Nov. 5, 1935. T. N. HUNT 2,019,978

RETRACTABLE CORE BARREL

Filed Oct. 16, 1933 2 Sheets-Sheet 1

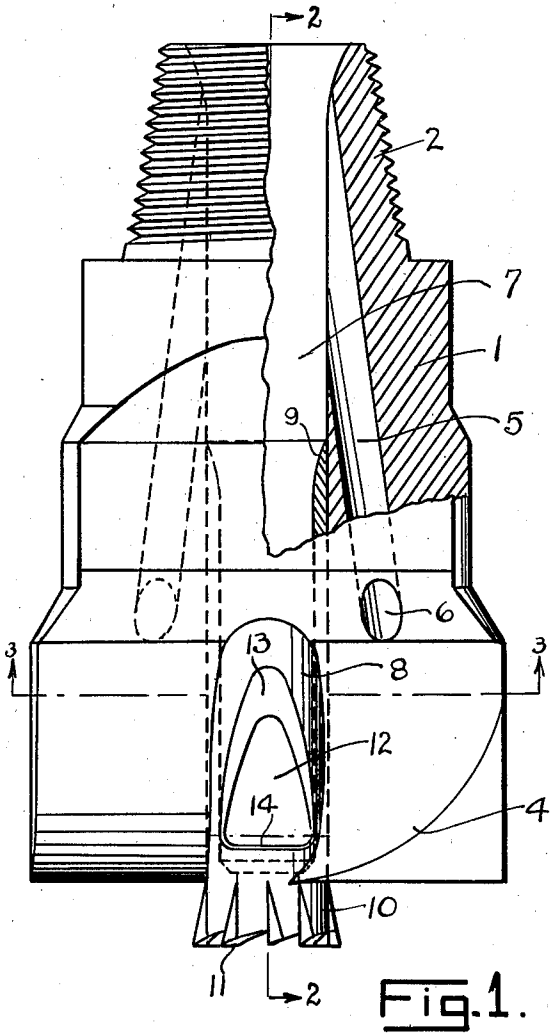


Fig. 1.

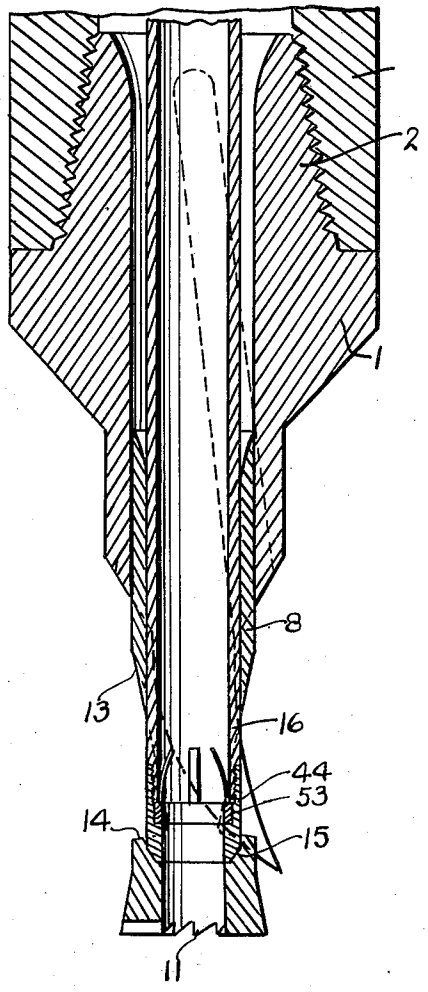


Fig. 2.

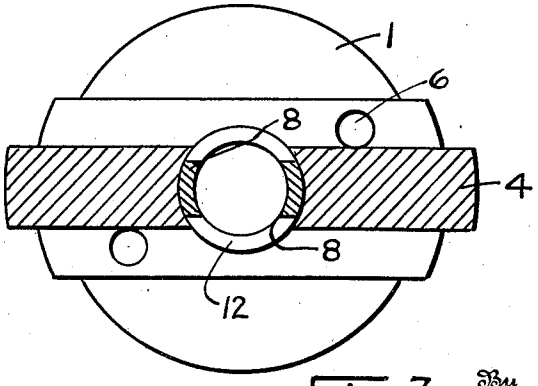


Fig. 3.

