

March 31, 1953

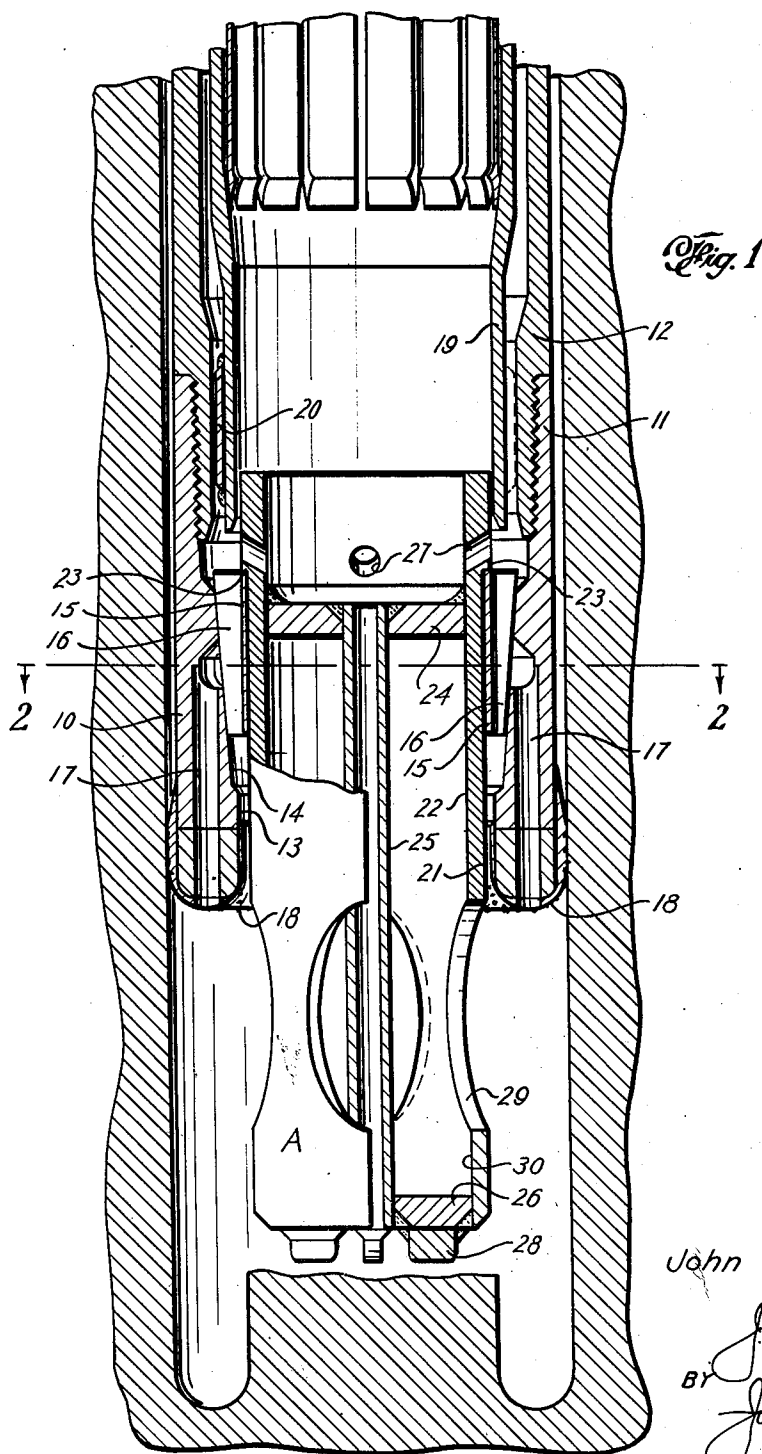
J. C. STOKES

2,633,336

CORE DRILLING APPARATUS

Filed Dec. 13, 1948

2 SHEETS—SHEET 1



John C. Stokes
INVENTOR
By *J. Vincent Martin*
and
Joe E. Edwards
ATTORNEYS

March 31, 1953

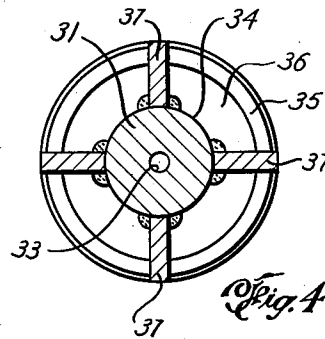
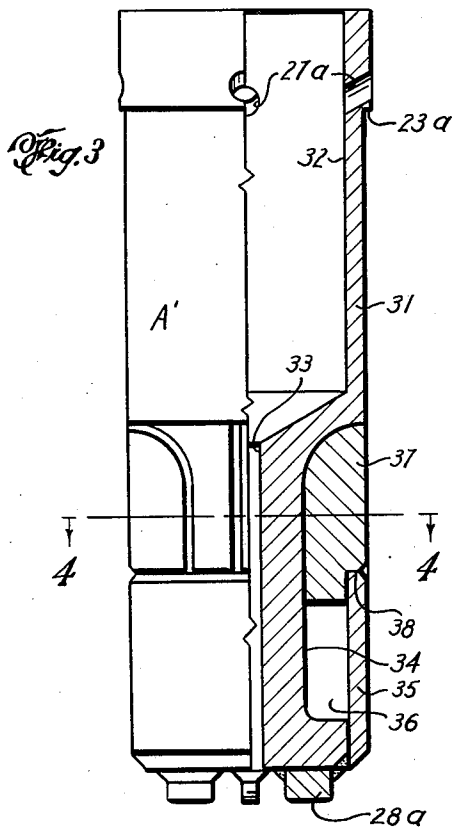
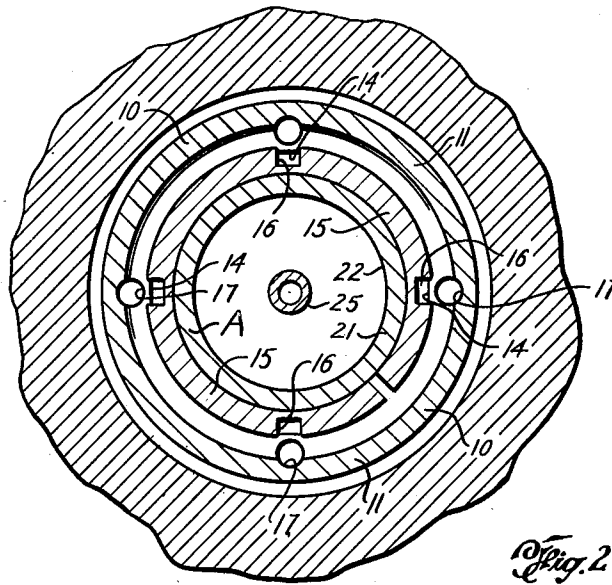
J. C. STOKES

2,633,336

CORE DRILLING APPARATUS

Filed Dec. 13, 1948

2 SHEETS—SHEET 2



John C. Stokes
INVENTOR
BY J. Vincent Martin
and
Joe E. Andrews
ATTORNEYS

UNITED STATES PATENT OFFICE

2,633,336

CORE DRILLING APPARATUS

John C. Stokes, Houston, Tex., assignor to Reed
Roller Bit Company, Houston, Tex., a corpora-
tion of Texas

Application December 13, 1948, Serial No. 64,923

8 Claims. (Cl. 255—72)

1

2

This invention relates to new and useful improvements in core drilling apparatus and particularly to an improved closure for closing the lower end of the core barrel during lowering of the apparatus within a well bore.

As is well known, it has become the general practice in core drilling apparatus to provide a plug or closure for closing the lower end of the core barrel during lowering of the apparatus into position. Usually this plug is mounted in position by frangible or frictional means so that a predetermined pressure against its lower end, usually by imposition of the weight of the drill string thereon, releases the plug to allow it to move upwardly within the core barrel in advance of the core. These plugs are effective to close the core barrel until coring begins but have no means for cleaning out the bottom of the bore prior to the coring operation.

In more recent years, coring in harder formations is being accomplished with diamond bits which are constructed with diamond chips or particles embedded in the cutting face, such bits being employed not only for bore hole drilling but also for coring operations. It has been found that during a drilling or coring operation, some of the diamonds may become detached from the cutting face of the bit falling to the bottom of the bore and it is obviously desirable to recover said diamond. Also, junk in the form of various metallic pieces which may have broken off from the pipe couplings or tools may be present in the bottom of the bore hole and it is desirable that this junk be removed prior to a coring operation.

