Dec. 29, 1931. J. C. STOKES 1,838,467

COLLAPSIBLE BIT

Filed July 2, 1927

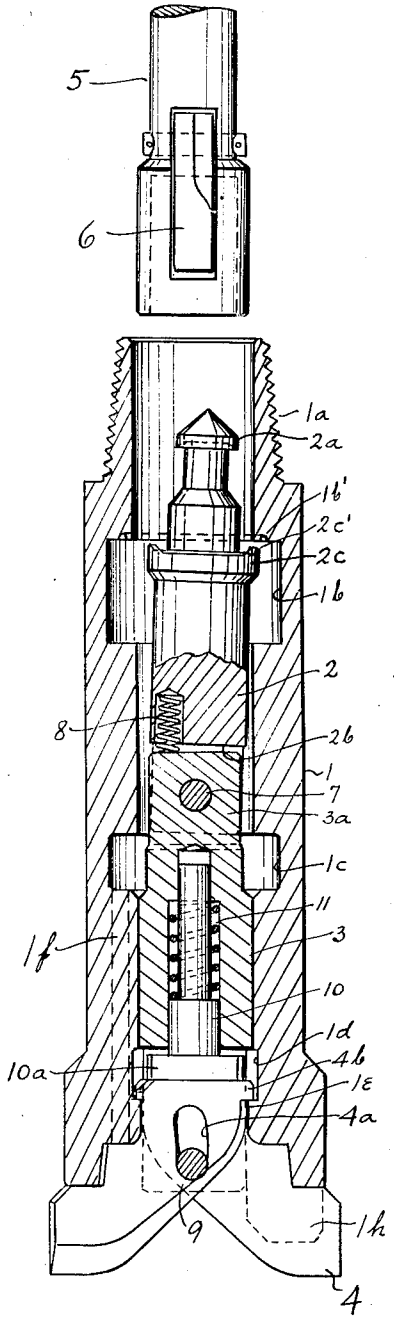


Fig. 1.

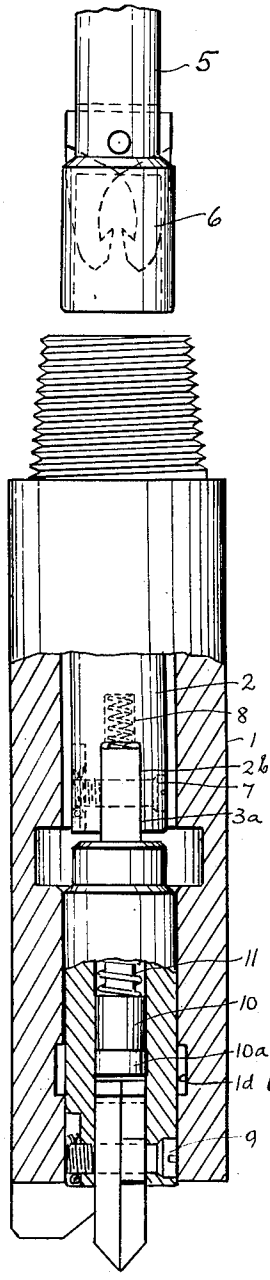


Fig. 2.

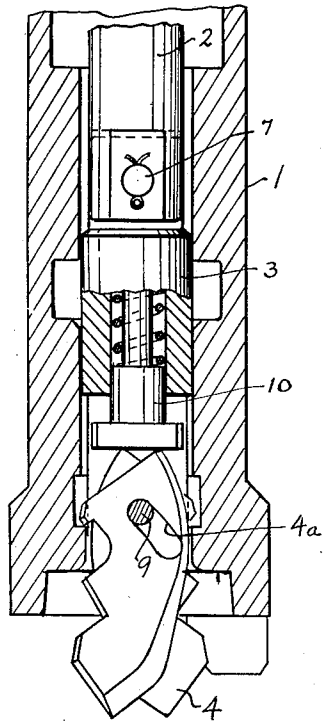


Fig. 4.

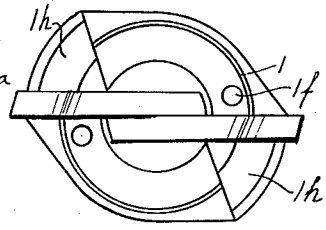


Fig. 3.