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RETRACTABLE CORE BARREL

Filed Oct. 16, 1933 2 Sheets-Sheet 2

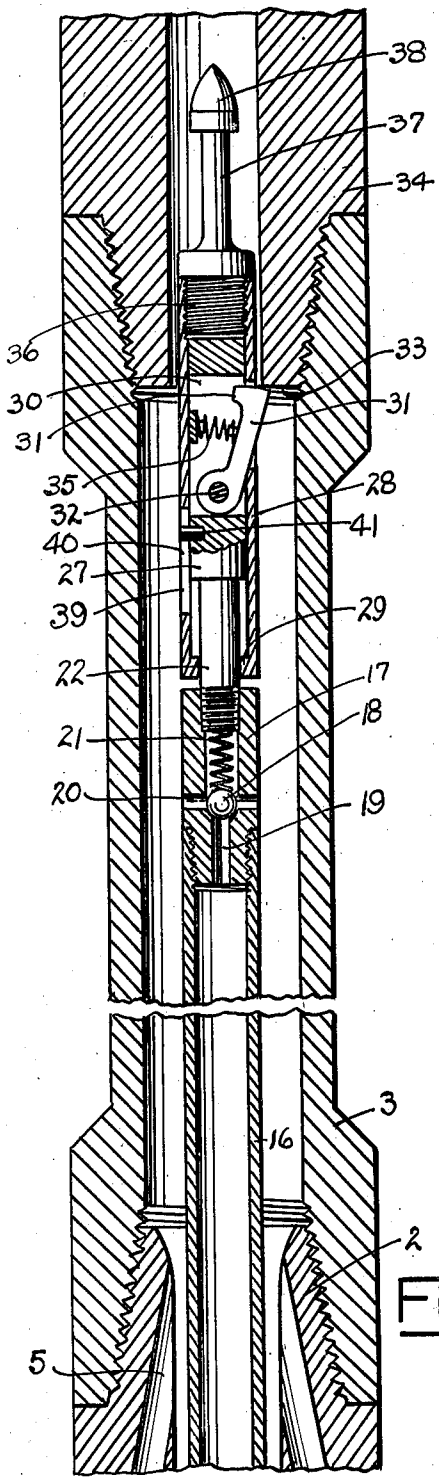


Fig. 4.

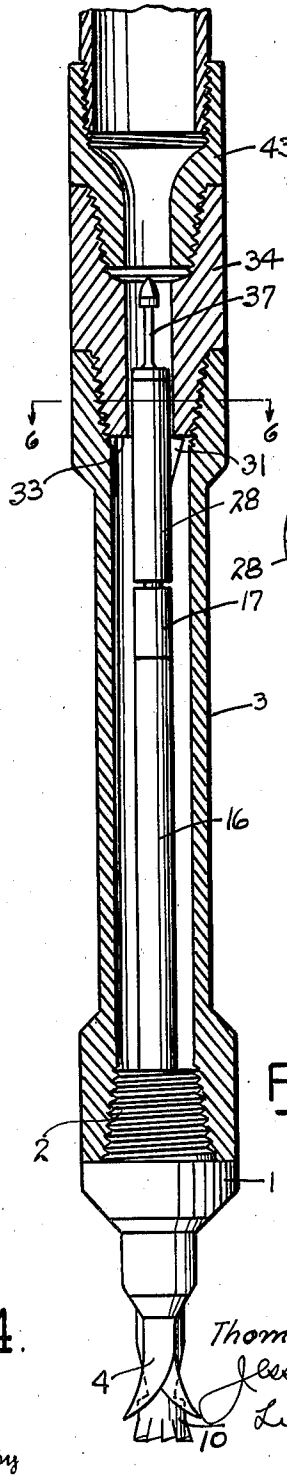


Fig. 5.

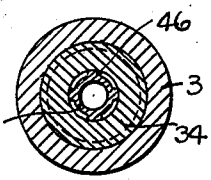


Fig. 6.

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UNITED STATES PATENT OFFICE

2,019,978

RETRACTABLE CORE BARREL

Thomas N. Hunt, Houston, Tex.

Application October 16, 1933, Serial No. 693,765

11 Claims. (Cl. 255—72)

My invention relates to drill bits for drilling deep wells for oil, gas, sulphur and the like and has particular reference to core bits where samples of the formation are to be obtained.

