June 29, 1937. J. D. BRACK 2,084,988

PUMP PRESSURE OPERATED CORE BARREL

Filed Feb. 27, 1934

Fig. 1

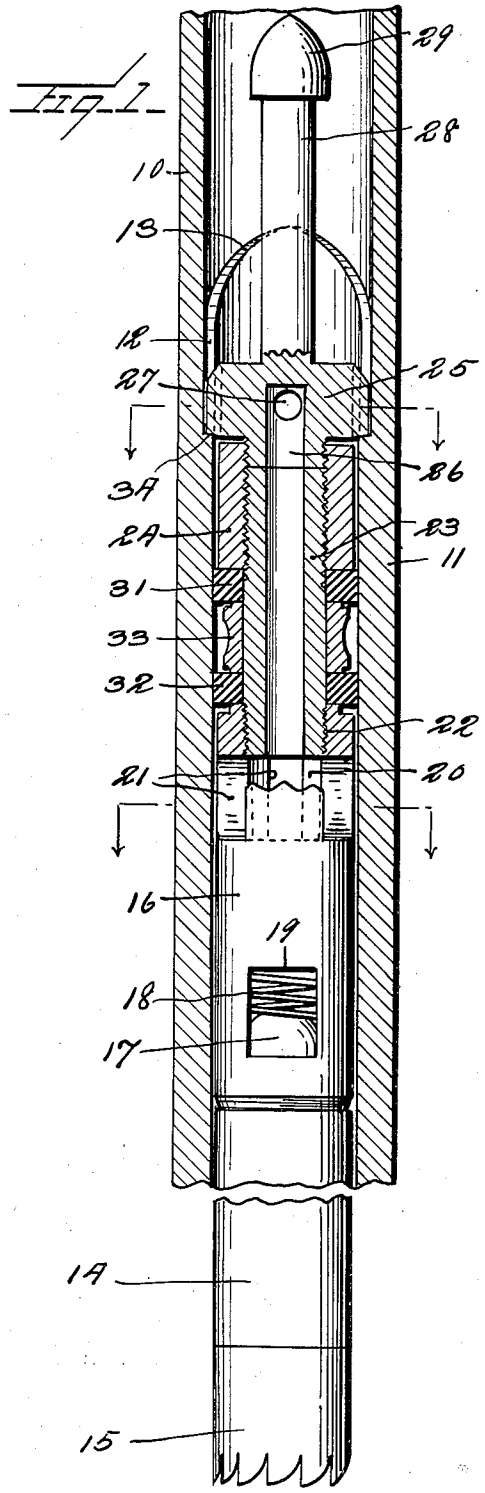


Fig. 2

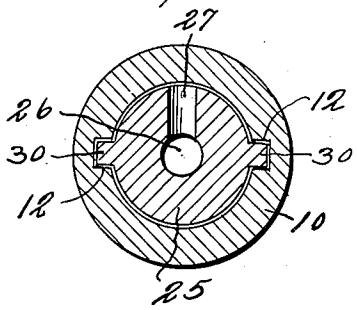


Fig. 3

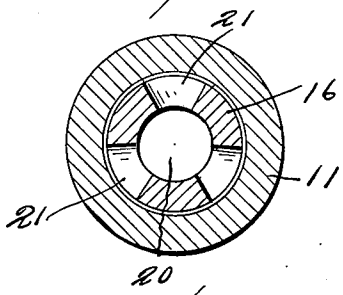
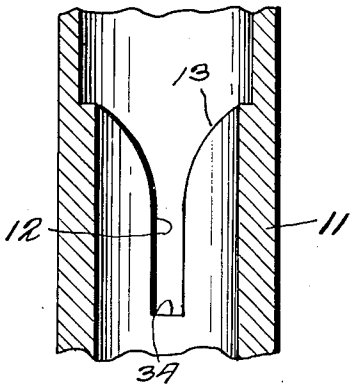


Fig. 4



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Patented June 29, 1937

2,084,988

UNITED STATES PATENT OFFICE

2,084,988

PUMP PRESSURE OPERATED CORE BARREL

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Application February 27, 1934, Serial No. 713,210

6 Claims. (Cl. 255—72)

This invention relates to core barrels which are used within the interior of rotary drills and particularly to means for forcing the core barrel outward when it is desired to project the cutter head of the core barrel to or beyond the lower or cutting end of the rotary drill.