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UNITED STATES PATENT OFFICE

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COLLAPSIBLE BIT

Application filed July 2, 1927. Serial No. 202,990.

This invention relates to deep well drilling apparatus and more particularly to collapsible bits of the type disclosed in my Letters Patent of the United States No. 1,360,328, of November 30, 1920; No. 1,379,483 of May 24, 1921; No. 1,442,188 of January 16, 1923; No. 1,448,818 of March 20, 1923; No. 1,451,794 of April 17, 1923; and No. 1,511,640 of October 14, 1924—the present invention constituting an improvement of the devices covered by said Letters Patent.

One of the principal objects of this invention is the provision of a new and improved bit carrier adapted to be dropped into a drill stem, and co-operative means carried by the lower end of the stem whereby the carrier automatically becomes removably locked in its lower-most position.

An object of the invention is to provide means to indicate the position of the blades with respect to the head.

It has been found that in the use of collapsible bits of this general type, the blades movably mounted on the carrier are caught by obstacles in the drill stem when the carrier is lowered or elevated therein, whereby the carrier becomes locked in the stem and drilling operations must be discontinued until it has been removed. This invention has for another of its objects to provide new and improved means adapted to prevent this by yieldably holding the blades in a proper position in the carrier.

Various other objects will hereinafter appear.

In the accompanying drawings, illustrative of the preferred embodiment of the invention, Fig. 1 is a sectional side elevation of the bit with the blades in their operative position and the water passages open; Fig. 2 is a side elevation, partly in section, taken at a right angle to Fig. 1; Fig. 3 is a bottom plan view; and Fig. 4 is a sectional side elevation, the carrier having been elevated in the head, to illustrate the blades in their inoperative position and the closure of the water passages.

Referring generally to the drawings, the bit head is indicated at 1 and comprises a cylindrical body provided with a screw-threaded shank 1*a* whereby it may be attached to the usual drill stem, not shown.

The bit carrier comprises an upper section 2 and a lower section 3, pivotally connected together. The blades 4 are slidably and pivotally mounted in the fork of the lower section 3, whereby they may be swung into inoperative position to permit movement of the carrier in the stem and head, and swung outwardly into cutting position.

The overshot 5 is of the type fully described in my patents hereinabove referred to. It is attached to the end of a suitable line, whereby it is lowered into and removed from the stem and is provided with a pair of dogs 6 which are adapted to engage the conical head 2*a* to effect removal of the bit carrier.

Referring specifically to the drawings, it will be observed that the upper section 2 has a transverse slot 2*b* in the lower end thereof to receive the reduced end or tongue 3*a* of the lower section 3. A pin 7 pivotally connects said sections together, the tongue 3*a* being spaced from the bottom wall of slot 2*b* so that rocking of section 2 on section 3 is permitted. A spring 8 is secured in a suitable recess in section 2 and is disposed at one side of the axis of rotation of section 2 with respect to section 3, and bears against the end of tongue 3*a*. It will be obvious that said spring will normally hold the section 2 in the position with respect to section 3 illustrated in Fig. 1.

The bit carrier need not be lowered into the drill stem by means of the overshot 5 and the cable attached thereto, but may be dropped into the drill stem, and a great amount of time may thereby be saved. When the bit carrier reaches its lowermost position in the head 1, the spring 8 will rock the upper section 2 on its pivot 7 and thus move the projection 2*c'* into the annular groove 1*b* in the head thereby automatically locking the carrier in its lowermost position. It will be observed that the projection 2*c'* is adapted to enter the annular groove 1*b'* in the upper wall of the annular groove 1*b*.

It is to be understood that the spring 8 need not be used, as the upper section 2 of

the carrier will be moved into engagement with the upper wall or shoulder of the groove 1*b* by gravity when the section 2 is so jarred that its center of gravity is not in the same vertical plane with the axis of pin 7, or by centrifugal force upon rotation of the bit, or by the cleaning fluid pumped through the head.

This feature will be found particularly useful when a heavy mud or a like formation is encountered. The exertion of pressure against the lower end of the bit carrier by such formations frequently moves the bit carrier upwardly in the head, thus causing the collapse of the blades and consequent interruption of the drilling operation. By the means described, the bit carrier will be positively held in its lowermost position in the head.