In obtaining samples of formation with ordinary core bits it is necessary to withdraw the drill bit and core barrel from the hole whenever a sample is to be taken. My invention relates to core barrels so constructed that the drill bit and drill stem may remain in the hole and the core barrel be lowered down from the surface into position to receive the core and when a proper core has been taken it is possible to remove the core barrel with the core, leaving the drill bit and drill stem in the hole. The necessity of withdrawing the complete drill stem and bit from the hole is thus avoided. Bits of this general character have been previously constructed. My invention relates to certain improvements upon bits of this character.

It is an object of the invention to provide a core bit with a retractable core barrel and in which the core barrel may safely be made of comparatively light material and thus make it possible to take larger cores without difficulty.

Another object of the invention is to provide a core barrel which may be lowered through the drill stem and through tool joints of ordinary construction without the necessity of reaming the passage through the tool joints to allow the core barrel to pass. I am enabled to make the core barrel of smaller external diameter due to the fact that the inner diameter may be made comparatively large due to the thin wall of the barrel.

It is another object to provide a tool of this character in which the core barrel may be lowered into a seat in the core bit and to provide for maintaining the seat into which the core barrel is lowered constantly clear of material so that there will be no difficulty in proper seating of the barrel.

It is a further object of the invention to provide a core bit which is strong and durable and which may be connected with ordinary types of fish tail bit without difficulty.

I desire to provide a simple and economical construction of core barrel which will operate positively and accurately and will not easily get out of order.

I also provide a simple and effective means for latching the core barrel in position while operating but which may be positively released when the core barrel is to be withdrawn.

In the drawings herewith, I have shown one embodiment of my invention, it being understood, however, that various changes and modifications in the structure there shown may be made without departing from the invention.

Fig. 1 shows a front elevation of a drill bit constructed to receive my improved type of core barrel.

Fig. 2 is a longitudinal section through the bit shown in Fig. 1, taken approximately on the line 2—2.

Fig. 3 is a transverse section on the plane 3—3 of Fig. 1.

Fig. 4 is a central longitudinal section through the upper end of the bit and core barrel, said view showing the upper extension of the section shown in Fig. 2.

Fig. 5 is a view on a reduced scale showing in longitudinal section the drill collar and bit with my core barrel therein.

Fig. 6 is a transverse section illustrating a slightly different embodiment of the core barrel.

In carrying out my invention I contemplate the use of any ordinary type of well drill. However, the core barrel is particularly adapted for use in soft or semi-hard formations and a fish tail bit is shown in the illustration of my invention. In Fig. 1 the drill bit is shown as made up of a head 1, having an upper tapered shank 2 threaded for attachment to the drill collar 3. The lower end of the bit is shown as having the usual fish tail blades 4 with water channels 5 extending longitudinally through the head and blade to discharge at 6 directly above the edge of the bit.

In forming my core bit there is a cylindrical opening 7 longitudinally of the bit and adapted to receive a sleeve or bushing 8 adapted to fit within said opening in the lower end thereof.

The sleeve 8 is fitted tightly within the opening and is held in position by welding or other similar means, the upper end of the sleeve being beveled at 9 to better receive the core barrel. The sleeve is visible at the side of the blade on both sides thereof and projects below the blades for a short distance at 10. The lower end 10 is formed into a cutting bit having teeth thereon to cut the core which is to be removed.

On each side of the sleeve along the flat face of the blade an opening 12 is cut through the sleeve on both sides, thus leaving an opening or window directly through the core barrel. This opening is made by a slightly diagonal cut in the side of the sleeve as shown at 13, the lower end of the cut being on a straight line at 14 and forming a shoulder, as shown in Fig. 2.

On the inner side of the sleeve 8 and in the upper portion of the head 10 is a downwardly tapered seat 15 to receive the core barrel 16.

It is to be understood that during the normal drilling the core barrel 16 will not be in place but will be ready for insertion when a core is to be obtained. This core barrel 16 is of the usual tubular construction and shaped to engage closely within the sleeve 8. It extends upwardly above the bit into the drill collar 3 and is connected by means of a flush threaded connection with a coupling member 17, which forms a valve chamber to receive a valve 18 tending to close an opening 19 through the coupling. There are lateral passages 20 for fluid passing the valve 18 so as to provide a vent for fluid trapped within the barrel while the core is being taken. The valve 18 is held resiliently in its seat by coil spring 21 bearing at its upper end against a post 22, which is screwed downwardly into the upper end of the coupling member.

