April 24, 1951 E. T. ALLEN 2,550,035

RETRIEVABLE DRILLING BIT

Filed Dec. 13, 1947

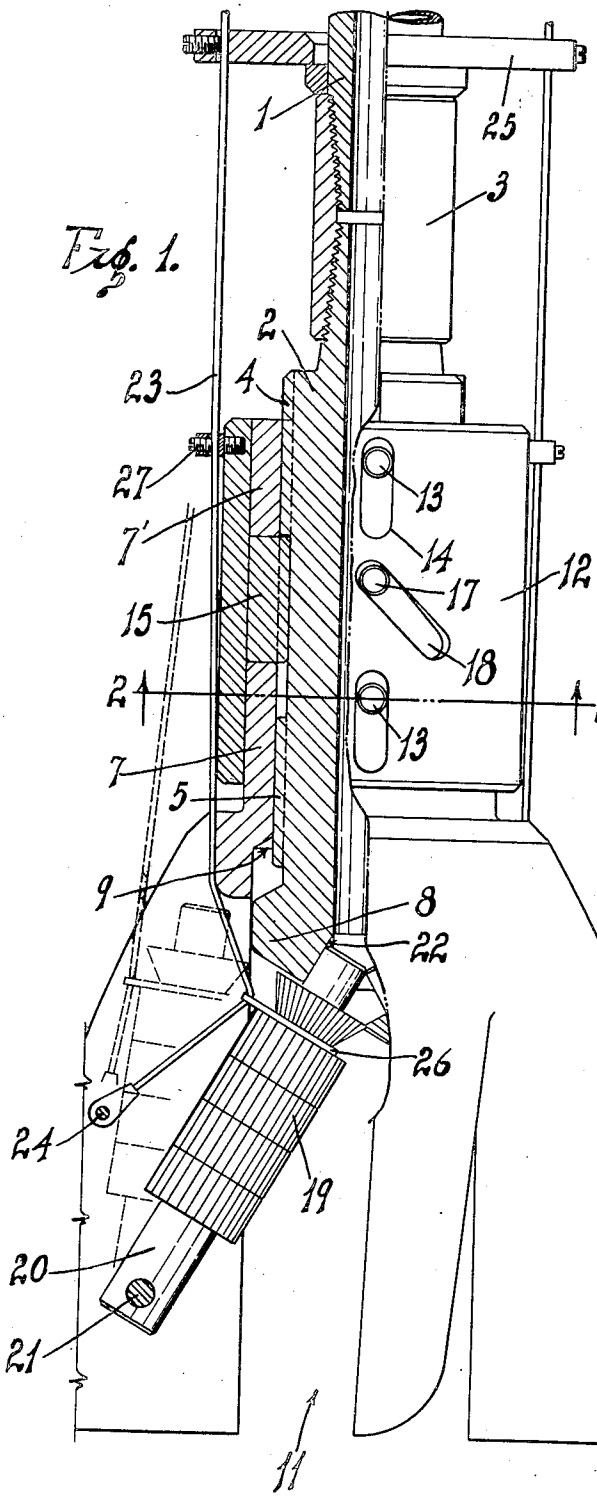


Fig. 1.

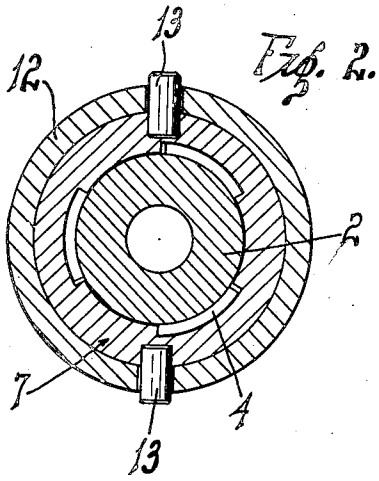


Fig. 2.

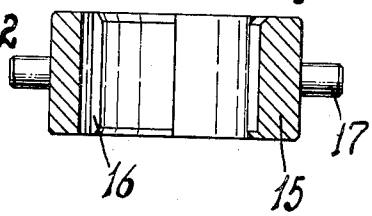


Fig. 3.

INVENTOR.
Ethan T. Allen.
BY
H. A. Duckman.
ATTORNEY.

Patented Apr. 24, 1951

2,550,035

UNITED STATES PATENT OFFICE

2,550,035

RETRIEVABLE DRILLING BIT

Ethan T. Allen, Gardena, Calif.