When overshot 5 is lowered into the head, it centers the section 2, that is, so moves the same that the longitudinal axis thereof is substantially coincident with the longitudinal axis of the section 3 and of the head 1. Flange 2*c* and the upper wall of groove 1*b* are thus held out of engagement. While the cup-shaped recess in the bottom of overshot 5 thus moves into the head and over the upper end of section 2 to center the latter in the former, and said function is particularly desirable, the dogs 6 may be used alone, the weight of the lower section being such that when said dogs engage conical head 2*a* and the carrier is pulled upwardly, the resistance of spring 8 will be overcome and the section 2 centered.

The lower section 3 is forked for the reception of the upper ends of blades 4 which have elongated slots 4*a* therein through which pivot pin 9 extends. It will be observed that each of the slots 4*a* is cut at an angle to the longitudinal axis of the blade. The object of this will presently appear. Section 3 has a central longitudinal chamber extending upwardly from the bottom wall of its fork, and a spring-pressed plunger 10 is reciprocable in said chamber, said plunger having an elongated lower head 10*a* in contact with the upper ends of blades 4.

When the carrier is being moved upwardly or downwardly, the blades assume the position illustrated by Fig. 4, and the pressure of the plunger thereupon holds the upper ends of the slots 4*a* in tight contact with pin 9, and lateral movement of the upper ends of the blades is thereby prevented. The shoulders 4*b* of the blades cannot, therefore, engage the shoulders formed by the grooves 1*b* and 1*c* in the head 1, nor any obstacle in the drill stem. If the shoulders 4*b* of the blades were permitted to engage any obstacle in the stem or head, the blades would swing on the pin 9 and, becoming locked, would prevent movement of the carrier. In view of the fact that the slots 4*a* are angular, as above pointed out, the blades must move upwardly in order to permit lateral movement of their upper ends. Such upward movement is prevented by the plunger 10.

The lower end of the head is provided with an internal annular flange 1*e* adjacent annular groove 1*d*, and when the shoulders 4*b* of blades 4 strike against said flange, the blades swing and slide on the pin 9 to assume the position shown in Fig. 1, the resistance of the spring-pressed plunger 10 to such movement of the blades being overcome, and said plunger receding in its chamber to permit the same. The engagement of the shoulders 4*b* with the flange 1*e* takes place because the internal diameter of the flange 1*e* is less than the external diameter of the section 3 of the carrier, and the outer ends of the shoulders 4*b* are substantially flush with the outer surface of the section 3. The elongated head 10*a* of the plunger is then in contact with the flat upper ends of the blades, as shown.

A pair of oppositely disposed downwardly projecting lugs 1*h* are formed integral with the bottom of head 1 to provide shoulders for the positive support of the blades when the bit is in operation.

If the bit carrier, when dropped into the stem, reaches its lowermost position in the head and the blades are in an operative position, flushing water pumped into the head passes between the upper section 2 and the head into annular groove 1*c* and thence through courses 1*f* to discharge at points immediately in front of the cutting edges of blades 4.

When the carrier is not in its lowermost position and the blades are therefore in their inoperative position, (Fig. 4) the passage of water into annular groove 1*c* is obstructed. If for any reason, the assumption by the bits of an operative position on the bottom of the head is prevented, the passage of water will, by the means described, be obstructed. The driller, by observing the resistance encountered by the pump employed to force water through the bit in the usual manner, can readily ascertain the position of the blades on the head.

The invention is not limited to the specific embodiment shown, and various changes may be made within the scope of the following claims.

I claim:

1. In a collapsible drill, a head, a carrier slidable in said head, said carrier comprising an upper and a lower section pivoted together, a blade carried by said lower section, and a spring to urge said upper section into locking engagement with said head to hold said blade in its operative position.

2. In a collapsible drill, a head, a carrier slidable in said head, said carrier comprising a pair of sections having a tongue and groove

pivotal connection, a blade carried by said carrier, and a spring between said sections and serving to urge one of said sections into locking engagement with said head to hold said blade in its operative position.

3. In a collapsible drill, a hollow cylindrical head having an internal annular groove, a carrier slidable in said head and comprising upper and lower cylindrical sections pivoted together and snugly fitting in said head, and a blade pivotally carried by said lower section and adapted to assume an operative position against the bottom of said head, said upper section being movable into locking engagement in said groove when said blade has assumed said position.