The post 22 has a head 27 adapted to fit within a cylindrical barrel 28. Said barrel has an inwardly extending flange 29 at its lower end to fit about the post 22 and limit the relative downward movement of the head 27. Said head 27 is slotted diametrically at 30 to house a latching dog 31. Said dog is pivoted upon a transverse pin 32 at its lower end, the upper end being movable outwardly through the wall of the slot 30 to engage below a shoulder 33 upon a sub 34. There is a spring 35 within the slot which bears against the dog and tends to normally force it outwardly into latching position.

The barrel 28 within which the head 27 is movable is closed at its upper end by a threaded plug 36 which has an upwardly extending pin 37 thereon, whose upper end is formed into a head 38 to be engaged by an overshot of ordinary construction. There is a lateral slot 39 in the barrel 28 below the latching dog, as shown at 40, said slot being adapted to receive a pin 41 in the head. This slot is of predetermined length so as to limit the sliding movement of the barrel 28 upon the head 27.

The drill collar 3 may be connected with a tool joint member 43 by means of the sub 34 previously mentioned. However, it is obvious that the sub may be omitted if desired. The lower end of the sub at 33 furnishes a shoulder against which the dog 31 may engage and thus hold the core barrel in position with its lower end engaging upon the seat 15 in the core bit.

In the operation of this device the retractable core barrel will be in position only when a core is desired but in the normal operation of the device the opening 12 through the sleeve 8 will be unobstructed and when the flushing fluid is circulating about the drill bit it will also circulate freely down the sleeve 8 and through the openings 12, keeping the seat 15 free of any obstruction. When it is desired to take a core, the bit is raised off the bottom and flushing fluid is pumped through the bit to assure that all of the core which might be in the bit is flushed clear thereof and then the core barrel is lowered through the drill stem by means of an overshot and wire line until the lower end of the core barrel engages the tapered seat 15. The length of the core barrel will be adjusted so that when the barrel encounters its seat at the lower end the latch 31 will be beneath the shoulder 33 and as the weight of the core barrel rests upon the seat the sleeve 28 will slide downwardly along the head 27, thus allowing the latch 31 to be forced outwardly into engagement with the shoulder 33, thus latching the device in place.

The bit may then be rotated and a core of the proper length may be taken. A core catcher 44 of ordinary construction is provided toward the lower end of the core barrel, said core catcher constituting a ring with spring arms thereon. Said ring is adapted to be engaged in position by forming a detachable lower section 45 on the core barrel and recessing this section to receive the ring 53 when the detachable section is connected to the main portion of the barrel.

Thus, when the core barrel is to be removed an overshot will be lowered through the drill stem to engage the head 38 upon the barrel 28. When an upward pull is exerted upon the sleeve 28 said sleeve will move upwardly relative to the head 27 until the pin 41 engages the lower end of the slot 29 and the lower head engages against the flange 29. When this is done the side wall of the barrel will engage the latching dog 31 and force it inwardly from beneath the shoulder and hold it in retracted position. The core barrel may then be moved upwardly, the core catcher engaging the core and withdrawing the sample of the material with the core barrel from the well. The bit may then continue drilling until another sample is desired.

While I have shown a latch 31 to retain the core barrel in position while the core is being taken, I have found that the latch may be omitted if desired and in such case I rely upon the force of the flushing fluid as holding the core barrel in position. It will be noted that the upper end of the barrel engages in the passage through the sub 34. Where the latch is omitted I prefer to form laterally extending ribs 46 on the core barrel, as shown in Fig. 6. These ribs serve as a guide centering the barrel in the passage through the sub. The upper shoulders on these ribs form baffles against which the flushing fluid may engage and assist further in holding the barrel seated.

The advantages accruing from my invention lie largely in the manner in which the core barrel is assured of a clear seat when it is lowered into the bit. It is a frequent difficulty in tools of this character that where the barrel is seated within the bit, the core bit itself not being removable, it is practically impossible to provide for the lowering of the barrel entirely to its seat, the lower end of the bit being clogged up with material during the drilling. However, with the two openings 12 at each side of the sleeve 8, free circulation through the barrel and across the seat is obtained so that whenever the core barrel is lowered to position it is assured of a clear passage directly downward to its position without danger of encountering packed sand or mud as is ordinarily the case. This feature is, of course, important and is depended upon largely for the successful operation of my device. This, together with the simple construction of the latching member are features which enable my core barrel to operate positively and accurately at all times.