It is, therefore, one object of this invention to provide an improved closure for the lower end of a core barrel which closure constitutes a combined plug and fishing basket, whereby any material which may be present in the bottom of the well bore may be recovered prior to the coring operation and before the closure is moved upwardly out of its barrel-closing position.

An important object of the invention is to provide an improved core barrel closure which has a receptacle in its lower portion and which has means for circulating the usual drilling fluid through and around said receptacle, whereby any material, such as diamonds, which may be present in the bottom of the bore hole will flush into the receptacle and be thereby recovered when the closure is ultimately brought to the surface with the core barrel; the mounting of said closure in the lower portion of the core barrel

being such that the pressure of the circulating drilling or flushing fluid maintains said closure in position, closing the core barrel during the flushing operation.

Another object of the invention is to provide an improved combination plug and fishing basket, of the character described, having means for assuring a circulation of the flushing fluid beneath the device when said device is at the bottom of the well bore, whereby removal of all extraneous material in the bottom of said well bore is accomplished.

A further object of the invention is to provide an improved combined plug and fishing basket which is particularly adapted for use in conjunction with a diamond core drill.

The construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Figure 1 is a transverse, vertical sectional view of the improved closure, showing the same mounted within the lower end of the core-taking apparatus,

Figure 2 is a horizontal, cross-sectional view, taken on the line 2—2 of Figure 1,

Figure 3 is a view, partly in section and partly in elevation, of a modified form of closure, and

Figure 4 is a horizontal cross-sectional view, taken on the line 4—4 of Figure 3.

In the drawings, the letter A designates the improved combined plug and fishing basket which is illustrated as combined with a diamond core bit 10, although it is to be understood that the device A may be employed with any core-taking apparatus. The diamond core bit 10 has the usual internally threaded box 11 at its upper end, whereby the bit may be connected to the lower end of an outer core barrel 12. As is well known, the barrel 12 is connected with the drill pipe, whereby a rotation may be imparted to the core bit 10. The core bit is formed with a central or axial bore 13 and the intermediate portion of the bore is inclined to provide a tapered core catcher seat 14 and a split core catcher 15 engages this seat. As is illustrated in Figure 2, the core catcher 15 comprises a split sleeve having a plurality of axial grooves 16 in its outer surface. Drilling fluid circulated downwardly through the core barrel 12 may pass

3

through the grooves or recesses 16 in the core catcher and then downwardly through circulating passages 17 which extend through the body of the core bit. The cutting surface 18 of the bit is disposed at the lower end thereof and includes the usual diamonds which are embedded in said cutting surface. An inner core barrel 19 is mounted within the outer barrel 12 and has its lower end axially centered by means of spacing ribs 20. Usually, the inner barrel 19 is rotatably mounted with respect to the outer barrel 12.

The improved closure A comprises a tubular body 21 having a bore 22 extending entirely therethrough. An external shoulder 23 is formed at the upper portion of the tubular body 21 and this shoulder is adapted to engage the upper end of the core catcher 15, whereby the body 21 will be supported within the core bit. The body is of such length that when the shoulder 23 is in engagement with the core catcher 15, the lower portion of the body 21 projects downwardly in advance of the core bit.

A transverse partition 24 is welded or otherwise secured across the upper portion of the bore 22 and this partition or plate substantially closes the upper end of the bore. A fluid conducting tube 25 has its upper end secured within the partition 24 and extends axially through the tubular body 21. The lower end of the tube is suitably fastened within a bottom closure plate 26 which is welded or otherwise secured in the lower end of the bore 22 of the body 21. The tube 25 has its upper end communicating with the area above the upper partition 24, and its lower end communicates with the space below the bottom plate 26. Fluid which is circulated downwardly through the core barrel 12 may enter the upper end of the tubular body 21 above the partition or plate 24 through inclined inlet ports 27 which extend through the wall of the body. In this manner, fluid circulated downwardly through the drill pipe and outer barrel 12 will be directed into contact with the plate 24 and may flow downwardly through the circulating tube 25 to escape from the lower end thereof beneath the bottom plate 26 of the device. The pressure acting against the upper plate 24 will function to maintain the device A in its lowered position with the supporting shoulder 23 engaging the core catcher 15.

