Aug. 1, 1939. G. C. OLIVER 2,167,991

SAND LINE CORE BARREL

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FIG. 1

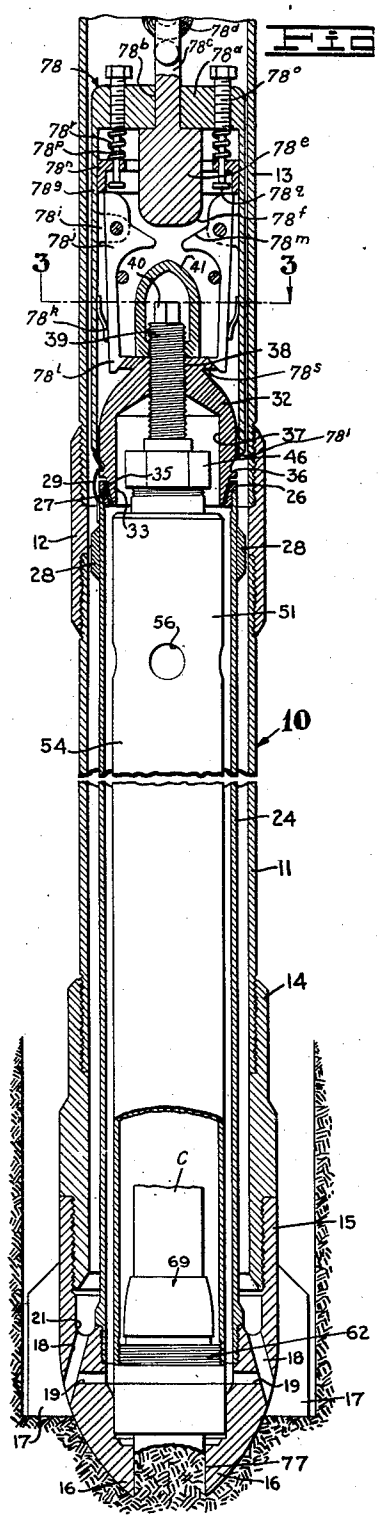
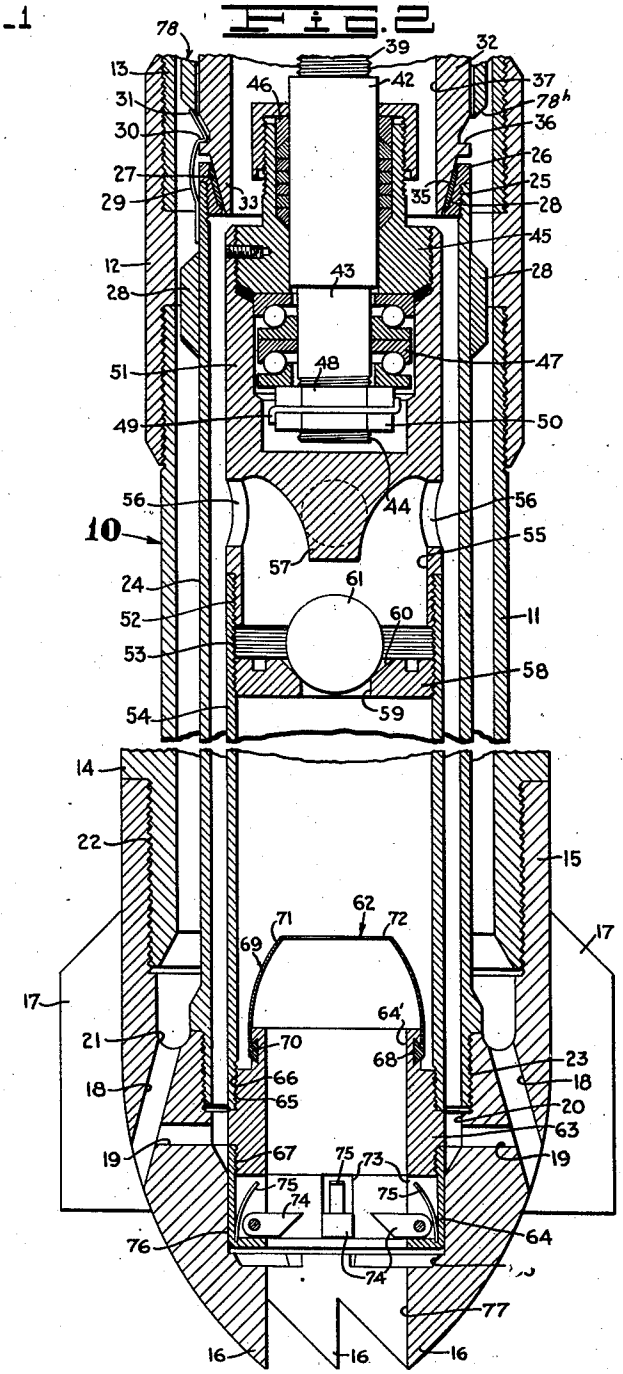


