

Dec. 6, 1949

C. L. DEELY
CORE BARREL

2,490,512

Filed March 12, 1946

3 Sheets-Sheet 1

Fig. 1

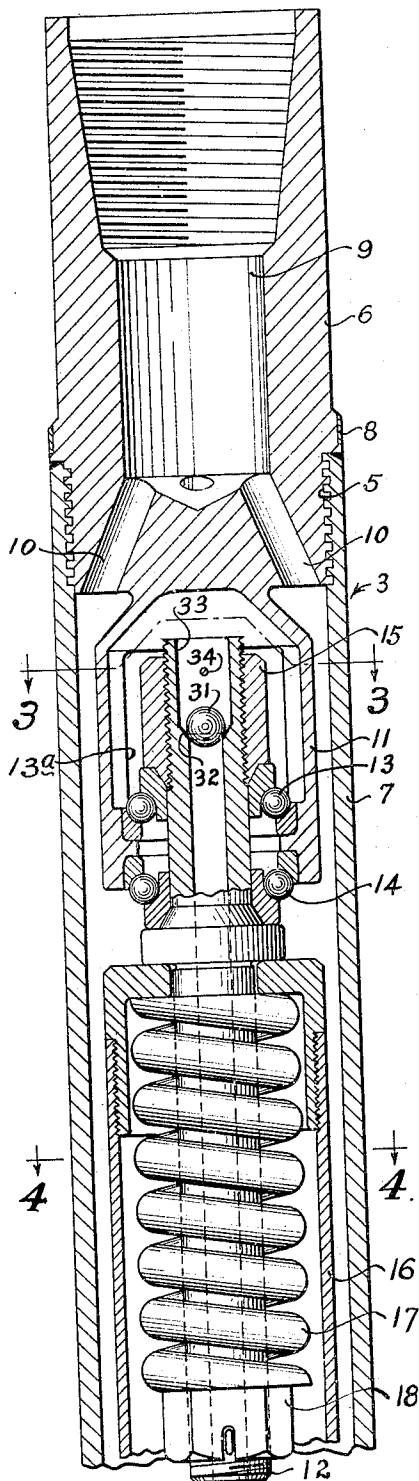
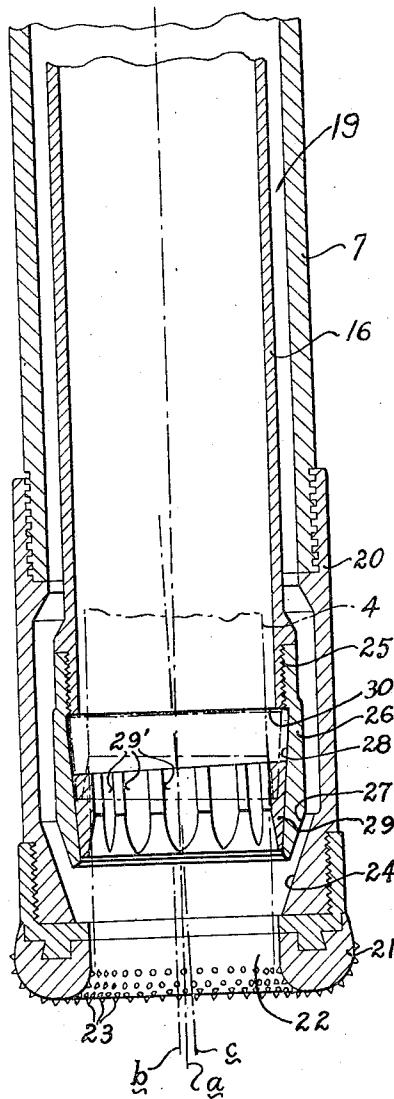


