

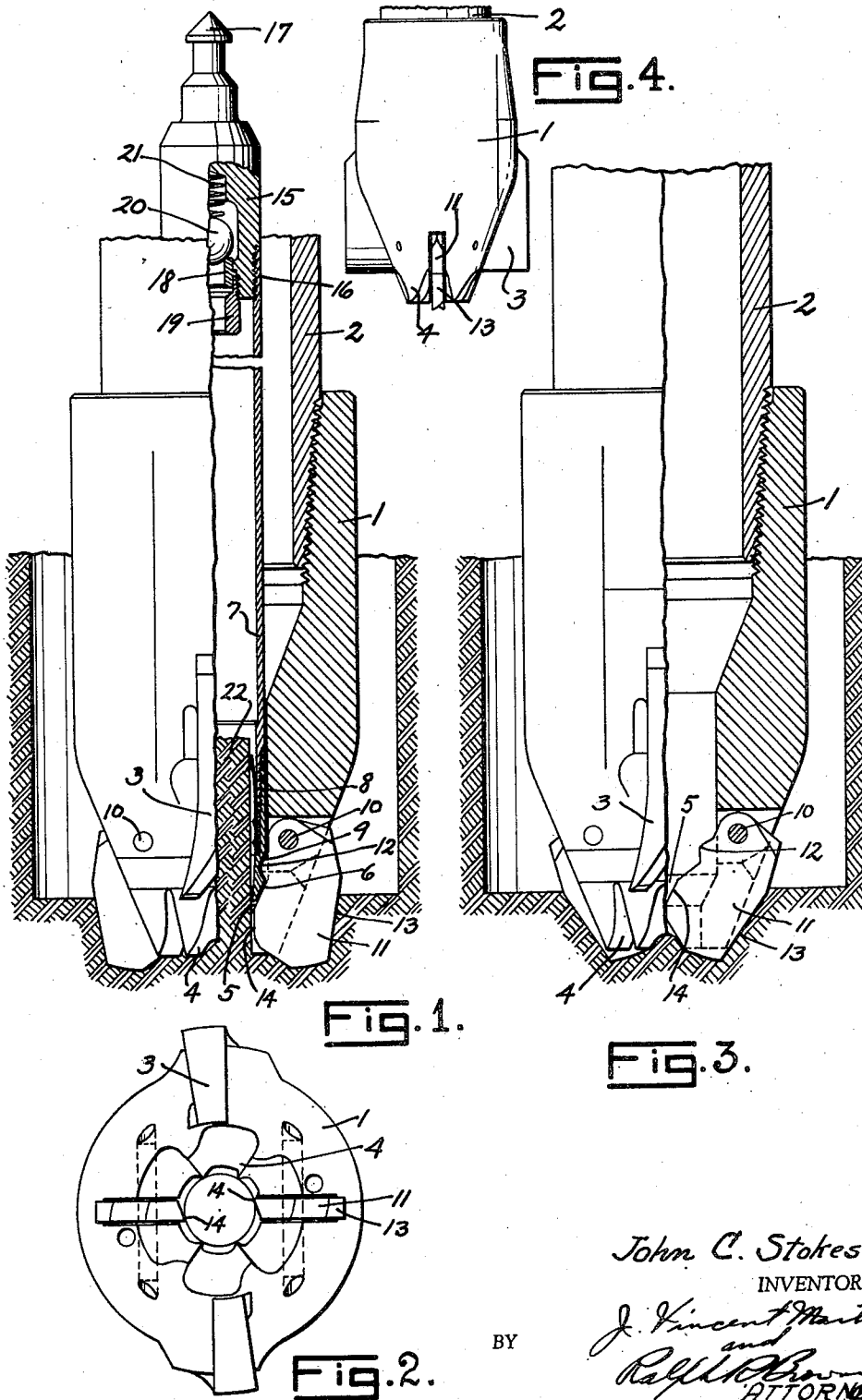
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WIRELINE CORE BARREL

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WIRE LINE CORE BARREL

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This invention relates in general to wire line coring equipment and has for its general object the provision of such equipment, which will be simpler and more effective than wire line coring equipment has been in the past.