FIG. 2



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FIG. 3

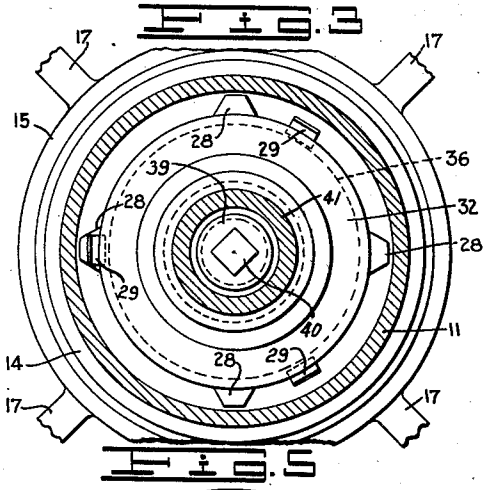


FIG. 5

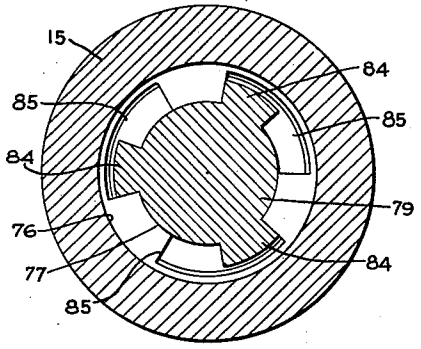


FIG. 4

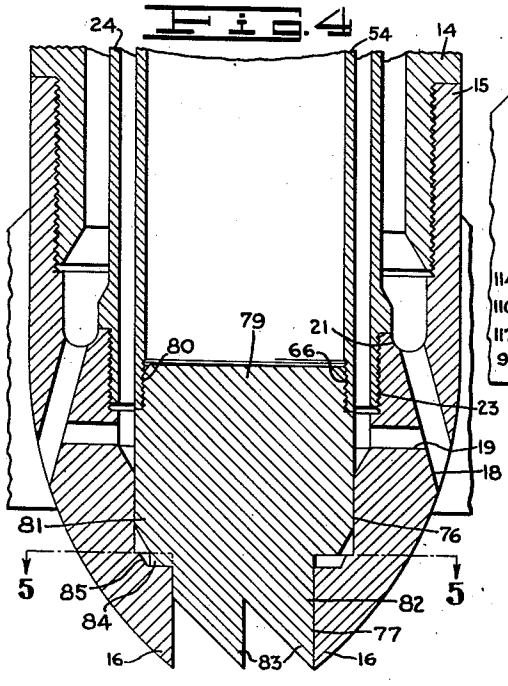
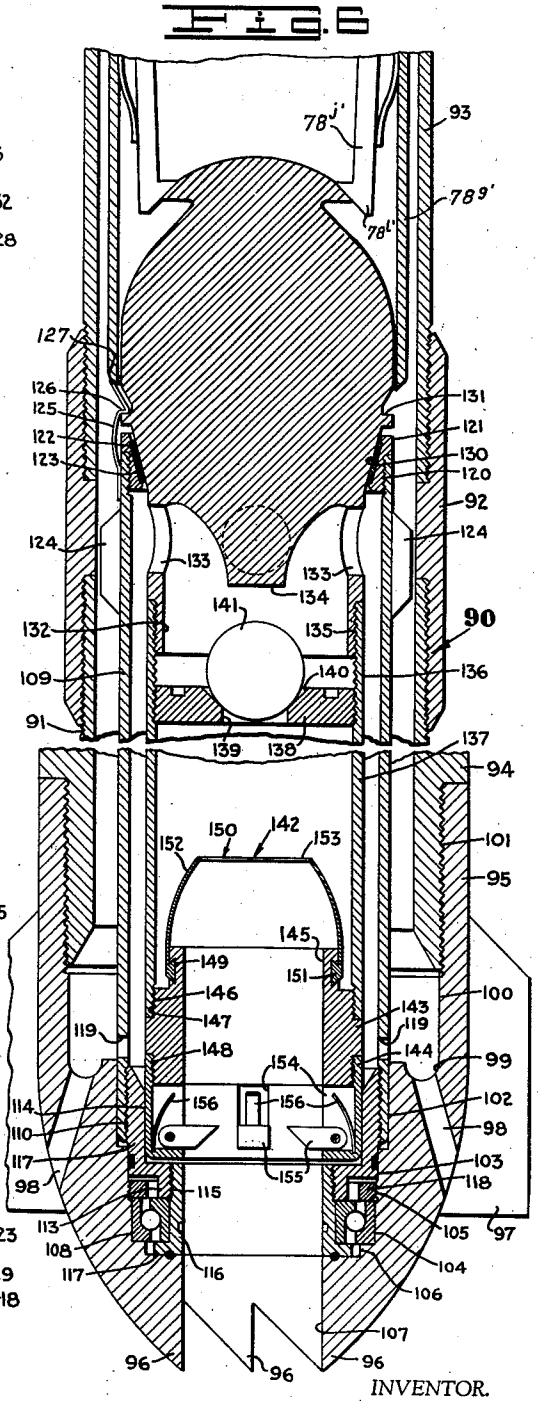


FIG. 6



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Patented Aug. 1, 1939 2,167,991

UNITED STATES PATENT OFFICE

2,167,991

SAND LINE CORE BARREL

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Application May 16, 1938, Serial No. 208,213

8 Claims. (Cl. 255—72)

This invention relates to improvements in core barrels.

The general object of the invention is to provide a core barrel including an inner and an outer member wherein novel means is provided for supporting the members.

A further object of the invention is to provide a core barrel including an outer barrel and a core retainer with novel means for supporting the core retainer.

Another object of the invention is to provide a core barrel including an outer member and a core retainer including novel means whereby the core retainer may be raised and lowered on a sand line.

An additional object of my invention is to provide a novel bit member for use with a core barrel.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a central sectional view through a string of drill pipe showing my improved core barrel;

Fig. 2 is a fragmentary enlarged section through my improved core barrel;

Fig. 3 is an enlarged section taken on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary view of the bit end of the core barrel showing the core catcher replaced by a bit portion;

Fig. 5 is a section taken on line 5—5 of Fig. 4;

Fig. 6 is a view similar to Fig. 2 showing a modified means of mounting the core retainer.

Referring to the drawings by reference characters I have shown my invention as embodied in a core barrel which is indicated generally at 10. As shown the core barrel includes a shell 11 which is connected to a coupling 12 which is in turn connected to a string of drill pipe 13. The lower end of the shell 11 is connected to a collar 14 which has a bit 15 secured to the lower end thereof.

The bit 15 includes cutting teeth 16 and reamer blades 17. The bit 15 is provided with downwardly directed circulation apertures 18 and lateral apertures 19. The apertures 19 communicate at their inner ends with a bore 20 of the bit and at their outer ends intersect the apertures 18. The apertures 18 at their upper ends communicate with a peripheral channel 21 in the inner wall of the bit 15. The upper end of the bit has threads 22 thereon which engage similar threads on the collar 14 and the bit bore 20 includes a threaded portion 23 below the channel 21.