What I claim as new is:

1. In a core bit, a bit head having an axial opening, a tubular core cutter secured in said opening, lateral windows in the side of said cutter presented outwardly of said bit head to allow fluid to pass freely therethrough, a seat in said cutter below said openings, and a retractable core barrel adapted to be lowered to and retracted from said seat while said bit head is in the well.

2. In a core bit, a bit head having an axial opening, a tubular core bit secured in said opening and having cutters extending in advance of

said bit head, a core barrel seat in said core bit, said core bit having opposed openings in the walls thereof to allow free flow of flushing fluid therethrough above said seat, and a core barrel adapted to be lowered into said seat and close said openings.

3. In a core bit, a bit head, a tubular core cutter axially of said head and extending in advance of said head, lateral windows in opposite sides of said core cutter, a core barrel adapted to be lowered through said head and form a close fit with the interior of said core cutter below said windows, and means to releasably latch said core barrel in position.

4. In a core bit, a bit head, a tubular core cutter axially of said head and extending in advance of said head, lateral windows in opposite sides of said core cutter, a core barrel adapted to be lowered through said head, and prevent circulation of flushing fluid through said windows, and means on said core cutter to support said barrel.

5. In a core bit, a head, a flattened blade at the lower end thereof, an axial core bit with wide openings at the sides of said blade, a seat in said core bit below said openings, and a core barrel adapted to be lowered to said seat to close said openings.

6. In a core bit, a head, a cutting blade at the lower end thereof, a drill collar and drill stem connected with said head, a tubular core bit axially of said head, lateral openings in opposite sides of said core bit, an inner seat in said core bit below said openings, a core barrel adapted to be lowered through said drill collar and said core bit to said seat, and means on said core barrel and said drill collar cooperating to releasably latch said core barrel in said seat.

7. In a core bit, a head, a cutting blade at the lower end thereof, a drill collar and drill stem connected with said head, a tubular core bit axially of said head, a seat in said core bit, means above said seat whereby said seat may be washed free of material tending to clog the same, a core barrel adapted to be lowered through said drill collar and said core bit to said seat, and means on said core barrel and said drill collar cooperating to releasably latch said core barrel in said seat.

8. In a core bit, a head, a cutting blade at the lower end thereof, a drill collar and drill stem connected with said head, a tubular core bit axially of said head, lateral openings in opposite sides of said core bit, an inner seat in said core bit below said openings, a core barrel adapted to be lowered through said drill collar and said core bit to said seat, a latching dog on said core barrel, means to press said dog laterally from said barrel, and a sleeve slidably mounted on said core barrel to move said dog inwardly.

9. A core bit having an axial opening, a core barrel adapted to be lowered into said opening to seat in said bit, a drill collar, an inner shoulder associated with the upper end of said drill collar, a post at the upper end of said barrel, a head on said post, a sleeve engaging over said head and about said post, a latching dog on said head, means to press said dog laterally through a slot in said sleeve to engage below said shoulder, said sleeve being slidable upwardly relative to said head to engage the outer side of said dog and move it inwardly away from said shoulder, and means on said sleeve whereby it may be engaged for upward movement.

10. A core bit having an axial opening, a seat in said opening adjacent the lower end of said bit, a core barrel adapted to be lowered into said opening to seat in said bit, lateral windows above said seat to allow access of fluid thereto, a drill collar, an inner shoulder associated with the upper end of said drill collar, a post at the upper end of said barrel, a head on said post, a sleeve engaging over said head and about said post, a latching dog on said head, means to press said dog laterally through a slot in said sleeve to engage below said shoulder, said sleeve being slidable upwardly relative to said head to engage said dog and move it inwardly away from said shoulder, and means on said sleeve whereby it may be engaged for upward movement.

11. A well drill adapted to drill a well bore, a core cutter formed axially of said drill and extending forwardly in advance thereof, an annular cutting edge on the forward end of said core cutter, a core barrel seat in said core cutter spaced upwardly from the lower end of said cutter, and lateral openings in said core cutter adjacent said seat to allow the free passage of flushing fluid therethrough, and a core barrel adapted to be moved downwardly through said core bit from the surface and fit in said seat.

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