

Dec. 5, 1950

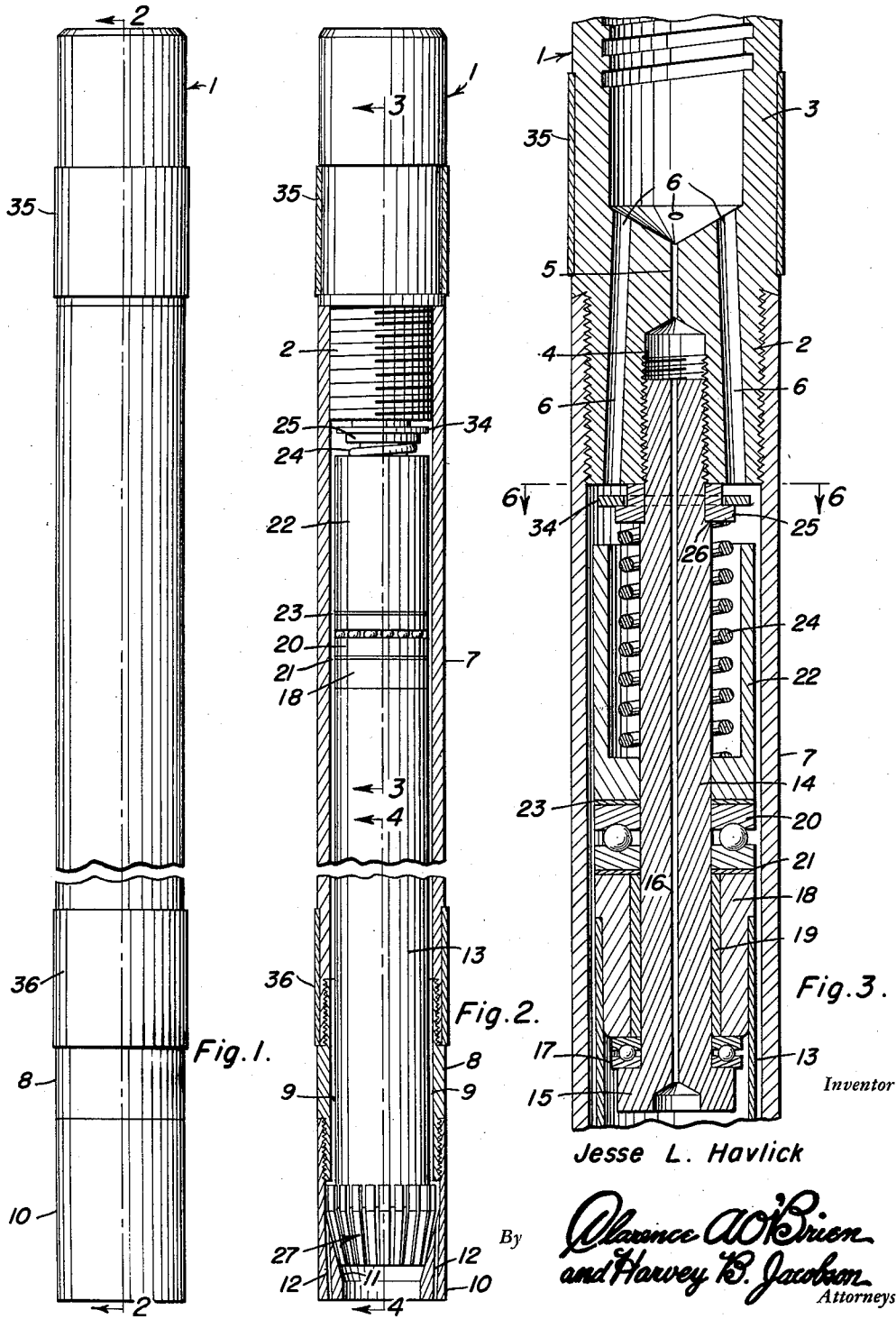
J. L. HAVLICK

2,532,716

DOUBLE TUBE CORE BARREL FOR CORE DRILLING

Filed Nov. 28, 1947

2 Sheets-Sheet 1



Dec. 5, 1950

J. L. HAVLICK

2,532,716

DOUBLE TUBE CORE BARREL FOR CORE DRILLING

Filed Nov. 28, 1947

2 Sheets-Sheet 2

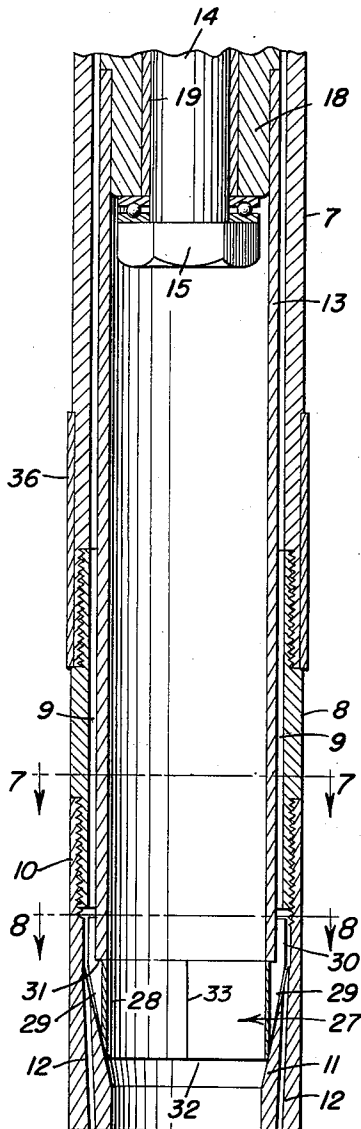


Fig. 4.

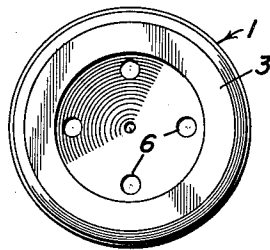


Fig. 5.

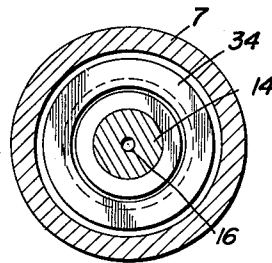


Fig. 6.

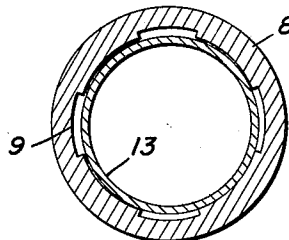


Fig. 7.

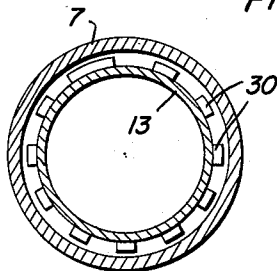


Fig. 8.

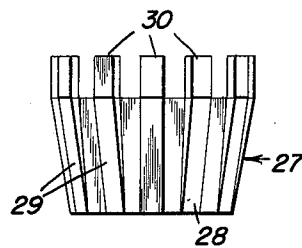


Fig. 9.

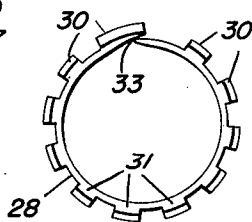


Fig. 10.

Inventor

Jesse L. Havlick

By

Alma A. O'Brien
and Harvey B. Jacobson
Attorneys

UNITED STATES PATENT OFFICE

2,532,716

DOUBLE TUBE CORE BARREL FOR CORE DRILLING

Jesse L. Havlick, Spokane, Wash., assignor of
forty per cent to Gerben Meidema, Spokane,
Wash.

Application November 28, 1947, Serial No. 788,427

5 Claims. (Cl. 255—72)

1

My invention relates to improvements in double tube core barrels for use in obtaining sample cores in core drilling operations.

The primary object of my invention is to achieve, especially in core drilling in soft formations, better core delivery to the collar of the hole than has heretofore been possible with core barrels of commerce.

Another object is to provide improved means for retaining the core in the bit and picking up the core closer to the bottom of the hole than has heretofore been possible.

Still another object is to seal off from the core, during the drilling operation, water circulating through the barrel to the bottom of the hole for drilling purposes;

Still another object is to provide for discharging such water at the leading end of the bit to facilitate drilling;

Still another object is to provide, when the drilling period is ended, either by the barrel being filled with core, or when the core wedges in the barrel, for substantially cutting off the flow of water through the barrel so that a drill operator will be advised at the surface through the usual water pump pressure gauge, that the core barrel is blocked and should be lifted.

Still another object of my invention is to provide a core barrel for achieving the above which is simple in construction, will not get out of order, and is comparatively inexpensive to manufacture and use.

Other and subordinate objects, also within the purview of my invention, together with the precise nature of my improvements, will be readily understood when the succeeding description and claims are read with reference to the drawings accompanying and forming part of this specification.