Fig.2



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Fig. 3

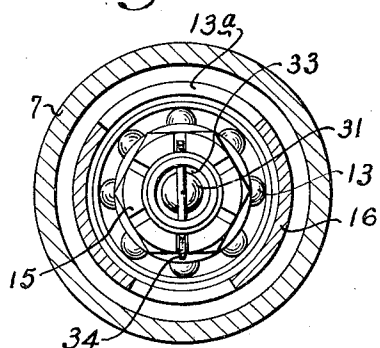


Fig. 4

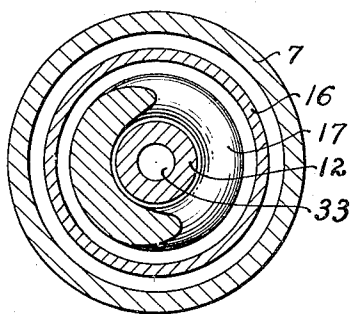


Fig. 7

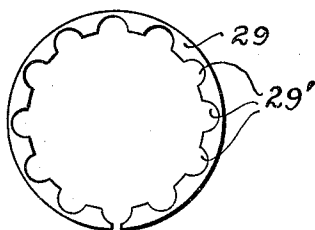


Fig. 5

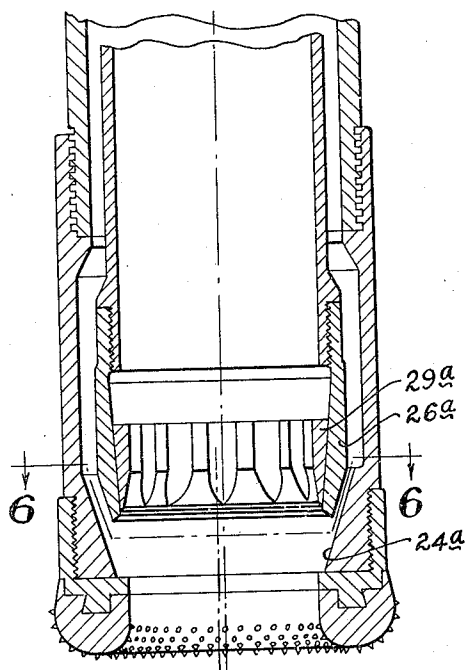
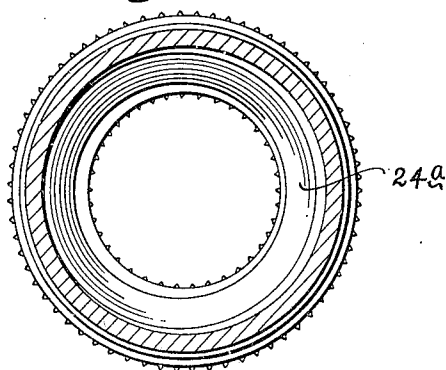


Fig. 6



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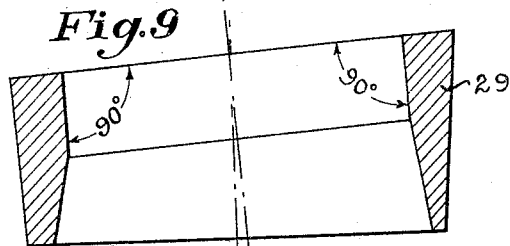
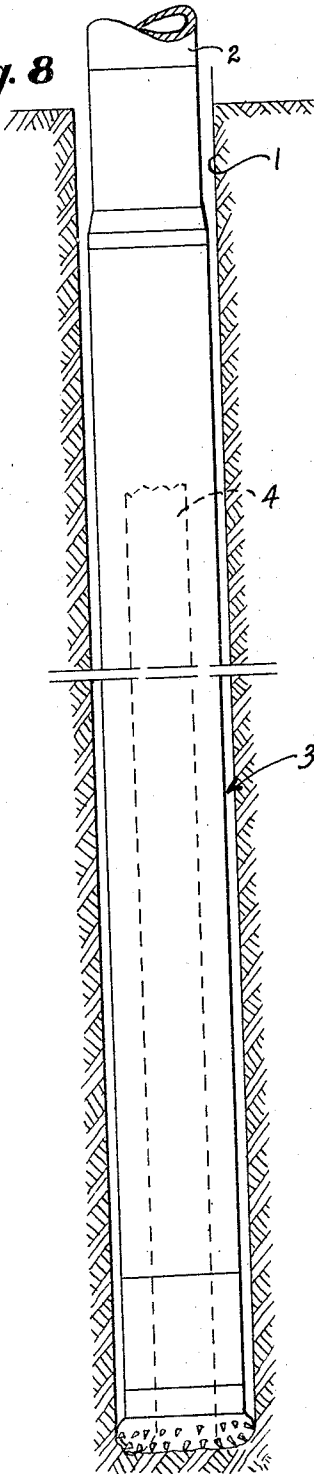
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CORE BARREL

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Fig. 8



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UNITED STATES PATENT OFFICE

2,490,512

CORE BARREL

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19 Claims. (Cl. 255-72)

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This invention relates to improvements in core barrels, and more particularly to core barrels associated with a cutter which is rotated to cut a core from the earth strata during the drilling of a well.