In the past it has been generally the construction of wire line coring equipment that the core bit which is carried on the lower end of the drill stem is formed with the cutter means which is in fixed position on the bit and which is disposed about the openings to the bit. The core barrel is adapted to be lowered through the drill stem and seated within the core bit so that its lower end may either lie within the core bit or protrude beyond the lower end of the core bit and have teeth thereon for the purpose of trimming the core. The core barrel is usually latched down by means of a latching device on its upper end that is adapted to engage with a suitable part of the drill collar, to which the core bit is attached. It will readily be seen that with such a construction a special type and length of drill collar will be necessary and a special sub and driver will have to be provided for use therewith.

With such an apparatus also it is customary when the core bit is to be used without taking a core, to remove the core barrel and to lower in place thereof a dummy tool, known as a center bit, this tool being latched in place in the same manner as the core barrel and having teeth on its lower end for the purpose of drilling the center of the hole and preventing the formation of a core. This, however, necessitates running the center bit in and out each time that the device is changed from one for taking a core to one for drilling a full hole and vice versa, and this change requires a substantial amount of time.

In view of the foregoing, it is a more specific object of this invention to provide a structure in which it will be unnecessary to make use of any special drill collar, sub, or driver.

Another object of this invention is to provide a structure in which the use of a center bit will be avoided and time thereby saved in setting and removing the center bit.

Another object of this invention is to provide a structure in which there will be no wear or burning of the cutter head when no core is being cut.

Another object of this invention is to provide a structure which will cut more clearance around a core and thereby lessen the danger of balling the cutter head or burning the core.

Another object of this invention is to provide a structure which will cut faster than any heretofore known combination of cutter head and center bit.

5 Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawing, wherein is illustrated by way of example one embodiment of this invention.

10 In the drawing:

Fig. 1 is a view partly in side elevation and partly in vertical cross section, illustrating a wire line coring apparatus constructed in accordance with this invention, the same being shown during the operation of taking a core.

15 Fig. 2 is a bottom plan view of the structure illustrated in Figure 1.

Fig. 3 is a view similar to Fig. 1 but illustrating the device in use when no core is being taken.

20 Fig. 4 shows the side elevation of the device illustrated in Figs. 1 to 3 but taken at right angles to Figs. 1 and 3.

With reference more particularly to the drawing, the numeral 1 indicates the body of the 25 core bit, which is secured to the lower end of the drill stem. Adjacent its lower end, the bit 1 is provided with the laterally extending fish tail cutters or blades 3, which may be of somewhat usual construction, and at its lower end it is provided with cutting blades 4, which serve 30 to perform a normal operation of trimming the opening around the core as the core is being formed.

Just above the lower ends of the blades 4, the 35 same are provided on their inner surfaces with a downwardly and inwardly tapered seat 5, adapted to receive the lower tapered end 6 of the core barrel 7. The tapered end 6 is formed on a head member, which is threaded at 8 to the core barrel proper, and this head member 40 is provided with a circumferential groove 9 against its lower end for purpose presently to be described.

The body 1, at circumferentially spaced points, 45 is provided with notches extending upwardly from its lower end, and in these notches are mounted by means of pivot pins 10 a plurality of swinging cutter blades, 11. These cutter blades have projections 12 on their inner edges, which are adapted, when the core barrel is properly seated within the core bit after blades 11 50 are swung inwardly by the pivots, to engage within the circumferential groove 9 so as to hold the core barrel downwardly in its proper 55 seated position within the core bit.

It will be seen that by virtue of this construction the core barrel will be held downwardly in place within the core bit without the necessity for any latching mechanism such as is customarily provided near the upper end of the core barrel. This eliminates the necessity for any special drill collar, sub or driver, and at the same time makes it possible to more easily dislodge the core barrel when it is desired to remove the same.