Application December 13, 1947, Serial No. 791,584

10 Claims. (Cl. 255—72)

1

This invention relates to a retrievable drilling bit whereby a bit can be lowered into a well or raised from the well without removing the drill pipe.

An object of my invention is to provide a novel retrievable drilling bit, which is lowered to the bottom of the bored hole over the drill pipe—that is, it encircles the drill pipe, and the bit can be removed from the well in the same manner.

Another object of my invention is to provide a novel retrievable drilling bit with a novel latching means whereby the bit is secured to the drill pipe at the lower end of said pipe, and is manually latched and released as desired by the operator.

Still another object of my invention is to provide a novel bit of the character stated, in which the core breakers or cutters are retracted when the bit is to be removed from the well.

A feature of my invention is to provide a bit of the character stated, which can be quickly and easily lowered into a well or removed therefrom without removing the drill pipe at the same time.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description, and the appended claims.

In the drawing:

Figure 1 is a quarter longitudinal sectional view of my retrieving drilling bit.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is a transverse sectional view of the locking ring.

Referring more particularly to the drawing, the numeral 1 indicates the drill pipe which extends from the surface of the well to the bottom. A mandrel 2 is secured to the lower end of the drill pipe 1 in the usual and well-known manner —that is, the usual collar 3 connects these parts, which is common practice in the oil industry. A plurality of spaced splines 4 are formed adjacent the upper end of the mandrel 2, and a second series of spaced splines 5 are formed adjacent the lower end of the mandrel. The splines 4 and 5 are spaced longitudinally, the purpose of which will be subsequently described. Furthermore, the splines 4 and 5 are in longitudinal alignment, and the purpose of this will be apparent from the subsequent description.

The bit 6 is formed with a collar 7, which rises from the bit and is preferably integral with said bit. The collar 7 is formed with internal splines, which engage the splines 4 and 5 of the mandrel 2, and thus the mandrel drives the bit, i. e. rotates the same, when the drill pipe 1 is rotated. A ring 7' surrounds the mandrel 2 and engages the splines 4. A shoulder 8 on the lower end of the mandrel 2 limits the downward movement of

2

the bit 6, and prevents this bit from sliding off of the end of the mandrel. The bit is provided with an internal shoulder 9, which can engage the shoulder 8. The blades 10 of the bit 6 surround the central core opening 11, and this core opening permits the bit assembly to be moved upwardly over the drill pipe 1 due to the fact that the core opening is somewhat larger than any of the collars 3 or other projections on the drill pipe.

To lock the bit 6 onto the mandrel 2, I preferably provide the following arrangement:

A sleeve 12 encircles the collar 7, and this sleeve is guided in its vertical movement by the pins 13, which project from the collar 7 and extend through vertical slots 14 in the sleeve. Similar pins also project from the ring 7' and also similarly engage the sleeve 12. A locking ring 15 is positioned between the splines 4 and 5, and this ring is also internally splined, as shown at 16. A pin 17 projects from the locking ring 15 and extends into an inclined groove or slot 18 in the sleeve 12. When the bit is lowered into the well, the splines 16 are in alignment with the splines 4 and 5, and by rotating the splines 16 out of alignment with the splines 4 and 5, the bit 6 will then be locked in position on the pipe 1, and will be prevented from moving longitudinally on the pipe. A slight longitudinal movement, however, is permitted, and the purpose of this will be further described. The locking ring 15 is caused to rotate by the weight of the sleeve 12, as well as its own weight, and the pin 17 moving in the slot 18 will impart a partial rotation to the locking ring.

As shown, the blades 10 of the bit 6 would leave a core in the center in the space 11, and it is necessary to break this core. To accomplish this, I provide a plurality of cones or cutters 19, which are journaled on the spindle 20. The spindle is pivotally mounted to the body of the bit 6, as shown at 21. When the cutters 19 are in operative position, as shown in solid lines in Figure 1, the upper end of the spindle 20 enters the conical bore 22 in the bottom of the mandrel 2. In this position, the cutters are definitely held in cutting position within the core area 11.