It has long been customary to take cores from a well during the drilling process, but in soft and fractured formations the core frequently disintegrates due to the action thereon of the drilling fluid; and in very hard formations the core is frequently difficult to remove from the well due to the inability of core devices in use heretofore to break off the core near the lower end thereof.

The primary object of the present invention is to provide a core drill and core catcher whereby a core is formed, broken off, and removed from the well with a minimum of disintegration and shattering.

A still further object of this invention is to provide in a core drill and core catcher for a minimum area of the core to be exposed to the action of the drilling fluid while the core is being cut or formed.

Another object of this invention is to provide a normally non-rotatable core-receiving element which may be engaged with a rotatable portion of the core drill to provide for the clean-cut severing of the core from the earth stratum.

According to the preferred embodiment of my invention a non-rotatable core catching tube is disposed so that the lower end thereof will extend substantially to the lower end of the core cutter tube. This non-rotatable tube is positioned on bearings so that the core may be fed therinto while the core drill is being operated. A substantially annular, resilient, core catching element is adapted to expand when the core enters said core receiving tube and to contract upon the downward movement of the core relative thereto.

By having the core-receiving tube extend to a point near the bottom of the core drill or cutter, the core is protected against appreciable abrasive action of the drilling fluid. Just enough of the core is exposed to the action of the drilling fluid to flush away the cuttings as the core enters the tube 16.

The invention also provides means for severing the core substantially at the lower end of the core-receiving tube. Dual severing action is obtained, preferably, by making the inner tapered bore of the outer rotatable member eccentric with respect to the axial center of the core-receiving tube and core drill bit, and by providing the axis of the core catcher divergent to the axis of the

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core drill. When the core catcher is seated in the core-receiving tube, however, this core catching element is so positioned that it will normally move upward and self-align with the core as the core moves into the non-rotatable core-receiving tube.

An embodiment of this invention, together with a modification thereof, are illustrated in the accompanying drawings, in which:

Fig. 1 is a fragmentary vertical section of the upper portion of the core drill;

Fig. 2 is a similar view of the lower portion thereof;

Fig. 3 is a horizontal section on the line 3-3 of Fig. 1;

Fig. 4 is a similar view on the line 4-4 of Fig. 1;

Fig. 5 is a view similar to Fig. 2, but showing a modified form of core catcher;

Fig. 6 is a cross section thereof on the line 6-6 of Fig. 5;

Fig. 7 is a top plan view of the core catcher removed from the device;

Fig. 8 is a partial vertical section through a well showing a drill stem and core drill, with the core shown in dotted outline; and

Fig. 9 is a sectional view of the core catcher of Fig. 2, removed from the core barrel.

Referring to Fig. 8, the numeral 1 designates a conventional well formed as a bore in the earth formation. A rotary drill stem 2 extends down through the bore 1, and supports a core barrel generally designated at 3 on the lower end thereof. As the well is drilled, the core 4, indicated in dotted outline in Fig. 8, is formed, as will be described in detail hereinafter.

The core barrel 3 is attached to the drill stem 2 by a threaded tool joint 5 formed in the body 6 which is screw threaded to the upper end of an outer tube 7 which may be of any desired length, but, for purpose of illustration, may be twenty feet or more in length.

The body 6, preferably has a hardened wear ring 8 formed integral therewith immediately above the outer tube 7. The hardened ring 8 may be made of tungsten carbide, "Stellite," or other well-known hard-surfacing material.

The body 6 has an axial opening 9 therein, which connects with diverging passages 10 that lead to the interior of the outer tube 7. A bearing support 11 is formed on the lower end of the body 6 and is adapted to receive and support a tubular pin 12, on bearings 13 and 14. A nut 15 is threaded on the pin 12 above the bearings 13 so as to position properly the pin 12 with respect to the bearings. Bearing 13 may be in-

serted through a hole 13a by turning said bearing obliquely during the insertion through the hole.

