutter, said core barrel being arranged for movement through the drill string to and from a seat in said cutter, and means carried by the barrel normally forming a driving connection between the stem and the barrel when the barrel is seated, said means serving to support the barrel when the barrel is lifted

from its seat, said core barrel having an inner and an outer shell arranged for relative rotation.

2. A core drill including a tubular drill stem adapted to be secured to a drill string, an annular cutter on said stem, a core barrel for receiving a core and movable through the drill string, said core barrel having an outer shell arranged to seat in said annular cutter, and an inner shell rotatably supported within the outer shell, and releasable means for maintaining the outer shell on its seat.

3. A core drill including a tubular drill stem adapted to be secured to a drill string, an annular cutter on said stem, a core barrel movable through the drill string and arranged to be supported in the drill stem for receiving a core, said core barrel having an inner shell and an outer shell arranged for relative rotation, said outer shell seating in said cutter, cutting means on the outer shell for forming a core, a driving connection between the outer shell and the stem, and means to maintain said shell on its seat.

4. A retractable core barrel including an outer shell, a cutter adapted to form a core secured to said shell, an inner shell rotatably supported at its lower end by the cutter, and a bearing support for the upper end of the inner shell carried by the outer shell.

5. A core drill including a tubular drill stem adapted to be secured to a drill string, an annular cutter on said stem, a core barrel movable through the drill string and arranged to be supported in the drill stem for receiving a core, and means to maintain the core barrel against upward movement, comprising: a pair of latch members pivoted adjacent the upper end of the core barrel and arranged to swing outwardly, each member having an upwardly directed shoulder, means forming an annular downwardly directed shoulder in the drill stem under which the upwardly directed shoulders are arranged to engage, each latch member having an upward extension with an inclined outer surface, a release member encompassing said extensions and having surfaces cooperating with the extensions to swing the latch members inward in response to upward movement of the release member.

6. In a retractable core barrel, movable through a drill string and adapted to be supported in a drill stem for receiving a core, an inner shell and an outer shell, said outer shell carrying means for cutting the core, means forming a seat for supporting the outer shell, means for releasably securing the outer shell on its seat, said means also providing a driving means for the outer shell, and means rotatably supporting the inner shell in said outer shell.

ALFRED MUHLBACH.