Positioned in the shell 11 I provide an outer core barrel 24 the lower end of which is externally threaded to engage the threads 23 of the bit and adjacent the upper end the outer core barrel is internally threaded as at 25 to receive a similarly threaded bushing member 26. As shown the inner face of the bushing 26 is downwardly convergently tapered and has a resilient seat member 27 which may be made of rubber positioned in a groove 28 in the tapered face of the bushing.

Positioned on the outer surface of the outer barrel 24 below the upper end thereof I provide a plurality of spacer lugs 28 which may be secured to the barrel 24 as by welding. Mounted on the barrel 24 adjacent the upper end thereof I provide a plurality of spring clips 29 having hooked end portions 30 positioned above the end of the barrel 24 and including upwardly and outwardly inclined release portions 31.

Above the outer barrel I provide a head member 32, the lower end 33 of which is tapered as at 35 to match the taper of the bushing 26 and is adapted to engage the resilient seat member 27. Above the tapered portion 35 the head has a peripheral groove 36 therein in which the hook portions 20 of the spring clips 29 are positioned. The head 32 has a recess 37 therein which opens through the lower end of the head and a reduced threaded aperture 38 which opens through the upper end of the head and into the recess 37.

Positioned in the threaded aperture 38 I provide a threaded stem 39 the upper end of which includes a wrench engaging portion 40 and which has a cap nut 41 thereon locking it to the head 32. The threaded stem 39 includes a cylindrical portion 42 and a reduced cylindrical portion 43 which terminates in a threaded portion 44. Mounted on the cylindrical portion 42 I show a plug 45 which is chambered to receive a packing gland 46.

Mounted on the reduced portion 43 I show antifriction bearings 47 which preferably are of the radial thrust type. The upper bearing element engages the plug 45 while the lower bearing element engages a threaded nut 48 on the threaded end 44. A lock washer 49 serves to hold the nut 48 in place and a lock nut 50 serves to hold the washer 49 in place.

The outer surface of the plug 45 is threaded to receive the threaded end of a support member 51 the lower end of which is threaded at 52 to engage internal threads 53 of a core retaining bar-

rel 54. The support member 51 has a recess 55 therein which opens through the lower end thereof. A plurality of apertures 56 in the support member open into the recess 55. The bottom of the member 51 is formed to provide a depending circulation diverging member 57.

Positioned in the core retainer below the support member 51 I provide a plug 58 which is externally threaded to engage the threads 53 of the retainer 54. The plug 58 has a central aperture 59 therethrough the upper portion of which includes a tapered valve seat 60 to receive a valve ball 61. The previously mentioned circulation diverging member 57 also acts to limit the upward movement of the ball valve 61.

At the lower end of the core retainer barrel I provide a core catcher assembly which is indicated at 62 and includes an upper member 63 and a lower member 64 which have coaxial bores 64' therethrough. The upper member is externally threaded as at 65 to engage a threaded portion 66 of the core retainer 54 and is threaded as at 67 to engage a similarly threaded portion of the lower member 64. The upper member 53 above the threads 65 includes an external dovetail groove 68 in which a rubber catcher member 69 is vulcanized. The rubber catcher 69 includes a dovetail portion 70 which fits in the groove 68 and an upwardly and inwardly extending portion 71 having an aperture 72 in the upper end thereof.

The lower member 64 includes a plurality of slots 73 opening into the bore 64' in which core catchers 74 are pivotally mounted. Springs 75 normally urge these catchers inwardly. The lower member 64 of the core catcher fits within a reduced bore 76 in the drill bit 15. The bit further includes an aperture 77 which opens through the bottom thereof and into the bore 76.