An inner core receiving tube 16 is mounted on the pin 12 below the bearings 13 and 14, and suspended by a spring 17 interposed between a nut 18 threaded on the lower end of the pin 12 and the closed upper end of the tube 16. The tube 16 is mounted axially of the outer tube 7, but spaced from the inner wall thereof to provide an annular passage 19 therebetween, so as to permit drilling fluid to be circulated during the drilling operation.

The lower end of the outer tube 7 has a sleeve 20 Fig. (2) threaded thereon. The sleeve 20 has a core drill bit 21 threaded on the lower end thereof. The core drill bit or cutter 21 has an axial opening 22 formed therein, which opening is concentric with respect to the outer tube 7, and normally concentric with respect to the inner core receiving tube 16. The core drill bit 21 may be formed of any type of cutter, but the form shown preferably, has hardened inserts 23, such as diamonds or tungsten carbide elements.

The lower portion of the sleeve 20 has a tapered inner bore 24 which is preferably eccentric with respect to the axial opening 22, as is best illustrated in Figs. 2 and 6. The inner core-receiving tube 16 has its lower end threaded at 25 and to which is attached a core catcher retainer 26. The core catcher retainer 26 has a tapered outer surface 27 at its lower end, which surface is concentric with respect to the inner core receiving tube 16. The inner bore or surface 28 of the retainer 26 is tapered and concentric to the inner tube 16, and is adapted to receive and support a spring core catcher 29. The core catcher 29 has an outer tapered surface complementary to the inner surface 28, and adapted to engage wedgingly the inner tapered surface of the core catcher retainer 26.

The bore of the core catcher 29 is tapered upwardly and inwardly from its lower extremity for a portion of its length, so as to admit the core 4 into the lower end thereof, which core catcher 29 expands sufficiently to admit the core but fits snugly therearound. The core catcher 29 remains non-rotatable at all times during the core cutting operation as when expanded against the inner wall 28 of the core receiving barrel, which is also normally non-rotatable, therefore no turning action takes place. The core will cause the core catcher 29 to move upwardly from the position shown in full lines, to the position shown in dotted lines in Fig. 2, so that the upper surface of the core catcher 29 will rest against the shoulder 30 formed by the lower end of the inner tube 16. With the upper surface of the core catcher 29 resting against the shoulder 30, the axial opening of the core catcher 29 will be in alignment with the inner bore of the inner core-receiving tubular member 16. The tapered lower portion of the core catcher 29 allows the core to pass freely thereinto, but, once the core starts into the catcher it minimizes the likelihood of the core catcher 29 tilting and breaking off the core prematurely. It is preferable to have the core catcher 29 tapered for a portion of its length with the remainder of its length forming a cylindrical portion of a size slightly smaller than the core as cut from the earth formation.

The core catcher 29 has inner axial grooves 29', Fig. 7, around the inner circumference thereof, and has a split spring ring so that the core catch-

er 29 may expand evenly as it receives the core therein during the drilling operation.

The tubular pin 12 has a ball check valve 31 seated on a tapered seat 32 in the upper end thereof so as to permit the escape of drilling fluid and air upward through the axial opening 33 while the core enters the tube 16. A retaining pin 34 is fixed above the ball check valve 31 to prevent the ball from becoming displaced. The ball check valve 31 serves to prevent the entrance of drilling fluid into the top of the inner core-receiving tube 16 which might cause disintegration of the core or might force it out of the lower end of the tube 16.

In the operation of the preferred form of the invention, as shown in Figs. 1-4, and 7, the drill stem 2 is rotated in the conventional manner, which causes the core barrel 3 to rotate so as to cut away an annular portion of the earth stratum, leaving the undisturbed core 4 in the center as the core drill bit 21 moves downward therearound. Drilling fluid is circulated downward through the annular passage 19 and between the tapered inner surface 24 of the sleeve 20 and the tapered outer surface 27 of the core catcher retainer 26, thence downward through and around the bottom of the core drill bit 21 and up around the outer tubular member 7 to the top of the well. The only area of the core 4 which is exposed to the action of the drilling fluid is between the lower end of the tapered outer surface 27 and the bottom of the core drill bit 21, which is a comparatively short distance.