Each of the blades 11 is provided with an outer edge surface 13, which is inclined downwardly and inwardly for all ordinary positions of the blade so that when the bit 1 is placed on the bottom of the well and rotated, these blades 11 will tend to swing inwardly about their pivots 10. Thus, if the core barrel is in place within the core bit, they will tend to swing inwardly to the position illustrated in Fig. 1, in which position the projections 12 will engage the groove 9 to hold the core barrel in place. When the core barrel is not in place, the blades will tend to swing inwardly to the position illustrated in Fig. 3, in which position they completely close the lower end of the opening through the core bit in so far as the formation of any core is concerned, so that as the drilling proceeds any core will not be formed but will be broken up by the blades 11.

Each of the blades 11 is also provided with a cutting edge 14, which is disposed most closely adjacent the axis of rotation of the core bit, and these cutting edges 14 will serve when the core barrel is in place and a coring operation is being carried out, to trim the outside surface of the core so that there will be ample clearance for the core to enter the core barrel.

At the upper end of the core barrel, as previously stated, there is no necessity for providing any latching mechanism such as heretofore employed, and hence the upper end of the core barrel is merely provided with a head 15, secured to the upper end of the core barrel by means of threads 16. This head 15 has at its upper end a spearhead 17, which may be engaged by an overshot for the purpose of removing the core barrel from the well, and at its lower end it is made hollow and adapted to receive a valve seat 18, held in place by means of an appropriate holding nut 19. The valve seat 18 is adapted to receive a downwardly seating ball valve 20, which is normally urged downwardly towards its seating position by means of a spring 21. It will thus be seen that this ball valve 20 will serve to permit flow of fluid upwardly from the core barrel during the taking of a core but will serve to prevent the downward flow of fluid into the core barrel due to the force of the slush being pumped through the drill stem from the surface of the ground.

It will be seen from the foregoing that a structure has been provided which is capable of carrying out and accomplishing all of the objects and advantages sought by this invention. The operation of this device is briefly as follows:

The bit 1 will be lowered into a well on a drill stem in the usual manner, it being unnecessary, however, to provide special drill collars, subs or drives as is the usual practice in wire line coring apparatus. When it is desired to take a core, the core barrel 7 with its associated parts is dropped into the upper end of the drill stem and either pumped into place or lowered on a wire line until its lower end 6 seats within the seat

5 in the drill bit 1. The drill bit is then lowered against the bottom of the well and the drilling operations begin. As hereinbefore described, the blades 11 will be swung inwardly by contact with the bottom of the well and when they swing inwardly the projections 12 will engage within the circumferential groove 9 and thus latch the core barrel 7 downwardly and in its proper coring position, as illustrated in Fig. 1.

10 When the coring operation has been completed, an overshot on a wire line may be lowered into the drill stem and brought in to engagement with the spearhead 17, in the well-known manner. The drill bit 1 will be lifted from the bottom of the well so that the blades 11 will be free to swing outwardly and disengage the projections 12 from the groove 9, whereupon the core barrel will, of course, be free to move upwardly. The core barrel can then be removed from the well by means of the wire line with overshot attached and the core taken out of the core barrel for examination.

25 If it be desired to drill ahead without taking a core, it is unnecessary as in the usual construction to lower a center bit into place. All that is necessary is to merely lower the drill bit 1 against the bottom of the well and begin drilling. The engagement of the blades 11 with the bottom of the well will cause them to swing inwardly to the position illustrated in Fig. 3, in which position they will drill the center of the bottom of the well and prevent the formation of any core.

30 It has been found that with a device of the type just described the drilling can be carried out much faster than with any combination of core cutter head and center bit heretofore employed. Also, the blades 11 may be so designed that they will cut more clearance around the core during the coring operation and thereby greatly reduce the danger of bailing up the cutter head or burning the core. Furthermore, in the event the core barrel fails to seat properly, there can be no burning of the cutter head because no core is being cut. On the other hand, if the core barrel fails to seat properly the blades 11 will swing inwardly in the position shown in Fig. 3, even though the core barrel may be in place just above its seat. Under these circumstances, of course, no core will be taken and none will be formed because it will be broken up by the blades 11.