In order to remove the inner core barrel 54 from the well I provide a coupling member indicated generally at 78 and which includes an end member 78*a* which has a central aperture 78*b* mounted on a pull member 78*c* which is connected to the sand line 78*d*. The pull member includes a head 78*e* the lower end of which is bevelled as at 78*b*. The end member 78*a* is secured upon the upper end of a sleeve 78*g*, the lower part of which is bevelled as at 78*h*. The sleeve 78*g* includes inwardly directed bosses 78*i* on which dogs 78*j* are pivoted. The dogs are urged inwardly by springs 78*k* and include prongs 78*l*. The dogs also include cam surfaces 78*m*. Within the sleeve 78*g* a flanged collar 78*n* is slidably mounted. Screws 78*o* pass through the end member 78*a* and have reduced ends 78*p* which pass through the collar 78*n* and included heads 78*q*. Spring 78*r* on the portion 78*p* urge the flanged collar 78*n* downwardly.

In operation the core barrel is assembled on the drill string as shown in Figs. 1 and 2 and the bit 15 lowered to the bottom of the well hole. Thereafter the bit is rotated through the medium of the drill string and cuts a core C which as the bit moves downwardly passes through the core catcher 62 into the core retaining barrel 54.

As the core is entering the core retaining barrel 54 any fluid therein displaced by the core passes upwardly through the aperture 59 unseating the ball valve 61 and out through the apertures 56 into the space between the core retaining barrel and the outer barrel whence it passes through the bit apertures 19 and the bit apertures 18.

After a sufficient length of core has been obtained the drill string is held stationary. The screws 78*o* are related until the heads 78*q* pull the flanged collar 78*n* above the path of the upper ends of the dogs 78*j*. The operator then lowers the sand line 78*d*. As the sand line is thus moved the bevelled portion 78*h* of the sleeve 78*g* engages the spring clips 29 and forces them out of engagement with the head 32. As the sand line is further lowered the prongs 78*l* on the dogs 78*j* enter a groove 78*s* on the head member 32 and are held in this position by the springs 78*k*. The sand line is then pulled upwardly and the inner core barrel 54 is pulled out of the well. The length of the sleeve 78*g* is such that the lower end thereof holds the clips 29 outwardly until after the groove 36 has passed above the engaging portion of the clips.

After the core has been removed from the inner core barrel the screws 78*o* are rotated to the position shown in Fig. 1 and the operator again lowers the sand line 78*d* thus lowering the coupling member 78 and the core retaining barrel 54 downwardly through the drill string. The bevelled portion 78*h* opens the clips 29 after which the coupling member 78 rests upon the upper end of the prongs. Further lowering of the sand line causes the head 78*e* to the lowered relative to the rest of the coupling member so that the bevelled surface 78*f* engages the cam surfaces 78*m* and rocks the dogs about their pivot thus moving the prongs 78*l* from the groove 78*s*.

As the upper ends of the prongs move inwardly they clear the lower edge of the flanged collar 78*n* whereupon the springs 78*r* move the collar downwardly thus locking the dogs. The sand line is then moved upwardly and the prongs 78*l* being held outwardly are free to move upwardly so that the pull member is removed from the well.

After sufficient cores have been obtained and the operator desires to drill without coring the core catcher 62 is removed from the core retaining barrel 54 and is replaced by a plug bit 79 as shown in Fig. 4. The plug bit 79 includes a threaded portion 80 which engages the threaded portion 66 of the core retaining barrel and includes a body portion 81 which fits within the bit bore 76 and a reduced portion 82 which is positioned in the bit aperture 77. The lower portion 82 of the plug bit is shaped to match the teeth 16 shaped as at 83 to match the teeth 16 of the bit 15.

Extending downwardly from the body portion 81 the plug bit includes a plurality of spaced lugs 84 which are positioned in recesses 85 in the bit 15.

When the plug bit 78 is operatively positioned in the bit 15 as shown in Fig. 4 and the bit 15 is rotated through the medium of the drill string the bit 15 cuts without forming a core.

In Fig. 6 I have indicated a modification of my improved core barrel generally at 90. As shown the core barrel 90 includes an outer shell 91 which is connected to a coupling 92 which in turn is connected to a string of drill pipe 93. The lower end of the shell 91 is connected to a collar 94 in the same manner as previously described in connection with the shell 11 and the collar 14 and the collar has a bit 95 secured to the lower end thereof. The bit 95 like the bit 15 includes cutting teeth 96 and reamer blades 97. The bit 95 is provided with downwardly directed circulation apertures 98 the upper ends

of which communicate with a peripheral channel 99 in a recess 100 of the bit.

