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STEM FOR CORE DRILLS

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Fig. 1.

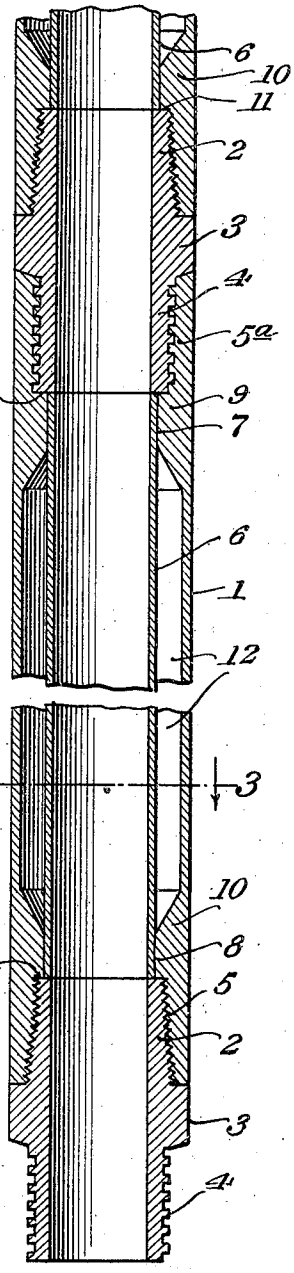


Fig. 2.

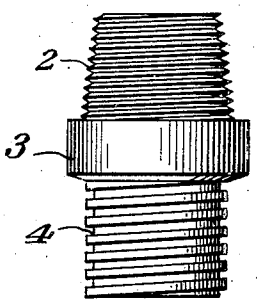
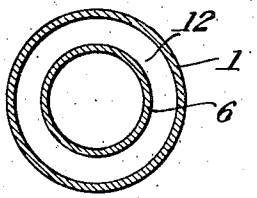


Fig. 3.



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WITNESS

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STEM FOR CORE DRILLS

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3 Claims. (Cl. 255—72)

This invention relates to drill stems and more particularly to a tubular stem for core drilling operations.

In core drilling operations it has heretofore, of necessity, been the common practice to raise the drill stem with the drilling appliances intact thereon and thereby remove the appliances entirely from the well hole each time the cored specimen of the formation is to be examined, or, in some operations, special core drills are provided with removable core barrels which are disengaged and removed from the drill body proper and bit in the ground and drawn to the surface by means of cables or rods which are lowered for the purpose in the conventional tubular drill stem with special fishing tools or grapples at their lower ends having provision for engaging the core barrel and first effecting its release from the drill body proper and bit and then lifting the barrel by pulling the cable or rod, the barrel, after removal of the core therefrom, being returned to the tubular drill stem and lowered by the same means and again engaged with the drill body proper and bit for further drilling operation, either method requiring special machinery and appliances for the purpose and involving considerable time and expense as well as causing wear and tear on the machinery and appliances, to say nothing of the hazards incidental to the practice of such methods. Attempts to remove the cores by other methods have also proven disadvantageous and unsatisfactory.

The object of the present invention is to provide a simple yet practical and efficient method and means for discharging the core without removing the stem and drill from the well hole, and, to this end, the invention consists primarily and broadly in the provision of a special core-conveying tube within each separate section or unit of the tubular drill stem proper, the respective core-conveying tubes being of the same bore diameter as the several coupling elements commonly termed "tool joints" in well drilling parlance, whereby the assembled drill stem in its entirety has a smooth bored passageway unobstructed throughout its length from top to bottom of the stem and communicably connected to the core barrel of the drill so that, after the core is formed and received in the core barrel of the drill, the stem may be raised only a slight distance to lift the regular well-boring bit and the associated advanced coring bit off bottom sufficiently to permit fluid under pressure at the bottom of the hole to enter the axial opening of the coring bit beneath the core and force the core up through the core-conveying tube of the stem.