In said drawings:

Figure 1 is a view in side elevation, partly broken away, of my improved double tube core barrel in a preferred embodiment thereof;

Figure 2 is a view in longitudinal section, partly in side elevation, taken on the line 2—2 of Figure 1;

Figure 3 is a fragmentary view in vertical section taken on the line 3—3 of Figure 2 and drawn to a larger scale;

Figure 4 is a similar view taken on the line 4—4 of Figure 2;

Figure 5 is a view in end elevation of the head section drawn to a larger scale;

Figure 6 is a view in transverse section taken on the line 6—6 of Figure 3;

Figure 7 is a similar view taken on line 7—7 of Figure 4;

Figure 8 is another similar view taken on the line 8—8 of Figure 4;

2

Figure 9 is a view in side elevation of the core lifter drawn to a larger scale; and

Figure 10 is a view in plan of the core lifter.

Referring to the drawings by numerals, my improved core barrel, as shown, comprises a cylindrical head section 1 with a lower reduced, externally threaded end 2. The head section 1 is formed with the usual internally threaded upper sleeve portion 3 for connection to the usual hollow rotating drill stem, not shown. A lower end, axial bore 4 is provided in said head section 1 and an axial reduced water return bore leading from said bore 4 to the interior of the sleeve portion 3. Longitudinal water discharge ports 6 extend from the sleeve portion 3 to the lower end of said head section 1 and are grouped around the bores 4, 5 in downwardly flaring relation.

An outer core barrel section 7 is threaded at its upper end onto the lower end of said head section 1 for rotation therewith, and with a tubular shell section 8 threaded onto the lower end thereof of slightly smaller internal diameter than said core barrel section 7 and provided with longitudinal water passage grooves 9 therein.

A tubular diamond point core bit 10, shown without the diamond points as sufficient for the present purposes, is threaded onto the lower end of the shell section 8. The drill bit 10 is provided with the usual downwardly tapered, intermediate bore portion 11 which, in this instance, is spaced below the lower end of the shell section 8. Longitudinal water discharge ports 12 are provided in the drill bit 10 extending from the upper end of said bore portion 11 to the bottom, or leading face of said drill bit.

An inner, relatively smaller diameter core barrel section 13 is yieldingly suspended, rotatably, in the outer core barrel section 7 from the head section 1 and in spaced relation to said outer core barrel section 7 to permit water to pass between said barrel sections, the suspension means comprising the following.

A guide bolt 14 with an upper end threaded into the bore 4 depends axially from the head section 1 with a lower end head 15 thereon and an axial water return bore 16 extending there-through into communication with the water return bore 5.

An end thrust ball bearing assembly 17 surrounding said bolt 14 rests on the head 15 and supports thereon a sleeve 18 surrounding said bolt 14 with a liner bushing 19, said sleeve 18 having the upper end of the inner core barrel section 13 suitably fixed thereto flush therewith.

A second ball bearing assembly 20 surrounding said bolt 14 rests on a sealing washer 21 on top of the sleeve 18 and supports a cup-like sleeve 22 surrounding said bolt 14 with a sealing washer 23 between the bottom of said sleeve and said assembly 20.

A coiled expansion spring 24 surrounds said bolt 14 and is interposed between the bottom of said sleeve 22 and a flanged collar 25 on the bolt 14 clamped against the lower end of the head section 1 by a shoulder 26 on said bolt 14. The purpose of the collar 25 will presently appear.

As will be apparent, the sleeve 18 with its liner 19, and the ball bearing assembly 20 and sleeve 22 are slidable upwardly on the guide bolt 14 in opposition to the tension exerted by the coil spring 24 to permit yielding upward movement of the inner core barrel section 13 in the outer core barrel section 7, and said sleeves 18, 22, together with the washers 21, 23 and said assembly 20, are spaced from the outer core barrel section 7 for the same purpose as the inner core barrel section 13. Due to the described arrangement, the outer and inner core barrel sections 7, 13 are arranged for relative advance and retraction endwise. As best shown in Figure 4, in the normal downward, or advance, limit of movement of the inner core barrel section 13, as determined by the head 15 of the guide bolt 14, in a manner which will be clear, the lower end of the inner core barrel section 13 is disposed in the bit 10 below the lower end of the shell section 8 but above the tapered bore portion 11 in said bit.

A core lifter 27 is attached to the lower end of the inner core barrel section 13, in the downward limit of movement of said core barrel section, in the outer core barrel section 7, to extend downwardly into the tapered bore 11 part way. The core lifter 27 has the form of a tubular, longitudinally split body 28 of the same internal diameter as that of said inner core barrel 13, when attached, said body being formed of resilient material whereby the same tends to contract circumferentially into reduced size diametrically. Longitudinal, laterally spaced ribs 29 on said body 27, of flat form, extend above the upper end thereof to form gripping fingers 30 for clamping engagement with the periphery of the lower end of said inner core section 13 in the space between the lower end of said shell section 8 and said bore portion 11. Shoulders 31 on the fingers 30 flush with the upper edge of the body 28 seat the lower end of the inner core barrel section 13 with its inner circumferential wall flush with the corresponding wall of said body 28. The ribs 29 taper downwardly from the fingers 30 to fit said bore portion 11 and to a lower end feather edge 32 on said body 28 fitting in said bore portion 11 so as to obviate forming a shoulder therein.