When it is desired to remove the bit, it is necessary to retract the cutters 19 to the position shown in dotted lines in Figure 1. To accomplish this, the mandrel 2 is raised an amount sufficient to clear the upper end of the spindle 20. The cutters 19 are then pulled outwardly by a suitable manual means, which I have here shown as a cable 23, the lower end of which is secured to the bit 6, as shown at 24, and the upper end is secured to a ring 25, which can slide vertically around the drill pipe 1. A separate cable may be attached to the ring 25, or the cables 23 can continue on to the surface.

The cable 23 passes through a plate 26, which is journaled on the spindle 20. Thus, by pulling upwardly on the cable 23, the spindle 20 is pulled outwardly to the position shown in dotted lines in Figure 1 after the mandrel has been raised as previously described. This limited vertical movement of the mandrel 2 is permitted by proper spacing of the splines 4 and 5, and this movement is only enough to clear the upper end of the spindle 20. The cable 23 may also be attached to the sleeve 12, as shown at 27, so that when the cutters 19 are retracted, the locking ring 15 will at the same time be rotated into a position where its splines 16 align with the splines 4 and 5, and thus the entire bit can be raised to the surface, sliding on the outside of the pipe 1.

Having described my invention, I claim:

1. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit below the splines on the mandrel, and means to rotate said ring to permit the ring to mesh with the spline on the mandrel.

2. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit below the splines on the mandrel, splines on the locking ring alignable with the splines on the mandrel, and means to rotate said ring into and out of alignment with the splines on the mandrel.

3. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit, splines on the locking ring alignable with the splines on the mandrel, a sleeve mounted on the bit for vertical movement, and cam means on the sleeve engageable by the ring to rotate the ring on vertical movement of the sleeve.

4. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit, splines on the locking ring alignable with the splines on the mandrel, a sleeve mounted on the bit for vertical movement, and cam means on the sleeve engageable by the ring to rotate the ring on vertical movement of the sleeve, and means to vertically move said sleeve.

5. A retrievable drilling bit mounted on a drill pipe, the bit having a bore therethrough to fit on the outside of the drill pipe, interengaging means on the drill pipe and the bit, and latch means on the bit releasably engaging the drill pipe and securing the bit on the drill pipe, core cutters pivotally mounted on the bit, and means to pivot said core cutters to move the same out of alignment with the drill pipe to permit the bit to slide over the drill pipe.

6. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, and latch means on the bit releasably engaging the drill pipe and securing the bit on the mandrel, core cutters pivotally mounted on the bit, and means to pivot said core cutters to move the same out of alignment with the drill pipe to permit the bit to slide over the drill pipe.

7. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit, splines on the locking ring alignable with the splines on the mandrel, and means to rotate said ring into and out of alignment with the splines on the mandrel, inwardly projecting core cutters mounted on the bit, and means to retract the core cutters to permit the bit to slide over the drill pipe.

8. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit, splines on the locking ring alignable with the splines on the mandrel, a sleeve mounted on the bit for vertical movement, and cam means on the sleeve engageable by the ring to rotate the ring on vertical movement of the sleeve, inwardly projecting core cutters mounted on the bit, and means to retract the core cutters to permit the bit to slide over the drill pipe.

9. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, and latch means on the bit releasably engaging the drill pipe and securing the bit on the mandrel, inwardly projecting core cutters pivotally mounted on the bit, means on the mandrel engaging the core cutters to hold them in cutting position, and means to retract said core cutters to permit the bit to slide over the drill pipe.

10. A retrievable drilling bit mounted on a drill pipe, a mandrel on the lower end of the drill pipe, the bit having a bore therethrough to fit on the outside of the mandrel, interengaging splines on the mandrel and the bit, a locking ring rotatably mounted on the bit, splines on the locking ring alignable with the splines on the mandrel, and manually operable means to rotate said ring into and out of alignment with the splines on the mandrel, inwardly projecting core cutters pivotally mounted on the bit, means on the drill engaging the core cutters to hold them in cutting position, and means to retract said core cutters to permit the bit to slide over the drill pipe.

ETHAN T. ALLEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
313,405	Davis	Mar. 3, 1885
1,406,185	Hansen	Feb. 14, 1922
1,482,397	Hansen	Feb. 5, 1924
2,099,859	Macready	Nov. 23, 1937
2,379,472	Bowman	July 3, 1945

FOREIGN PATENTS

Number	Country	Date
431,787	France	Sept. 20, 1911
49,977	Austria	Sept. 25, 1911
5,419	Germany	May 30, 1879