In further description of the invention in general and also as to the particular details thereof, reference is made to the accompanying drawing illustrating a practical adaptation of the invention, in which,—

Figure 1 is a longitudinal sectional view of a drill stem equipped in accordance with one practical structural form of the invention;

Figure 2 is a detail view, in side elevation, of a conventional flush type coupling element or tool joint for connecting the respective drill stem sections, said coupling element or tool joint being detached from the drill stem sections; and

Figure 3 is a cross section on the line 3—3 of Figure 1.

Referring now to the drawing in detail, the numeral 1 designates generally a section or unit of conventional drill stem tubing having a box 5 at one end in which is fitted the usually tapered V-threaded shank portion 2 of a conventional flush type tool joint 3, said tool joint, as shown, having the conventional substantially cylindrical reduced and square-threaded pin portion 4 at its outer end. The stem section 1 is provided at its opposite end with the usual counterpart internally threaded box 5a for the reception of the pin portion 4 of the tool joint 3 in the assembling of the several drill stem sections for use, this particular pin portion being that which is detached from the adjoining stem section or unit 1 when the stem is disassembled. However, in this connection, it is here noted that as far as the present invention is concerned, the general form and screw-threading of the shank or pin portions 2 and 4 may be varied. So, too, instead of providing the separate coupling element or tool joint 3 having the threaded shank portion 2 secured in the end of the drill stem section 1, the same may be eliminated and the equivalent of the pin 4 may be provided as an integral extension at one end of each section or unit, or drill stem sections of any conventional or special type and provision for joining them endwise together may be used for the purposes of the present invention.

As first herein stated, the present invention contemplates broadly the provision of a continuous axial passage within the drill stem proper and extending throughout the length thereof, the passage being formed by alined tubular inserts 6 abutting the respective coupling elements or tool joints and without interruption throughout its length except at the joints of the several sepa-

rate stem sections, at which joints the ends of the tubular inserts are brought into abutting sealed contact with the coupling elements or tool joints and in exact registration so that no shoulders or offsets occur at the joints and the inserts being otherwise free of internal obstructions throughout the length thereof which might interfere with the free passage of a core through the alined inserts.

The inserts 6 may be placed either permanently or removably in the drill stem sections 1 in any approved or desired manner. However, for practical purposes and as illustrated in the drawing, the insert in each stem section or unit 1, is secured at its opposite end portions tightly and with sealed effect in the reduced bore portions 7 and 8, respectively, in thickened end portions 9 and 10 of the section or unit 1, with its extreme ends flush with annular shoulders 11 and 11a respectively formed at the bottoms of the boxes 5 and 5a. Thus, when the sections or units 1 are coupled, the ends of the shank portions 2 and pin portions 4 of the coupling elements or tool joints 3 are brought into abutting contact or very close relation to the ends of tubular inserts 6 and in exact registration therewith so that no offsets or shoulders occur, particularly inasmuch as the bores of the tubular inserts 6 and the coupling elements or tool joints 3 are of precisely the same diameter.

The structure for carrying out the present invention may be further modified in many respects. As one particular example, it is obvious that the tubular insert 6 may be welded or otherwise attached to the end of the shank 2 of the coupling element or tool joint 3 so as to be inserted in the stem section or unit 1 with said shank portion 2 when the latter is screwed into the box 5 of the stem section or unit 1, and the insert is thereby held in place until such time that it may be necessary to detach the coupling element or tool joint 3 from the stem section or unit.

Although the hereinbefore described application of the tubular insert 6 as a separate element in the stem section or unit 1 is a preferred and more generally used embodiment of the present invention, the joint application of the tubular insert 6 and coupling element or tool joint 3 to the stem section or unit 1 may be also used to good advantage, and inasmuch as this modification is clearly apparent no detailed illustration thereof in the drawings is deemed necessary.