The object of the invention is to provide a device of this character which will do away with the use of a spring for projecting the core barrel and to provide in place of this means whereby pump pressure may be used for forcing the core barrel outward.

A further object is to provide a device of this character which will prevent mud from going into the core barrel, but at the same time permit mud to escape around the core barrel so as to reach the bit.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawing, wherein:—

Figure 1 is a vertical section through a drill bit adjacent the lower end thereof and through the upper portion of the core barrel, the lower portion of the core barrel being shown in elevation;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section on the line 3—3 of Fig. 3;

Figure 4 is a vertical section through the drill collar taken at right angles to the section shown in Figure 1 and showing the grooves for the reception of the driving element.

Referring to the drawing, 10 designates the usual drill collar. This collar carries an annular drill bit at its lower end (not shown). The drill collar 10 above its lower end is formed, as shown in Figure 4, with a thickened portion 11 which may be formed either as a separate tube inserted as a sleeve in the interior of the tube 10 or the tube 10 may be initially formed with this thickened portion 11. The interior of the drill collar 10 is formed with vertically extending recessed means which functions in securing the core barrel to the drill collar so that the rotary motion of the drill collar may be imparted to the core barrel. This means is illustrated as opposed vertical grooves 12. Each of these widen out toward its upper end as at 13 to form a guide mouth.

Disposed within the collar and vertically movable therein is the core barrel designated 14, the core barrel being shown as having a lower section or cutter head 15 connected thereto in any suitable manner and an upper section 16 connected thereto in any suitable manner, it being understood that the sections 14, 15 and 16 are connected to each other so as to form practically one single piece. The section 16 just above its point of connection with the section 14 has the usual ball valve 17 resting upon a seat (not shown) and urged toward its seat by the usual spring 18. This prevents liquid from passing down into the core barrel but permits liquid to pass upward when a core is being forced upward into the core barrel and permits the escape of this liquid through the port 19.

The upper end of the core barrel, as shown in Figures 1 and 3 is formed with a central passage 20 and at the lower end of this passage with radiating ports 21. The upper end of the core barrel 16 is interiorly screw-threaded as at 22. Having screw-threaded engagement with these screw-threads 22 is a nipple 23 and engaged with the upper end of this nipple is a nut 24. Engaged with the upper end of this nut is a head or driving element 25. The nipple 23 is tubular in construction and the driving element 25 is formed with an upwardly extending bore 26 registering with the bore of the nipple. Extending radially from the core 26 is an inlet opening 27. The lower end of the nipple registers with the bore 20 in the core barrel section 16.

The driving element 25 is formed with an upwardly extending lift nipple 28 having an upwardly tapering or rounded head 29 at its upper end. The driving element 25 is formed at diametrically opposite points with the outwardly extending lugs 30 which are adapted to engage in the grooves 12 of the drill column. It will thus be obvious that when the core barrel is raised a certain amount, the lugs 30 will escape from the grooves 12 and thus the drill collar will rotate, but the core barrel will not rotate. When, however, the core barrel is lowered or forced downward to a predetermined amount, the lugs 25 will engage in the grooves 12 and then the core barrel will be rotated with the drill column.

The purpose of laterally flaring the upper ends of each of the grooves 12 is to permit the ready insertion of the lugs into engagement with these grooves.

Disposed between the upper end of the core barrel section 16 and the nut 24 are two cups 31 and 32 which fit the interior of the drill collar. The cup 31 bears against the nut 24. Disposed between the cup 31 and the cup 32 is a spacer 33. The cup 32 is held between the spacer and the upper end of the core barrel section 16. The nut 24 acts as a jam nut to hold the cups in place. It is to be particularly noted from the

sectional views in Figures 2 and 3 that the cylindrical body of the driving element 25 is less in diameter than the internal diameter of the drill collar 10 and that the sections 14 and 16 of the core barrel are also less in diameter than the interior diameter of the drill collar but that the cups 31 and 32 fit the drill barrel closely.

