Jan. 4, 1944. B. W. SEWELL 2,338,670

RETRACTABLE HARD FORMATION BIT

Filed March 26, 1942 2 Sheets-Sheet 1

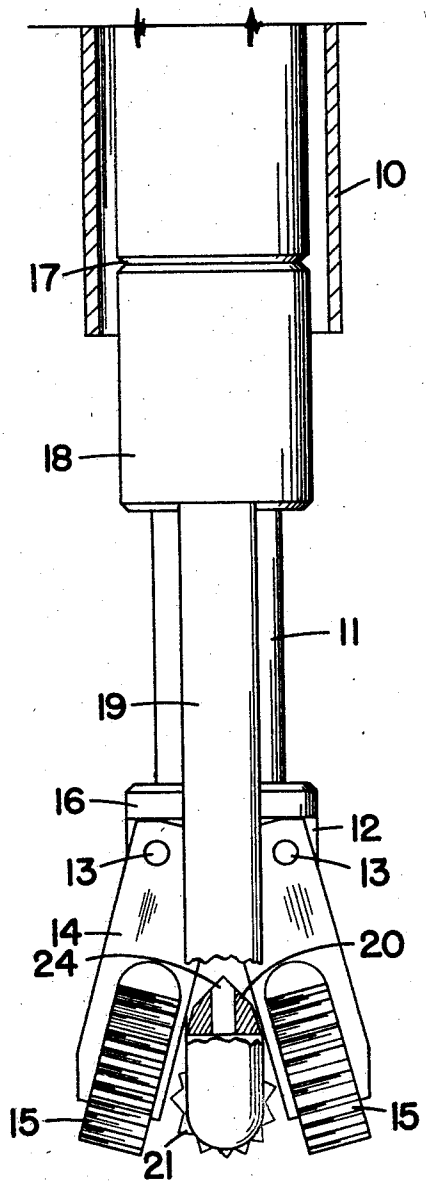


FIG. 1.

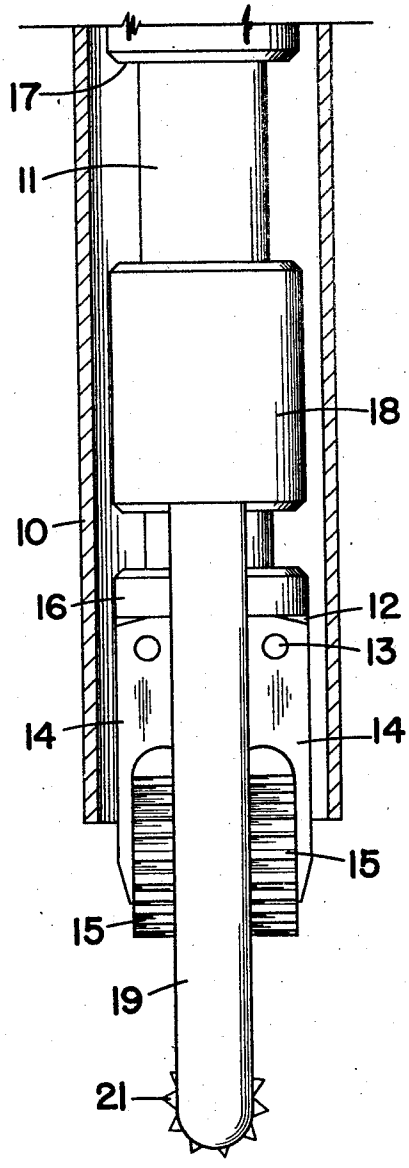


FIG. 2.