The upper portion of the recess 100 is threaded as at 101 to engage similar threads on a collar 94. Below the recess 100 the bit has a reduced recess 102 opening into the recess 100 and below the recess 102 the bit has a further reduced recess 103 opening into the recess 102 and below the recess 103 the bit has a further reduced recess 104 therein opening into the recess 103. The upper portion of the recess 104 includes a threaded portion 105. Below the recess 104 the bit has a further reduced recess 106 therein opening into the recess 104 and below the recess 106 the bit has a central aperture 107 therein opening through the bottom of the bit and communicating with the recess 106.

Positioned in the recess 104 I provide an anti-friction bearing 108 and positioned in the shell 91 I provide an outer core barrel 109 the lower portion of which is internally threaded as at 110 to receive a similarly threaded portion of a cap member 112. The lower portion of the cap is positioned in the bit recess 103 and a reduced hub 113 on the cap engages the inner raceway of the anti-friction bearing 108. The cap 112 has an open topped recess 114 therein and a reduced threaded recess 115 opening into the recess 114 and through the lower end of the cap.

A clamping member 116 threadedly engages the cap 112 and includes an enlarged head portion 117 positioned in the bit aperture 106 engaging the bottom of the inner raceway of the bearing 108. A lock nut 118 engages the bit threads 105 and engages the top of the outer raceway of the bearing 108 and firmly clamps the bearing in the recess 104.

Above the cap member 112 the shell 109 has a plurality of apertures 119 in the side wall thereof which open into the bit recess 100. The upper end of the outer core barrel is internally threaded as at 120 to receive a similarly threaded bushing member 121. As shown the inner face of the bushing 121 is directly convergently tapered and has a resilient seat member 122 positioned in a groove 123 in the tapered face of the bushing.

Positioned on the outer surface of the outer barrel 109 below the upper end thereof I provide a plurality of spacer lugs 124 which may be secured to the barrel as by welding. Mounted on the outer barrel 109 adjacent the upper end thereof I provide a plurality of spring clips 125 having hooked end portions 126 positioned above the end of the barrel 109 and including upwardly and outwardly inclined release portions 127.

Above the outer barrel 109 I provide a head member 128 which includes a bail portion 129 for attaching thereto a sand line as previously described in connection with the device 10. The lower end of the head 128 is tapered as at 130 to match the taper of the bushing 121 and is adapted to engage the resilient seat member 122. Above the tapered portion 130 the head has a peripheral groove 131 therein in which the hook portions 126 of the spring clips are positioned.

The head 128 has a recess 132 therein which opens through the lower end thereof. The head 128 has a plurality of apertures 133 opening through the side walls thereof into the recess 132. The bottom of the recess 132 is formed to provide a depending circulation diverging member 134. The lower portion of the head 128 is threaded as at 135 to engage a similarly threaded portion 136 adjacent to the upper end of a core retaining barrel 137.

Positioned in the core retainer below the head 128 I provide a plug 138 which is externally threaded to engage the threads 136 of the retainer 137. The plug 138 has a central aperture 139 therethrough the upper portion of which includes a tapered valve seat 140 to receive a valve ball 141. The previously mentioned circulation diverging member 138 also acts to limit the upward movement of the ball valve 141.

At the lower end of the core retainer barrel I provide a core catcher assembly which is indicated at 142 and includes an upper member 143 and a lower member 144 each of which has a coaxial bore 145 therethrough. The upper member is externally threaded as at 146 to engage a threaded portion 147 of the core retainer 137 and is threaded as at 148 to engage a similarly threaded portion of the lower member 144.

The upper member 143 above the threads 146 includes an external dovetail groove 149 in which a rubber catcher member 150 is vulcanized. The rubber catcher includes a dovetail portion 151 which fits in the grove 149 and an upwardly and inwardly extending portion 152 having an aperture 153 in the upper end thereof.