As the core receiving tube 16 moves downward around the core 4, the core catcher 29 will move from the position shown in full lines in Fig. 2, to the position shown in dotted lines therein. During the cutting operation, weight is held on the core barrel 3 so as to cause a cutting action by the diamond cutters 23. After a sufficient length of core has been cut, the drill stem 2 is raised slightly, which will cause the core catcher 29 to move downward along the tapered surface 28, thereby gripping the core 4. With the core catcher 29 having a diverging inner bore relative to the axis of the tapered surface 28, the core catcher will tilt slightly in an effort to align its outer surface with the inner tapered surface 28 of the core catcher retainer 26. This tilting action causes a cleavage of the core 4 and normally causes the core to break off. However, if the core does not break due to this action, a continued pull will cause a contraction of the core catcher 29 to grip the core tightly and hold the inner core-receiving tube 16 against upward movement, causing spring 17 to yield until the inner tapered bore 24 contacts the outer tapered surface 27 of the core catcher retainer 26. Since the inner tapered surface 24 is eccentrically disposed with respect to core drill bit 21 and the outer tube 7, the inner core-receiving tube 16 will be slightly out of axial alignment with the outer tube 7 and the axial bore 22 of core drill bit 21. Then upon rotation of the outer tube 7, while maintaining the upward pull on the core barrel 2, the two members will clutchingly engage, which will transmit an eccentric torsional motion to the lower portion of the core 4, which will cause the core to break off.

During the coring operation, the core receiving tube 16 is maintained in a non-rotating condition due to the swiveling action of the bearings 13 and 14. In this manner, the core is undisturbed, thereby preventing disintegration or wear there-

on, which would result from friction caused by rotation, which has been a difficulty experienced heretofore. However, during the severing of the core, the outer tapered surface 27 on the lower end of the core catcher retainer 26 and the tapered inner bore 24 on the sleeve 20 form a clutch to cause the core-receiving tube 16 to rotate in unison with the outer tube 7. The core catcher 29 is grooved on its inner side and grips the core, which prevents said core catcher 29 from turning relative to tube 16 and sleeve 20 when the core catcher 29 is wedgingly engaged with the inner tapered bore 28 of the core catcher retainer.

After the core is broken loose, the core barrel is raised out of the bore hole of the well in the usual manner, and the core is removed therefrom by removing the sleeve 20 and the core catcher retainer 26.

The form of the invention described above is particularly adaptable for use in very hard formations, because of the double breaking action while the core receiving tube is rotating with the outer tube, for severing the core.

In the preferred form of the invention, as shown in Figure 2, it is to be pointed out that the center line *a* is the true center of the axial opening of the core drill bit 22. Center line *b* is the true center of the tapered bore 24, which tapered bore is eccentric with respect to opening 22. Center line *c* is the true center of the bore of core catcher 29, and when in seated position, is angularly divergent with respect to center line *a*; but when in raised position, as indicated in dot-dash outline, in Figure 2, with the upper face against shoulder 30, the opening therethrough will align with opening 22.

It will be readily appreciated that when core catcher retainer 26 moves downward and is forced to assume a position within the taper 24, that it will move over so the center line thereof will coincide with center line *b*. Furthermore, when pull is exerted upward, the core catcher 29 will slip downward into the taper and align itself so as to present an axis such as indicated by the center line *c*. The component action of the eccentric movement coupled with the bending action of the core by the slip 29 seeking alignment with the tapered surfaces 28, will cause a dual breaking action.

The form of the invention shown in Figs. 5 and 6 has a core catcher 29a that is similar in construction to the core catcher 29, except that the bore of the core catcher 29a is axial with respect to the outer tapered surface thereof.

The operation of this form of the invention is the same as that of the form described above, except with respect to the diverging axial bore of the core catcher 29. The core catcher 29a will clamp the core securely until the tapered member 26a moves downward to engage the eccentric tapered bore 24a, thereby giving the core an eccentric motion while rotating the core barrel 3, when in slightly raised position. This modified form of the invention is well adapted for use in softer formation where breakage is easier.

It is also to be pointed out that, in the preferred form of the invention, the core being cut in the earth's stratum is received into the inner tube which is not rotated during the core cutting action, while drilling fluid is circulated downward past the core, with a relatively small area of the core being exposed to the abrasive action of the drilling fluid.