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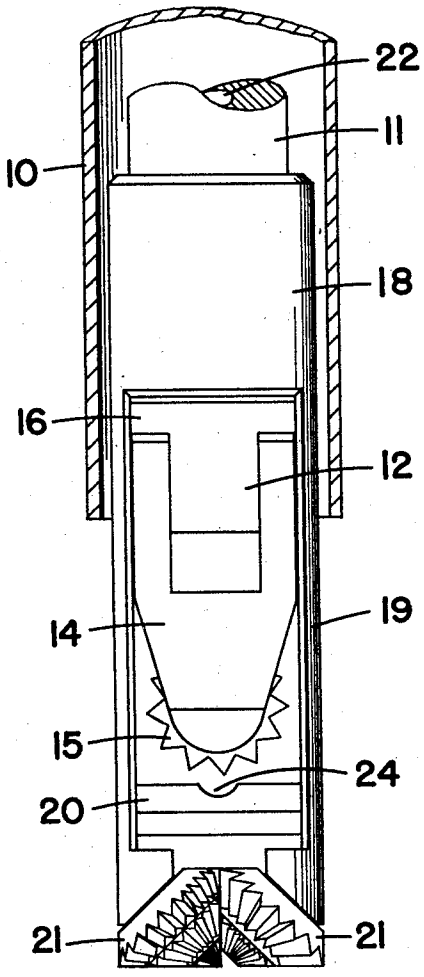


FIG. 3.

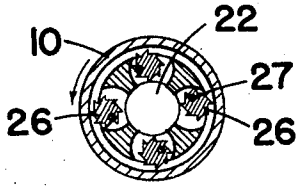


FIG. 6.

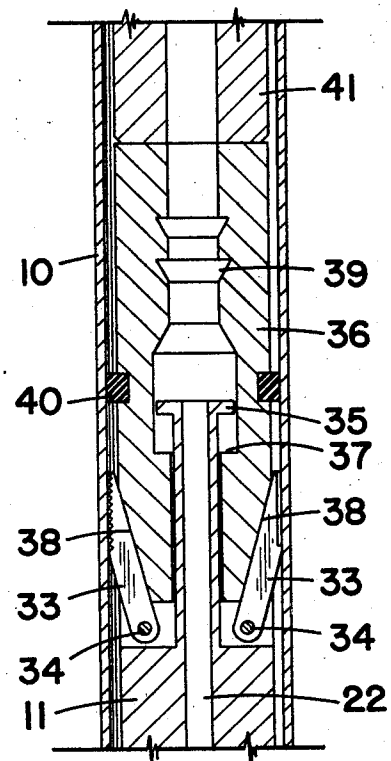


FIG. 4.

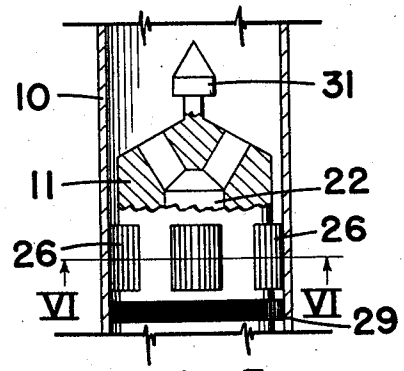


FIG. 5.

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UNITED STATES PATENT OFFICE

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RETRACTABLE HARD FORMATION BIT

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Application March 26, 1942, Serial No. 436,293

4 Claims. (Cl. 255—75)

The present invention is directed to a wire line retractable drilling bit.

An object of the present invention is to devise a drill bit which may be lowered and retrieved through the bore of the drill pipe.

A further object of the present invention is to devise a bit which may be lowered and retrieved through the bore of the drill pipe and which is provided with cutters adapted for drilling hard formations.

Other objects and advantages of the present invention may be seen from a reading of the following description taken in conjunction with the drawings in which

Fig. 1 is an elevation, partly in section, of a bit embodying the present invention with the cutters expanded for drilling;

Fig. 2 is an elevation, partly in section, of the device of Fig. 1 with the cutters of the bit retracted so that the device may be moved along the bore of the drill pipe;

Fig. 3 is a fragmentary view, partly in section, of the lower end of the device in the condition shown in Fig. 2, but at an angle of 90° to the view of Fig. 2;

Figs. 4 and 5 are fragmentary views illustrating different arrangements for locking the drill bit to the drill pipe; and

Fig. 6 is a view taken along line VI—VI of Figure 5.