The lower member 144 includes a plurality of slots 154 opening into the bore 145 in which core catchers 155 are pivotally mounted. Springs 156 normally urge these catchers inwardly. The lower member 144 of the core catcher fits within the cap recess 114.

The device 90 is preferably employed with a coupling member including a sleeve 78g′ and dogs 78j′ having prongs 78l′ which are similar to the sleeve dogs and prongs previously described and the use of the device 90 is similar in all respects to that prevously described in connection with the device 10.

From the foregoing description it will be apparent that I have provided a novel core barrel which is simple in construction and highly efficient in use.

Having thus described my invention I claim:

1. In a core barrel, a bit having a central bore, a cylindrical shell, means to secure said shell to said bit, an outer barrel mounted in said shell, a head member in said barrel, a stem adjustably mounted on said head member, said stem having a bearing thereon, a core barrel support on said bearing, an inner core barrel on said support and spaced from said outer barrel, said core barrel support having a plurality of apertures affording communication between the interior of said support and the exterior of said inner barrel, a core catcher assembly on said inner barrel, said outer barrel having a tapered seat portion adjacent the upper end thereof and said head member including a tapered surface to engage said seat portion, and releasable catch means on said outer barrel coacting with means on said head to releasably connect said head and said outer barrel.

2. In a core barrel, a bit having a central bore, a collar on which said bit is supported, a cylindrical shell, a coupling secured to said shell, an outer barrel mounted in said shell and removably secured to said bit, a head member in said barrel, said head having a threaded aperture, a stem having threads thereon and fitting said head aperture, said stem having a cylindrical portion thereon, an apertured plug rotatably mounted on said cylindrical portion, a core barrel support threadedly secured to said plug, an inner core barrel on said support and spaced

from said outer barrel having a plurality of apertures affording communication between the interior of said support and the exterior of said inner barrel, a core catcher assembly on said inner barrel, said core catcher assembly including an upper and a lower member, said lower member having a plurality of spring pressed catches therein, said outer barrel having a tapered seat portion adjacent the upper end thereof and said head member including a tapered surface to engage said seat portion, and releasable catch means on said outer barrel coacting with means on said head to releasably connect said head and said outer barrel.

3. In a core barrel, a drilling bit having a central bore therein to form a core and a plurality of cutting teeth thereon, a cylindrical shell, means to removably secure said bit to said shell and means to removably secure said shell to a string of drill tubing, an outer barrel positioned in said shell and removably secured to said bit, said barrel including a tapered seat portion adjacent the upper end thereof, a head member, said head member including a tapered portion to engage said outer barrel seat portion, coacting means on said barrel and said head for releasably connecting said barrel and said head, a stem member depending from said head, a bearing member supported on said stem, a core barrel positioned in said outer barrel, means to support said core barrel on said bearing, said core barrel having a closed chamber therein adjacent the upper end thereof, a plurality of apertures in the side wall of said core barrel opening into said chamber and into the space between said core barrel and said outer barrel, the lower wall of said chamber having an aperture therethrough with a ball valve seat portion adjacent the upper end thereof, a ball valve in said chamber adapted to engage said seat to prevent downward passage through said bottom wall aperture, a core catcher assembly removably secured to said core barrel adjacent the lower end thereof to receive a core from said drill bit bore.

4. In a core barrel, a drill bit having a central aperture to form a core, a shell, means to mount said bit on said shell, means to connect said shell to a string of drill tubing, an outer barrel positioned in said shell and releasably secured to said bit, a head member, said outer barrel including a seat portion adjacent the top thereof and said head member including a portion engaging said seat, releasable clip means on said outer barrel to releasably connect said head member and said outer barrel, an inner core barrel on said head member and positioned in said outer barrel, means to rotatably support said inner core barrel from said head member, a coupling member, a pull member shiftable on the coupling member and adapted to be connected to a sand line, said coupling member including a downwardly directed sleeve adapted to engage said releasable clip means, a plurality of dogs pivotally mounted in said sleeve, coacting engaging and supporting means on said dogs and said head member, means to urge said dogs to engaged position, means on said pull member operable when the pull member is shifted to shift said dogs from engaged position and movable means in said coupling member to hold said dogs in disengaged position.