When the core is formed of sufficient length, the upward movement of the barrel 3 will cause the expansible core catcher to contract around the core sufficiently to prevent its turning relative to the core catcher and inner tube. Then upon further upward movement of the core barrel, the core is slightly tilted by the action of the core catcher, causing a breaking action. Then upon further upward movement, the core catcher retainer engages an eccentric tapered bore to form a clutch so that the inner core-receiving tube will rotate in unison with the outer tube 7. This rotation will cause an eccentric action at the lower end of the core-receiving tube 16 to cause a breaking action on the lower end of the core.

With a core barrel of this construction, the maximum core recovery, in both hard and soft formations, can be achieved.

Having thus described the invention what is claimed is:

1. A core barrel comprising a rotatable outer tubular member, an inner tubular member adapted to receive the core therein and sleeved within said outer member, means at the lower ends of said inner and outer tubular members for clutching them together for rotatable or upward vertical movement as a unit upon relative axial movement between said members, a journal carried by the outer member, a shaft rotatably suspended on said journal, and means resiliently mounting said inner member on said shaft for axial movement of the outer member relative to said inner tubular member to enable clutching engagement between said tubular members, said journal providing for rotation of the outer member relative to said inner member when not so engaged.

2. A core barrel comprising a rotatable outer tubular member, an inner tubular member adapted to receive the core therein and sleeved within said outer member, means at the lower ends of said inner and outer tubular members for clutching them together for rotatable or upward vertical movement as a unit upon relative axial movement between said members, a journal carried by the outer member, a shaft rotatably suspended on said journal, means resiliently mounting said inner member on said shaft for axial movement of the outer member relative to said inner tubular member to enable clutching engagement between said tubular members, said journal providing for rotation of the outer member relative to said inner member when not so engaged, said shaft having an axial passage-way therethrough for fluid discharge from within said inner member upon movement of the core into said inner member, and check-valve means for controlling said axial passage.

3. A core barrel comprising a rotatable outer tubular member, an inner tubular member adapted to receive the core therein and sleeved within said outer member, means at the lower ends of said inner and outer tubular members for clutching them together for rotatable or upward vertical movement as a unit upon relative axial movement between said members, a journal carried by the outer member, a shaft rotatably suspended on said journal, and means resiliently mounting said inner member on said shaft for axial movement of the outer member relative to said inner tubular member to enable clutching engagement between said tubular members, said journal providing for rotation of the outer mem-

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ber relative to said inner member when not so engaged, said journal comprising open anti-friction bearings open to the space within the outer tubular member for washing action thereof by fluid flowing through said outer tubular member.

4. A core barrel comprising a rotary outer tubular member, an inner tubular member carried by said outer member and sleeved therein, a core drill bit carried by the outer tubular member at the lower end thereof, said inner tubular member having the lower end thereof extending downwardly in the outer tubular member to a point adjacent said core drill bit, a fluid passage between said tubular members extending lengthwise thereof and having an outlet end between the lower end of the inner member and the core drill bit, and a core catcher supported by the inner tubular member above said passage outlet end, said core catcher comprising an annular contractable spring having an inner opening therethrough constructed on an axis divergent relative to the axis of said inner member.

5. A core barrel comprising an outer tubular member, an inner tubular member supported within said outer member and sleeved therein and adapted to receive the core, and a core catcher mounted in the inner member and constructed substantially annular and radially yieldable to engage the core, said core catcher being shaped to provide an inner cylindrical surface having an axis inclined relative to the axis of the outside circumference of said core catcher.

6. A core barrel comprising a rotary outer tubular member, an inner tubular member sleeved in said outer member and adapted to receive the core therein, a split, tapered, resilient core catcher ring carried by the inner tubular member for seating in a downwardly converging tapered seat in the lower end thereof in position to engage the core therein, and means mounting said core catcher eccentric relative to the outer tubular member.

7. A core barrel comprising a rotatable outer tubular member, a barrel member within said outer member in position to receive a core therein, a bearing support carried by the outer member and of skeleton formation, a tubular shaft supporting the barrel member and extending into the skeleton support, means journaling the shaft on the skeleton support with the upper end of the shaft having open communication through the skeleton support into the outer member around the barrel member, whereby when the barrel member is held non-rotatable by contact with the unsevered core, the outer tubular member may rotate with respect thereto, and means provided within the non-rotating barrel member for gripping the core therein upon upward movement of the outer barrel.