Referring specifically to the drawings and first to the device disclosed in Figs. 1, 2 and 3, a body 11 having a medial portion of a generally tubular shape is shown with its upper end extending into the lower portion of a string of drill pipe 10. The lower end of body 11 is bifurcated to form extensions 12. Secured to bifurcated portion 12 by pivots 13 are arms 14 carrying cutters 15. It will be seen that the arms 14 are so attached that they may hang in a substantially vertical position as illustrated in Fig. 2, or else may be extended outwardly at an angle as shown in Fig. 1. When arms 14 hang down in a vertical position, cutters 15 are adjacent one another, and the device may be passed through a suitable drill stem. When the cutters 15 are expanded outwardly, they define a circle of greater diameter than the drill stem, and accordingly will produce a bore hole of sufficient diameter to allow normal drilling operations.

Arranged immediately above bifurcated portions 12 are lugs 16, and at substantial distance above them is shoulder 17. Shoulder 17 and lugs 16 have substantially the same outside diameter. Slidingly arranged on body 11 with its maximum downward and upward movements restricted by lugs 16 and shoulder 17, respectively, is sleeve 18 having its upper end of tubular form, an outside diameter corresponding to that of shoulder 17 and provided with two downward extensions 19 arranged to slide between lugs 16. The lower end of extensions 19 are joined together by wedge-shaped member 20 and arranged below member 20 are cone-shaped rock cutters 21, each cutter being secured to one of the extensions 19.

Extending down through body 11 is longitudinal passage 22 which serves to conduct drilling fluid through the drill bit. Arms 14 are provided with mud passages (not shown) communicating with passage 22 and extending adjacent cutters 15 to carry drilling fluid to these cutters. In like manner, member 20 is provided with passage 24 to convey drilling fluid to the cone-shaped rock bits 21.

The general operation of the device of the present invention will now be explained. The drill bit consists generally of two units, one unit carrying the two rock bits 15 and the other unit carrying the two rock bits 21. These two units are slidingly interrelated. When the device is to be moved along the bore of the drill pipe, the force of gravity pulls the unit carrying rock bits 21 downwardly and allows the rock bits 15 to swing inwardly, thereby permitting the passage of the tool through the bore of the pipe. When the device reaches the bottom of the bore hole, conical cutters 21 strike the bottom first, and member 11 will accordingly slide through collar 18, carrying cutters 15 downwardly. Wedge-shaped member 20 spreads arms 15 so that the cutters 15 are expanded outwardly and the device is in position to cut a hole of larger diameter than the maximum diameter of the drill pipe.

It is essential that means be provided to lock the device of the present invention to the drill collar, so that rotation of the string of drill pipe will correspondingly rotate it. A suitable mean: for locking the device to the drill stem is illustrated in Fig. 4 and another means is illustrated in Fig. 5.

In the locking means disclosed in Fig. 4, slips 33 have their lower ends secured to body 11 by pivots 34. Arranged to cooperate with body 11 is an upper member 36 of a general cylindrical shape. The lower portion of member 36 fits around the upper portion of body 11 so that the two elements can move longitudinally with respect to each other. The upper end of body 11 is provided with a circular outwardly projecting ledge 35. Inwardly extending ledge 37 is formed

in the lower portion of body **36** to cooperate with projection **35** to limit the relative movement of these two bodies. The lower portion of body **36** is shaped to form an inverted truncated cone **38**. When portion **38** comes in contact with slips **33**, it forces them against drill string **10** to lock the body to the drill string.

The upper portion of body **36** is provided with ridges **39** arranged adjacent the central bore. This arrangement is conventional to the art and is provided to cooperate with a fishing spear which may be used to retract the device by means of a wire line. Packing rings **40** are provided on body **36** to seal the space between the body and the drill stem against drilling fluid.