To permit a free circulation of the fluid flowing downwardly through the tube 25 beneath the device A, the bottom plate 26 which closes the lower end of the tubular body 21 is provided with downwardly extending lugs or cleats 28 and obviously, these lugs will prevent the bottom plate 26 from resting on the bottom of the well bore within which the apparatus is lowered. This will assure a free circulation of the fluid beneath the device. For receiving the material which will be dislodged from the bottom of the well bore upon a circulation of fluid downwardly within the lower end of the bore, the tubular body 21 is formed with a plurality of enlarged inlet openings 29. As is clearly shown in Figure 1, these openings are spaced around the body and are at a point spaced above the bottom 26 whereby a chamber or receptacle 30 is formed in the bottom of the body 21.

In the operation of the device, the same is positioned within the core bit 10 as illustrated in Figure 1, and the core-taking apparatus is lowered downwardly through the well bore. During the lowering movement, the device A

4

functions to close the lower end of the inner core barrel 19 to prevent the admission of drilling mud or other material into said barrel. The frictional engagement of the core catcher 15 with the outer wall of the tubular body 21 of the device will be ordinarily sufficient to maintain said device in position closing the lower end of said barrel. However, if desired, a shear pin or additional frictional means could be provided to assure that the device A will not move upwardly within the core barrel during the lowering operation. Upon reaching bottom, the lugs or cleats 28 will strike the bottom of the well bore, and at this time a flushing fluid which may be the ordinary drilling fluid is circulated downwardly through the drill pipe and outer barrel 12. As explained, this fluid will pass downwardly through the inclined ports 27 in the upper portion of the body 21 and will act against the upper partition or plate 24 to urge the device A downwardly and thereby maintain it in the position shown in Figure 1. A portion of the fluid will, of course, circulate downwardly through the circulating tube 25 and will escape beneath the bottom 26 of the device. The drilling fluid will also circulate downwardly through the circulating passages 17 of the bit and by controlling the pressure of the circulating fluid at this point, a turbulent or swirling action sufficient to wash the material which may have accumulated in the bottom of the well bore upwardly into the stream may be obtained. If the material consists of diamonds which may have been lost during a preceding drilling operation, the swirling or turbulent action of the fluid will flush said diamonds upwardly into the inlet openings 29 of the device A and said diamonds will, of course, fall downwardly into the receptacle 30 at the lower end of said device. Any other material or junk which may be present in the bottom of the well bore will also be agitated and washed upwardly into the receptacle 30.

After the flushing operation is complete, the drill pipe and bit 10 may be lowered to carry out the coring operation and at this time, the device A will move upwardly into the inner core barrel 19 in the usual manner. When the core has been taken and the apparatus removed, it will be evident that any material within the receptacle 30 may be recovered when the device A is removed from the inner core barrel.

A modified form of the invention is illustrated in Figures 3 and 4, wherein a combined plug and fishing basket A' includes a cylindrical body 31 having a bore 32. The lower portion of the bore 32 is reduced as indicated at 33 to provide a circulating fluid passage through the body. Inclined ports 27a are formed in the upper portion of the body 31 above an external supporting shoulder 23a. Fluid circulated downwardly through the core barrel when the device A' is in position within the core bit 10 will flow downwardly through the ports 27a and through the bore 32 and reduced passage 33 to escape from the lower end of said passage below the device. Lugs or cleats 28a are secured to the bottom of the body 31 and function in the same manner as the lugs or cleats 28 of the first form.

The lower portion of the body 31 is formed with an annular recess 34 and a sleeve or collar 35 which is secured to the body encircles the lower portion of this recess, whereby a receptacle 36 is formed within said collar or sleeve. A plurality of wings or ribs 37 are disposed within the upper portion of the recess 34 and each of said

5

wings is formed with an offset or shoulder 33 which engages the upper end of the collar or sleeve 35. The spaces between the radially extending wings 37 provide inlet openings, whereby material which is flushed upwardly from the bottom of the well bore may enter the annular receptacle 36 in the lower portion of the device A'. It will be apparent that the modification shown in Figures 3 and 4 operates in exactly the same manner as the device A of the first form.