8. A core barrel comprising a rotatable outer tubular member, a barrel member within said outer member in position to receive a core therein, a bearing support carried by the outer member and of skeleton formation, a tubular shaft supporting the barrel member and extending into the skeleton support, means journaling the shaft on the skeleton support with the upper end of the shaft having open communication through the skeleton support into the outer member around the barrel member, means resiliently mounting the barrel member on the lower end of the shaft and supporting the barrel member thereby providing for rotation of the outer member relative

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to the non-rotatable barrel member, said shaft providing an open passageway for fluid discharge from within the barrel member upon movement of the core therein, means provided within the non-rotating barrel member for gripping the core, and check valve means within the skeleton member and at the upper end of the shaft for controlling the passageway therethrough.

9. A core barrel comprising a barrel member having an open lower end adapted to receive a core therein, said barrel having a downwardly and inwardly tapered inner surface adjacent the lower end thereof, a core catcher within the barrel and having an external surface in position to seat on said tapered surface of the barrel member, said core catcher having an axis of the outer tapered conical member divergent to the axis of the outer cylindrical core barrel while the core is passing therethrough and having the axis of the inner bore of the core catcher in axial alignment with the outer core barrel while the core catcher is in raised position, and having the axis of the tapered conical member in axial alignment with the outer diameter of the cylindrical core barrel and the axis of the inner bore of the core catcher divergent to the axis of the outer core barrel when in seated position.

10. A core barrel comprising a barrel member having an open lower end adapted to receive a core therein, an outer drill member supporting said barrel member and longitudinally movable relative thereto, said barrel having a downwardly and inwardly tapered inner surface adjacent the lower end thereof, a core catcher within the barrel and having an external surface in position to seat on said tapered surface of the barrel member, said core catcher having an axis of the outer tapered conical member divergent to the axis of the outer cylindrical core barrel while the core is passing therethrough and having the axis of the inner bore of the core catcher in axial alignment with the outer core barrel while the core catcher is in raised position, and having the axis of the tapered conical member in axial alignment with the outer diameter of the cylindrical core barrel and the axis of the inner bore of the core catcher divergent to the axis of the outer core barrel when in seated position, said core catcher being constructed for yieldable contracting action upon upward movement of the outer drill member relative to the barrel member to break the core.

11. A core barrel comprising a rotatable outer member, an inner tubular member adapted to receive the core therein and sleeved within said outer member, a downwardly tapered seat formed within the lower end of said core receiving member and an inwardly protruding shoulder at the upper end of said taper, a complementary tapered, split core catcher grip ring having a shoulder on the upper end for complementary engagement with the inwardly protruding shoulder formed within said core receiving member, so as to form a friction element to prevent relative rotation between the core receiving element and the core, upon downward movement of the core receiving element over the core, a journal carried by the outer member, a shaft rotatably suspended on said journal, and a coiled spring sleeved over the shaft and supporting said inner member on said shaft for axial movement of the outer member relative thereto and mounted for rotation of the outer member relative to said inner member.

12. A core barrel comprising a tubular drilling member having a core drill on the lower end

thereof, a core receiving tube sleeved in the drilling member, a downwardly tapered seat formed within the lower end of said core receiving member and an inwardly protruding shoulder at the upper end of said taper, a complementary tapered, split core catcher grip ring having a shoulder on the upper end for complementary engagement with the inwardly protruding shoulder formed within said core receiving member, so as to form a friction element to prevent relative rotation between the core receiving element and the core, upon downward movement of the core receiving element over the core, a body supporting the drilling member, a shaft journaled on the body, and a coiled spring supporting the tube on the shaft for yielding movement of the tube lengthwise relative to the drilling member.

13. A core barrel comprising a tubular drilling member having a core drill on the lower end thereof, a core receiving tube sleeved in the drilling member, a downwardly tapered seat formed within the lower end of said core receiving member and an inwardly protruding shoulder at the upper end of said taper, a complementary tapered, split core catcher grip ring having a shoulder on the upper end for complementary engagement with the inwardly protruding shoulder formed within said core receiving member, so as to form a friction element to prevent relative rotation between the core receiving element and the core, upon downward movement of the core receiving element over the core, a body supporting the drilling member, means supporting the tube on the body for yielding movement lengthwise relative to the tubular drilling member, said supporting means including a journal for rotation of the drilling member relative to the tube, said tube having the lower end thereof disconnected from the lower end portion of the drilling member and core drill for freedom of fluid circulation therebetween.