As will be understood, the described core lifter 27 when clamped to the lower end of the inner core barrel section 13, as described, is held by said barrel section in an expanded position. In this connection, the edges 33 of the split in the body 28 are beveled to overlap, as shown in Figure 10, in the expanded condition of the core lifter 27 and so as to obviate an internal shoulder in said body 23 when said lifter is either expanded or contracted.

An annular, flat, check valve member 34 is slidably mounted on the collar 25 for engagement with the upper end of the sleeve 22 to be slid thereby upwardly against the lower end of the head section 1 in covering relation to the lower ends of the water discharge ports 6, to thereby close said ports. The valve member 34, when released, slides downwardly on said collar 25, under the influence of gravity, into port-opening position.

Suitable hard metal ware sleeves 35, 36 are

provided on the head section 1 and the outer barrel section 7 where desirable.

Referring now to the operation of the described invention, the core, not shown, passes upwardly through the bit 10 into the inner barrel section 13 freely, without any spring pressure being exerted against the same by the core lifter 27, the body 28 of said lifter acting as a guide for the core and as a guard to protect the lower end of the inner core barrel section against wear. The core lifter 27, when expanded, substantially seals off the core, during the drilling period, from the water circulating through the barrel. In my improved core barrel, the water passes downwardly from the head section 1 through the discharge ports 6, the space between the outer and inner core barrel sections 7, 13, the grooves 9 in the shell section 8, and the discharge ports 12 in the bit 10 and discharges at the face or leading end of said bit to return through the bit 10, core lifter 27, inner core barrel section 13 and the return port 16 to the head section 1, which is to say the upper sleeve portion 3 thereof.

When the drilling period is ended, either by the inner core barrel section 13 being filled with core, or by the core blocking or wedging in said section, the inner core barrel section 13 will remain stationary while the outer core barrel section 7 continues to rotate with the bit 10 and to advance relative to said inner core barrel section 13. This advance of the outer core barrel section 7 causes the lower end of the shell section 8 to engage the fingers 30 and thereby push the core lifter 27 off the lower end of the inner core barrel section 13, at which point said core lifter 27 contracts about the core to yieldingly grip the same. Such advance of the outer core barrel section 7 also causes the check valve member 34 to be engaged with the upper end of the sleeve 22 and thereby moved upwardly to close the discharge ports 6 and block the circulation of water through the barrel. This will cause a drill operator at the surface to notice a change in pressure on the pressure gauge, not shown, of the usual water circulating pump, not shown, at the surface, whereby the drilling operator will be advised that the barrel should be lifted out of the hole, not shown, being drilled in. As soon as the drill operator starts to lift the barrel from the bottom of the hole, the core lifter 27 is forced down in the bit 10 by advance of the inner core barrel section 13 relative to the outer core barrel section 7, such advance of the inner core barrel sections 13 being caused by the coil spring 24 previously compressed by the described advance of the outer core barrel section 7 relative to the inner core barrel section. This forcing of the core lifter 27 down in the bit 10 results in the tapered bore portion 11 in coaction with the ribs 29 forcing said core lifter into further contracted position about the core, thus insuring retaining of the core in the bit and picking up of the core close to the bottom of the hole.

The foregoing will, it is believed, suffice to impart a clear understanding of my invention, without further explanation.

Manifestly, the invention, as described, is susceptible of modification without departing from the inventive concept, and right is herein reserved to such modifications as fall within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. A core barrel comprising a head section for attachment to a hollow drill stem to be rotated

5

thereby, an outer core barrel section fixed to and depending from said head section for rotation therewith, a tubular drill bit depending from the lower end of the outer core barrel section and fixed thereto for drilling a core, an inner core barrel section for receiving said core, means to mount the inner core barrel section on said head section to provide for relative endwise advance and retraction of said outer and inner core barrel sections comprising a bolt depending axially from said head section, and a sleeve fixed to the upper end of the inner core barrel section and slidable and rotatable on said bolt, and an annular core lifter slidably fitted on the lower end of the inner core barrel section and in said bit for sliding off said end and being engageable by the lower end of the outer core barrel section to be thrust downwardly off the inner core barrel section upon advance of said outer section relative to said inner section, said lifter being resilient for contraction in sufficient degree to grip the core in said bit when said lifter is thrust off the inner core barrel section.