50 Having described my invention, I claim:

1. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and a plurality of blades pivotally mounted on said core bit and adapted to swing inwardly toward the axis of said bit and cut away the core when said core bit is operated without said core barrel in place therein, said core barrel when seated 60 extending between said blades to hold them outwardly and permit the formation of a core, and interfitting means on said blades and core barrel for holding said core barrel downwardly when said blades are urged inwardly thereagainst, as in drilling a well.

65 2. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and means on said core bit adapted to swing inwardly toward the axis thereof and engage said core barrel to hold it in place when said core bit is operated with the core barrel therein, and to swing further inwardly to prevent the formation of a core when said core bit is operated without the core barrel therein.

3. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and means on said core bit and engageable with the bottom of the hole to swing said means toward the axis of the bit and engage said core barrel to hold it in place when said core bit is operated with the core barrel therein.

4. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and blades pivotally mounted on said core bit and engageable with the bottom of the hole to swing said blades inwardly toward the axis of the bit and engage said core barrel to hold it in place when said core bit is operated with the core barrel therein.

5. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and blades on said core bit adapted to swing inwardly toward the axis thereof and engage said core barrel to hold it in place when said bit is operated with the core barrel therein and to swing further inwardly to prevent the formation of a core when said core bit is operated without said core barrel therein.

6. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and means on said core bit adapted to be swung inwardly by contact with the formation in a direction toward the axis of said core bit and to engage said core barrel to hold it in place when said core bit is operated with the core barrel therein, and to be swung inwardly still further by contact with the formation to prevent the formation of a core when said core bit is operated without the core barrel therein.

7. In a coring apparatus, a core bit, a removable core barrel adapted to seat within such core bit and receive a core cut thereby, and means on said core bit adapted to be swung inwardly by contact with the formation toward the axis of the core bit and to engage said core barrel and hold it in place when said core bit is operated with the core barrel therein.

8. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and blades having inner core trimming edges pivotally mounted on said core bit and adapted to swing inwardly toward the axis thereof when brought into engagement with the formation at the bottom of a well, said blades and barrel having interfitting parts thereon whereby when said blades are swung inwardly by engagement with the bot-

tom of the well, the said parts will serve to latch said core barrel in the core bit.

9. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and blades pivotally mounted on said core bit and adapted to be swung inwardly by contact with the formation at the bottom of a well, said blades and barrel having interfitting parts thereon whereby when said blades are swung inwardly said parts will interfit to latch said core barrel in place within said core bit, and whereby when said core bit is operated without said core barrel therein said blades will be swung inwardly into substantial engagement with each other to prevent the formation of a core.

10. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and blades on said core bit pivotally mounted thereon, said blades being shaped with a downwardly and inwardly inclined outer edge surface, whereby they will be swung inwardly toward the axis of said core bit when brought into contact with the bottom of a well hole so as to engage said core barrel and hold it in place when said core bit is operated with the core barrel therein.

11. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and receive a core cut thereby, and blades pivotally mounted on said core bit, and having their outer edge surfaces inclined downwardly and inwardly toward the axis of said core bit, whereby when said blades are brought into contact with the formation at the bottom of a well they will tend to swing inwardly toward the axis of said core bit and to engage said core barrel to hold it in place when said core bit is operated with the core barrel therein, and to swing further inwardly to prevent the formation of a core when said core bit is operated without the core barrel therein.

12. In a coring apparatus, a core bit, a removable core barrel adapted to seat within said core bit and having a circumferential groove formed therein adjacent to its lower end, blades pivotally mounted on said core bit and adapted to swing inwardly toward the axis thereof, said blades having projections thereon adapted to engage in said circumferential groove in the core barrel to hold said core barrel in place when said core bit is operated with the core barrel therein, and said blades being adapted to swing further inwardly to prevent the formation of a core when the core bit is operated without the core barrel therein.

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