5. In a core barrel, a coring bit, a cylindrical shell, means to removably secure said shell to said bit and to a string of drill tubing, an outer barrel positioned in said shell and removably secured to said bit, said barrel including a tapered seat portion adjacent the upper end thereof, a head member, said head member including a tapered portion to engage said outer barrel seat portion, coacting means on said barrel and said head for releasably connecting said barrel and said head, a stem member depending from said head, a bearing member supported on said stem, a core barrel positioned in said outer barrel, means to support said core barrel from said bearing, said core barrel having a closed chamber therein adjacent the upper end thereof, a plurality of apertures in the side walls of said core barrel opening into said chamber and into the space between said core barrel and said outer barrel, the upper wall of said chamber having a flow diverging member depending therefrom, the lower wall of said chamber having an aperture therethrough with a ball valve seat portion adjacent the upper end thereof, a ball valve in said chamber adapted to engage said seat to prevent downward passage through said bottom wall aperture, said flow diverging member acting to limit the upward movement of said ball valve, and a core catcher assembly removably secured to said core barrel adjacent the lower end thereof to receive a core from said drill bit bore.

6. In a core barrel, a drilling bit having a central bore therein to form a core and a plurality of cutting teeth thereon, a cylindrical shell, means to removably secure said bit to said shell and means to removably secure said shell to a string of drill tubing, an outer barrel positioned in said shell, an anti-friction bearing in said drill bit surrounding said bore, means connecting said outer barrel and said bearing to support said outer barrel, a core barrel positioned in said outer barrel, said core barrel including a head portion, means to support said core barrel on said head portion, coacting means on said outer barrel and said head portion for releasably connecting said outer barrel and said core barrel, said core barrel having a closed chamber therein adjacent the upper end thereof, a plurality of apertures in the side walls of said core barrel opening into said chamber and into the space between said core barrel and said outer barrel, the lower wall of said chamber having an aperture therethrough with a ball valve seat portion adjacent the upper end thereof, a ball valve in said chamber adapted to engage said seat to prevent downward passage through said bottom wall aperture, a core catcher assembly removably secured to said core barrel adjacent the lower end thereof to receive a core from said drill bit bore.

7. In a core barrel, a drilling bit having a central bore therein to form a core and a plurality of cutting teeth thereon, a cylindrical shell, means to removably secure said bit to said shell and means to removably secure said shell to a string of drill tubing, an outer barrel positioned in said shell, an anti-friction bearing in said drill bit surrounding said bore, means connecting said outer barrel and said bearing to support said outer barrel, said barrel including a tapered seat portion adjacent the upper end thereof, a core barrel positioned in said outer barrel, said core barrel including a head portion, said head portion including a tapered portion to engage said outer barrel seat portion, coacting means on said barrel and said head portion for releasably connecting said outer barrel and said core barrel, said core barrel having a closed chamber therein adjacent the upper end thereof, a plurality of apertures in the side walls of said core barrel

opening into said chamber and into the space between said core barrel and said outer barrel, the lower wall of said chamber having an aperture therethrough with a ball valve seat portion adjacent the upper end thereof, a ball valve in said chamber adapted to engage said seat to prevent downward passage through said bottom wall aperture, a core catcher assembly removably secured to said core barrel adjacent the lower end thereof to receive a core from said drill bit bore.

8. In a core barrel, a bit having a central bore, a cylindrical shell, means to secure said shell to said bit, an outer barrel mounted in said shell, a head member in said barrel, a stem on said head member, said stem having a bearing thereon, an inner core barrel rotatable on said bearing and spaced from said outer barrel, a core catcher assembly on said inner barrel, said outer barrel having a seat portion adjacent the upper end thereof and said head member including a surface to engage said seat portion and releasable catch means on said outer barrel coacting with means on said head to releasably connect said head member and said outer barrel.

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