14. A core barrel comprising a tubular drilling member having a core drill on the lower end thereof, a core receiving tube sleeved in the drilling member, a downwardly tapered seat formed within the lower end of said core receiving member and an inwardly protruding shoulder at the upper end of said taper, a complementary tapered, split core catcher grip ring having a shoulder on the upper end for complementary engagement with the inwardly protruding shoulder formed within said core receiving member, so as to form a friction element to prevent relative rotation between the core receiving element and the core, upon downward movement of the core receiving element over the core, a body supporting the drilling member, means supporting the tube on the body for yielding movement lengthwise relative to the tubular drilling member, said supporting means including a journal for rotation of the drilling member relative to the tube.

15. A core barrel comprising a tubular drilling member having a core drill on the lower end thereof, a core receiving tube sleeved in the drilling member, a downwardly tapered seat formed within the lower end of said core receiving member and an inwardly protruding shoulder at the upper end of said taper, a complementary tapered, split core catcher grip ring having a shoulder on the upper end for complementary engagement with the inwardly protruding shoulder formed within said core receiving member, so as to form a friction element to prevent relative rotation between the core receiving ele-

ment and the core, upon downward movement of the core receiving element over the core, a body supporting the drilling member, means supporting the tube on the body for yielding movement lengthwise relative to the tubular drilling member, said supporting means including a journal for rotation of the drilling member relative to the tube, said tube having the lower end thereof disconnected from the lower end portion of the drilling member and core drill for freedom of fluid circulation therebetween.

16. A core barrel comprising a tubular drilling member having a core drill on the lower end thereof, a core receiving tube sleeved in the drilling member, a downwardly tapered seat formed within the lower end of said core receiving member and an inwardly protruding shoulder at the upper end of said taper, a complementary tapered, split core catcher grip ring having a shoulder on the upper end for complementary engagement with the inwardly protruding shoulder formed within said core receiving member, so as to form a friction element to prevent relative rotation between the core receiving element and the core, upon downward movement of the core receiving element over the core, a body supporting the drilling member, a shaft journaled on the body, a coiled spring supporting the tube on the shaft for yielding movement of the tube lengthwise relative to the drilling member.

17. A core barrel comprising an outer rotatable tubular member, an inner tubular member resiliently sleeved within said outer tubular member, which inner member is adapted to receive a core, means mounting said inner tubular member to allow for rotation of said outer tubular member relative to the inner tubular member when said outer tubular member is in a lowered position, a tapered core catcher ring seated within a complementary tapered seat in the inner tubular member for engaging the core to normally hold the inner tubular member against rotary movement relative to the core, and means for clutchingly inter-engaging said inner tubular member with said outer tubular member upon upward movement of said outer tubular member.

18. A core barrel comprising an outer rotatable tubular member, an inner tubular member resiliently sleeved within said outer tubular member, the inner tubular member being adapted to receive a core, means mounting said inner tubular member to permit rotation of said outer tubular member relative to the inner tubular member when said outer tubular member is in a lowered position, a tapered core catcher ring seated within a complementary tapered seat in the inner tubular member for engaging the core to normally hold the inner tubular member against rotary movement relative to the core, and cooperative bevel clutch means formed between said inner tubular member and said outer tubular member so that upon relative upward movement of said outer tubular member said inner tubular member will engage said outer tubular member to rotate in unison therewith.

19. A core barrel comprising an outer tubular member, an inner tubular member resiliently sleeved within said outer tubular member and adapted to receive a core therein, a core catcher within said inner tubular member, said resiliently mounted inner tubular member being normally out of engagement with said outer tubular member during the normal core cutting operation,

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means at the lower ends of said inner and outer tubular members for clutching them together for rotatable or upward vertical movement as a unit upon relative axial movement between said members, means mounting said inner tubular member with respect to said outer tubular member for rotation of said outer tubular member relative to the inner tubular member while the inner tubular member is held substantially stationary relative to the core, said resilient mounting of said inner member adapted to permit sufficient axial movement of said outer tubular member with respect to said inner tubular member to cause interengagement of the clutching means of said tubular members upon upward movement of said outer tubular member so as to transmit a pulling and a torsional action to said core.

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