Obviously, the tubular inserts 6 may be seamless or other suitable tubing of relatively light weight yet requisite strength in comparison to the drill stem tubing proper so as not to add appreciably to the weight of the drill stem, and, in this connection, it is noted that annular dead air spaces 12 are provided between the walls of the stem sections 1 and the inserts 6 throughout the entire extent thereof between the thickened end portions 9 and 10 of the respective stem sections 1, by which provision considerable buoyancy is afforded to appreciably help floating of the drill stem in the fluid, or "mud" as it is termed, in the well hole and thereby practically offset the added weight of the tubular inserts.

The drill stem thus equipped with the core-conveying inserts 6 of the present invention may be handled and operated in the regular way in the drilling operation and to further advantage in that the most simple core drilling tool or appliance may be used, it being only necessary to have the upper end of the core barrel of the drill open and in direct alinement and abutting registration with the lower end of the lowermost tubular insert 6 of the drill stem proper and it also being only necessary to raise the drill stem slightly to lift the drill bit off bottom so that the liquid under pressure in the well hole outside the drill stem proper enters the axial opening in the coring bit, as hereinbefore stated, when it is desired to discharge the core from the barrel of the drill, the core being moved upwardly through the alined tubular inserts 6 to the top of the stem by the fluid pressure in the well hole, quickly and without prolonged stoppage in the drilling operation and thereby minimizing the cost of drilling by the elimination of hazards usually resulting from prolonged stoppage of operation as well as effecting the saving of time and wear and tear on the handling apparatus and machinery.

After the core is taken out at the top of the drill stem it is obvious that the fluid in the core-conveying insert line may be quickly removed by a simple pumping operation after the stem is lowered and the drill bit again set on the bottom of the hole, or by the application of compressed air at the top of the tubular insert so as to force the liquid down the tube and back into the well space surrounding the stem proper just prior to the resetting of the drill on bottom, either method consuming much less time than with the method and means heretofore generally employed and permitting continued drilling operation with only slight periods of cessation and thereby minimizing the well known hazards as just above pointed out.

While the illustrated and herein described structure is a practical embodiment of the invention, it is obvious that considerable modification may be made therein without departing from the spirit and scope of the invention as defined in the appended claims. The invention, therefore, is not limited to the specific construction and arrangement shown in the drawing.

What is claimed is:

1. A stem for core drilling operations, comprising tubular stem sections of the same external diameter throughout the length thereof and having inwardly enlarged ends internally threaded, core conveying tubes within the tubular stem sections and terminating adjacent the threads of the tubular stem sections, and tool joints screwed within the threaded ends of the tubular stem sections and contacting the core conveying tubes and having bores flush with the bores of said tubes, and central portions of the same external diameter as the tubular stem sections.

2. A stem for core drilling operations, comprising tubular stem sections of the same external diameter throughout the length thereof and having inwardly thickened ends, one end of each section having a straight internal thread and the opposite end having a tapered internal thread, core conveying tubes within the tubular stem sections, and tool joints, each joint having a straight threaded portion and a tapered threaded portion adapted to receive correspondingly threaded portions of two succeeding tubular stem sections, each of said tool joints having an interior bore flush with the bore of the core conveying tubes and an outer circumference flush with the outer periphery of the tubular stem sections.

3. A stem for core drilling operations, comprising tubular stem sections of the same external

diameter throughout the length thereof and having inwardly enlarged ends having threaded sockets to receive tool joints, core conveying tubes contained within the tubular stem sections and terminating adjacent said sockets, and tool joints secured within said sockets and having bores coaxial with and of the same diameter as the bore of said core conveying tubes and said joints having their exteriors at their portions of maximum diameter of the same diameter as the tubular stem sections, said stem sections with their contained core conveying tubes and said joints co-operating to form a drill rod line of substantially uniform external diameter throughout its length and having a continuous coaxial core-conveying passage of substantially uniform bore extending from end to end therethrough.

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