4. In a collapsible drill, a hollow cylindrical head having an internal annular groove, a carrier slidable in said head and comprising upper and lower cylindrical sections pivoted together and snugly fitting in said head, and a blade pivotally carried by said lower section and adapted to assume an operative position against the bottom of said head, said upper section having oppositely disposed shoulders movable into locking engagement in said groove when said blade has assumed said position.

5. In a collapsible drill, a hollow cylindrical head having an internal annular groove, a carrier slidable in said head and comprising upper and lower cylindrical sections pivoted together and snugly fitting in said head, a blade pivotally carried by said lower section and adapted to assume an operative position against the bottom of said head, and a spring to move said upper section into locking engagement in said groove when said blade has assumed said position.

6. In a collapsible drill, a hollow cylindrical head having an internal annular groove, a carrier slidable in said head and comprising upper and lower cylindrical sections pivoted together and snugly fitting in said head, a blade pivotally carried by said lower section and adapted to assume an operative position against the bottom of said head, said upper section being movable into locking engagement in said groove when said blade has assumed said position, and means to move said upper section out of locking engagement with said head.

7. In a collapsible drill, a hollow cylindrical head having an internal annular groove, a carrier slidable in said head and comprising upper and lower cylindrical sections pivoted together and snugly fitting in said head, a blade pivotally carried by said lower section and adapted to assume an operative position against the bottom of said head, a spring to move said upper section into locking engagement in said groove when said blade has assumed said position, and means to move said upper section out of locking engagement with said head.

8. A collapsible bit having a head, a carrier slidable in said head, a blade pivotally and slidably mounted on said carrier, and yieldable means to normally prevent sliding of said blade on said carrier to limit the projection of said blade laterally from said carrier.

9. A collapsible bit having a head, a carrier slidable in said head, a blade pivotally and slidably mounted on said carrier and having a shoulder, yieldable means to normally prevent sliding of said blade on said carrier to limit the projection of said shoulder laterally from said carrier, and means to engage said shoulder to positively effect sliding and rotation of said blade on said carrier to cause a projection of said blade laterally from said carrier.

10. A collapsible bit having a head, a carrier slidable in said head, a blade having an angular slot therein, a pin on said carrier and extending through said slot, and yieldable means to normally prevent sliding of said pin in said slot to limit the projection of said blade laterally from said carrier.

11. A collapsible bit having a head, a carrier slidable in said head, a blade having an angular slot therein and a shoulder, a pin on said carrier and extending through said slot, yieldable means to normally prevent sliding of said pin in said slot to limit the projection of said shoulder laterally from said carrier, and means to engage said shoulder to positively effect sliding of said pin in said slot and rotation of said blade on said pin to cause a projection of said blade laterally from said carrier.

12. A collapsible bit having a head, a carrier slidable in said head, a blade pivotally and slidably mounted on said carrier, and yieldable means to normally prevent sliding of said blade on said carrier to limit the projection of said blade laterally from said carrier, said means comprising a yieldable plunger slidably carried by said carrier and in contact with said blade.

13. A collapsible bit having a head, a carrier slidable in said head, a blade pivotally and slidably mounted on said carrier and having a shoulder, yieldable means to normally prevent sliding of said blade on said carrier to limit the projection of said shoulder laterally from said carrier, said means comprising a yieldable plunger slidably carried by said carrier and in contact with said blade, and means to engage said shoulder to positively effect sliding and rotation of said blade on said carrier to cause a projection of said blade laterally from said carrier.

14. A collapsible bit having a head, a carrier slidable in said head, a blade having an angular slot therein, a pin on said carrier and extending through said slot, and yieldable means to normally prevent sliding of said pin in said slot to limit the projection of said blade

laterally from said carrier, said means comprising a yieldable plunger slidably carried by said carrier and in contact with said blade.

15. A collapsible bit having a head, a carrier slidable in said head, a blade having an angular slot therein, a pin on said carrier and extending through said slot, and yieldable means to normally prevent sliding of said pin in said slot to limit the projection of said blade laterally from said carrier, said means comprising a yieldable plunger slidably carried by said carrier and in contact with said blade, said head and blade having engaging means to positively effect sliding of said pin in said slot and rotation of said blade on said pin to cause a projection of said blade laterally from said carrier.

In testimony whereof, I hereunto affix my signature.

JOHN C. STOKES.