2. A core barrel comprising a head section for attachment to a hollow drill stem to be rotated thereby, an outer core barrel section fixed to and depending from said head section for rotation therewith, a tubular drill bit depending from the lower end of the outer core barrel section and fixed thereto for drilling a core, an inner core barrel section for receiving said core, means to mount the inner core barrel section on said head section to provide for relative endwise advance and retraction of said outer and inner core barrel sections comprising a bolt depending axially from said head section, and a sleeve fixed to the upper end of the inner core barrel section and slidable and rotatable on said bolt, an annular core lifter slidably fitted on the lower end of the inner core barrel section and in said bit for sliding off said end and being engageable by the lower end of the outer core barrel section to be thrust downwardly off the inner core barrel section upon advance of said outer section relative to said inner section, said lifter being resilient for contraction in sufficient degree to grip the core in said bit when said lifter is thrust off the inner core barrel section, and camming devices on said lifter and bit coacting during downward thrust of said lifter to further contract the same and tighten the grip thereof on said core.

3. A core barrel comprising a head section for attachment to a hollow drill stem to be rotated thereby, an outer core barrel section fixed thereto and depending from said head section for rotation therewith, a tubular drill bit depending from the lower end of the outer core barrel section and fixed thereto for drilling a core, an inner core barrel section for receiving the core, means to mount the inner core barrel section on said head section to provide for relative endwise advance and retraction of said outer and inner core barrel sections comprising a bolt depending axially from said head section, and a sleeve fixed to the upper end of the inner core barrel section and slidable and rotatable on said barrel, said head section being ported and said inner and outer core barrel sections being spaced apart for passing water to said bit, and valve means operated by advance of the outer core barrel section relative to the inner core barrel section to close said ports and block passage of water to said bit.

4. A core barrel comprising a head section for attachment to a hollow drill stem to be rotated

6

thereby, an outer core barrel section fixed to and depending from said head section for rotation therewith, a tubular drill bit depending from the lower end of the outer core barrel section for receiving said core, means to mount the inner core barrel section on said head section to provide for relative endwise advance and retraction of said outer and inner core barrel sections comprising a bolt depending axially from said head section, and a sleeve fixed to the upper end of the inner core barrel section and slidable and rotatable on said bolt, an annular core lifter slidably fitted on the lower end of the inner core barrel section and in said bit for sliding off said end and being engageable by the lower end of the outer core barrel section to be thrust downwardly off the inner core barrel section upon advance of said outer section relative to said inner section, said lifter being resilient for contraction in sufficient degree to grip the core in said bit when said lifter is thrust off the inner core barrel section, and camming devices on said lifter and bit coacting during downward thrust of said lifter to further contract the same and tighten the grip thereof on said core comprising downwardly converging ribs on said lifter, and a downwardly tapered bore portion in said bit.

5. A core barrel comprising a head section for attachment to a hollow drill stem to be rotated thereby, an outer core barrel section fixed thereto and depending from said head section for rotation therewith, a tubular drill bit depending from the lower end of the outer core barrel section and fixed thereto for drilling a core, an inner core barrel section for receiving the core, means to mount the inner core barrel section on said head section to provide for relative endwise advance and retraction of said outer and inner core barrel sections comprising a bolt depending axially from said head section, and a sleeve fixed to the upper end of the inner core barrel section and slidable and rotatable on said barrel, said head section being ported and said inner and outer core barrel sections being spaced apart for passing water to said bit, and valve means operated by advance of the outer core barrel section relative to the inner core barrel section to close said ports and block passage of water to said bit comprising an annular valve member circumscribing said bolt and movable relative thereto to close said ports, and a member on said bolt for moving the valve member when said outer core barrel is advanced relative to said inner core barrel.

JESSE L. HAVLICK.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
Re. 18,045	Baker	Apr. 14, 1931
1,611,504	Baker	Dec. 21, 1926
1,853,581	Schmisrauter et al.	Apr. 12, 1932
1,903,232	Giesey	Mar. 28, 1933
1,994,848	Baker et al.	Mar. 19, 1935
2,001,764	Bradley	May 21, 1935
2,040,889	Whinnen	May 19, 1936
2,260,678	Muhlbach	Oct. 28, 1941
2,422,955	Duffield	June 24, 1947

FOREIGN PATENTS

Number	Country	Date
5,300	Great Britain	1914
608,248	Germany	Jan. 18, 1935