It will be apparent that the arrangement above described is provided with cutting means for drilling a bore hole and with locking means for locking the cutters so that they will rotate upon rotation of the drill string. In order to concentrate weight of the lower end of drill pipe a drill collar may be lowered through the drill stem until its lower end rests on the upper portion of body **36**. Such a drill collar is designated by numeral **41**. It will be apparent that as many drill collars as desired may be used with each succeeding drill collar resting upon the preceding collar.

In Figs. 5 and 6 is illustrated another means suitable for locking the device for rotation with the drill collar. This locking means may be substituted for that shown in Fig. 4. In the embodiment of Figs. 5 and 6 a plurality of teethed eccentrics **26** are mounted on longitudinally extending shafts **27** secured to body **11**. When the assembly is in position in the lower end of the drill stem, and the drill pipe is rotated in a clockwise direction, the frictional contact between the drill pipe and the eccentrics will cause the teeth to bite into the drill pipe, whereby the rotary motion will be transmitted through the body to the bits. A packer **29** is provided to prevent the loss of drilling fluid between body **11** and drill pipe **10**. It will be evident that when it is desired to remove the assembly from the drill pipe, the direction of rotation of the pipe may be reversed, releasing the eccentrics from the pipe. Thereupon, a conventional overshot (not shown) may be lowered on a wire line until it engages spear head **31**. Tension placed upon the wire line will then cause the withdrawal of the device upwardly through the drill stem.

While I have disclosed specific embodiments of the present invention, it will be obvious to the skilled worker that various changes may be made without departing from the scope of the invention. For example, while I have disclosed specific shapes of rock bits, it will be apparent that various other types of cutters may be substituted for those herein disclosed. Moreover, while I have disclosed specific means of locking the device to the drill stem, various other locking means at present known to the drilling and production art may be so employed. It is accordingly my intention not to be bound by the specific embodiments herein disclosed, but only in accordance with the hereto appended claims.

I claim:

1. A wire line retractable hard formation drilling bit comprising, in combination, a body, cutters suitable for drilling hard formations connected to said body, a sleeve slidably arranged on said body, cutters carried by said sleeve and means carried by said sleeve arranged to expand said first mentioned cutters outwardly when in one position and to allow said first mentioned cutters to retract when in a second position.

2. A wire line retractable bit comprising, in combination, an elongated body, arms having one end secured to said body and the other end adapted to expand outwardly, a sleeve arranged on said body for slidable movement, cutters carried by said sleeve, and a wedge-shaped member carried by said sleeve arranged to expand the unsecured ends of said arms outwardly when in one position, and to allow said arms to retract inwardly when in another position.

3. A wire line retractable drilling bit comprising, in combination, a tubular member having its lower end bifurcated, an arm pivoted to each bifurcated portion, a bit carried by each arm, a sleeve slidably arranged on said tubular member, outwardly extending members secured to said tubular portion to define the upper and lower limits of movement of said sleeve, downwardly extending members secured to said sleeve, rock bits carried by each downwardly extending member, and a member secured to said downwardly extending members arranged to expand said arms outwardly when said sleeve is in its upper position and to allow said arms to swing inwardly when the sleeve is in its lowermost position.

4. A wire line retractable drilling bit adapted for longitudinal movement in a drill pipe comprising, in combination, an elongated body having a central passage extending therethrough, a bifurcated lower end portion and an intermediate portion of lesser cross section than said end portion, an arm pivoted to each bifurcated portion of said lower end portion, a bit carried by each arm, a sleeve slidably mounted on said intermediate section, downwardly extending arms rigidly secured to said sleeve, bits carried by the rigidly secured arms, and a wedge shaped member carried by said rigidly secured arms and arranged to extend said pivoted arms outwardly when the sleeve is in an upper position and to allow said pivoted arm to swing inwardly when the sleeve is in a lower position.

BENJAMIN W. SEWELL.