The invention provides a simple and efficient means for closing the lower end of the core barrel 19 during lowering of the apparatus within the well bore. At the same time, the fishing basket which is formed as a part of the closure makes it possible to recover or remove diamonds, junk or other material which may have accumulated in the bottom of the well bore.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

Having described the invention, I claim:

1. The combination with a core-taking apparatus having a core bit and a core-receiving barrel, of a closure device including, a body having its upper portion mounted within the core bit with the lower portion extending downwardly in a plane below the bit, a transverse closure extending across the body, a receptacle in the lower portion of the body below the closure, said receptacle having its upper end open to the well bore within which the apparatus is lowered and means extending longitudinally through the closure and body for circulating a flushing fluid downwardly through the body and through the transverse closure in the body as well as exteriorly thereof to flush any loose material which may be present in the well bore into the receptacle.

2. The combination with a core-taking apparatus having a core bit and a core-receiving barrel, of a closure device including, a body having its upper portion mounted within the core bit with the lower portion extending downwardly in a plane below the bit, a receptacle in the lower portion of the body, said receptacle having its upper end open to the well bore within which the apparatus is lowered, means for circulating a flushing fluid downwardly through the body and also exteriorly thereof to flush any loose material which may be present in the well bore into the receptacle, and means for utilizing the fluid pressure to hold the body in position within the bit during the flushing operation.

3. A closure device for core-taking apparatus including, a cylindrical plug member having an axial bore extending entirely therethrough with the lower portion of said bore being reduced to form a restricted flow passage, the exterior lower portion of the body being formed with an annular recess, and a sleeve secured to the body and encircling the lower end of the annular recess to form an annular receptacle at the lower portion of the plug member.

4. The combination with a core-taking apparatus having a core bit and a core-receiving barrel, of a closure device adapted to be mounted within the core bit and comprising a combined plug and fishing basket, said fishing basket being disposed at the lower end of the plug and having an open upper end for receiving foreign material, said open upper end of the fishing basket being

6

located in a plane below the core bit when the closure device is mounted within said core bit and means extending longitudinally through the plug and basket for conducting a fluid downwardly through the device and for ejecting said fluid into the area below said basket.

5. A closure device for core-taking apparatus including, a body having a closed upper end and a central fluid passage therethrough and insertable within the bore of the core-taking apparatus, and an annular receptacle within the lower portion of the body, said receptacle having its upper end open to receive foreign material from exteriorly of the body, said open upper end of the receptacle being located in a plane below the bore of the core-taking apparatus when the body is within the bore.

6. A closure device for core-taking apparatus comprising, a cylindrical plug member insertable within the bore of the core-taking apparatus, and a receptacle secured to the lower portion of the member, said receptacle being in communication through enlarged openings with the area exteriorly of the member, said enlarged openings being disposed in a plane below the bore of the core-taking apparatus when the plug member is within said bore.

7. A closure device for core-taking apparatus comprising, a cylindrical plug member insertable within the bore of the core-taking apparatus, and a receptacle secured to the lower portion of the member, the upper end of said receptacle being in communication through enlarged openings with the area exteriorly of the member, the enlarged openings being disposed in a plane below the bore of the core-taking apparatus when the plug member is disposed therein, said member and receptacle having a fluid passage extending entirely therethrough, whereby fluid may be circulated downwardly through the member to the area therebelow.

8. A closure device for core-taking apparatus comprising, a cylindrical plug member, a receptacle secured to the lower portion of the member, the upper end of said receptacle being in communication through enlarged openings with the area exteriorly of the member, the enlarged openings being disposed in a plane below the bore of the core-taking apparatus when the plug member is disposed therein, said member and receptacle having a fluid passage extending entirely therethrough, whereby fluid may be circulated downwardly through the member to the area therebelow, and means on the underside of the receptacle for engaging the bottom of a well bore to space the underside of said receptacle from the bottom of the bore to assure circulation of fluid beneath said receptacle.

JOHN C. STOKES.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
470,593	Oxley -----	Mar. 8, 1892
587,779	Barker -----	Aug. 10, 1897
1,525,235	Hansen -----	Feb. 3, 1925
1,784,886	Baker -----	Dec. 16, 1930
1,819,484	Scott -----	Aug. 18, 1931
2,238,609	Sewell -----	Apr. 15, 1941
2,304,482	Simons -----	Dec. 8, 1942