It will thus be seen that liquid such as mud pumped down through the drill collar may pass by means of the port 27 into the passage 26 and pass downward through the nipple 23 and will be forced out through the ports 21 into the space between the core barrel sections 16 and 14 and thus down to the drill. This mud cannot pass into the core valve, however, because of the ball valve 17. The core barrel may be lifted by a wire line or cable engaged with the head 29 or by any other equivalent means but the core barrel is forced downward into operative position by the pressure of liquid acting on the piston cups 31 and 32. This pressure will force the core barrel downward until the lugs 30 bear against the shoulders 34 forming the lower ends of the grooves 12. Then the core barrel is in rotative engagement with the drill collar and a rotation of the drill collar will rotate the core barrel. When coring, any amount of pressure that is desired may be used to force the core barrel downward by running a pump, which pumps liquid into the upper end of the drill collar or drill stem at a greater or less speed. The construction which I have devised does away with a spring for forcing the core barrel downward and all the working parts corelated therewith.

To my knowledge, I am the first to use pump pressure for forcing a core barrel downward.

It will be understood that in use, the core barrel 16 is simply dropped through the drill stem and projects down through the bit about three inches. This is done when it is desired to secure a sample of the formation. When a hard formation is encountered, the core barrel will be pushed back into the bit where it will not cut, thus preventing the burning of the head, it being understood, however, that the barrel does not push up out of the driving slots 12. After the core is taken, a wire line with an overshot on it is let into the drill and engaged with the head 29 and the core barrel hoisted to the surface in order to examine the sample in the core barrel.

It is old to prepare the drill collar with various types of driving devices and it is to be understood that this driving device may be placed in a tool joint above the drill collar if desired and it is also to be understood that the cups 31 and 32 may be of any character or put together in any suitable manner so long as a vent 27 is provided for the inlet of mud and a vent 21 provided for the outlet with the cups disposed between these parts. The main feature of my invention is the provision of means whereby the core barrel is held out past the end of the bit by pump pressure.

I claim:—

1. The combination with a drill collar having vertical grooves above its lower end on its inside face, of a core barrel having a mud vent and a valve permitting the out-flow of mud from the upper end of the core barrel but preventing inflow thereto, the core barrel at its upper end above the valve having a vertical central passage and radial ports at the lower end of the passage, a nipple having threaded engagement with the interior of the upper end of the core barrel, a nut having threaded engagement with the upper end of the nipple, a hollow driving head having screw-threaded engagement with the nut, a driving head having a mud inlet port opening into the interior of the driving head, said driving head having radial lugs and the drill collar having vertical grooves open at their upper ends and having shoulders closing their lower ends in which grooves the lugs engage to secure rotative engagement between the head and the drill collar, and a plurality of cups disposed around said nipple between the nut and the upper end of the core barrel, and a spacer holding said cups apart, the driving head, the nut and the core barrel being less in diameter than the interior diameter of the drill collar.

2. In a device for taking cores in a well, a rotatable drill collar, a core barrel having cutting means on its lower end fitting within the drill collar and being movable freely therein and removable from the well without withdrawing the drill collar, means on said drill collar and said core barrel for imparting the rotation of the drill collar to the core barrel throughout a limited range of axial movement of the core barrel, said means permitting the core barrel to move freely throughout said range and in an unlimited upward direction, a stop on said drill collar for limiting the downward movement of the core barrel at a point where said cutting means extends below said drill collar, an upwardly extending stem on said core barrel, a cup on said stem fitting into the interior of the drill collar, and vents above and below said cup opening upon the exterior of the stem and core barrel, said core barrel through the action of said stem and cups being responsive only to the application of fluid pressure to tend to move the core barrel in a downward direction to project said cutting edge below said drill collar and into cutting position.

3. In combination with a drill collar of a removable core barrel, means including axial slots in the drill collar and corresponding projecting members on the core barrel for imparting the rotary movement of the drill collar to the core barrel, said projecting members being vertically movable in said slots to permit a limited relative movement between the drill collar and the core barrel while said rotary movement is being maintained, piston means associated with the core barrel and engaging the interior of the drill collar adapted to be acted upon by pressure of the fluid in the drill stem, means to permit said fluid to by-pass said piston means in order to reach the drill and means to prevent the fluid from entering the core barrel.

4. In a device for taking cores in a well, a rotatable drill collar, a vertical groove on the inner wall of the drill collar, a transverse shoulder on the wall of the drill collar, a core barrel having cutting means on its lower end and fitting within the drill collar to be movable freely therein and removable from the well without withdrawing the drill collar, means on said core barrel engageable in the groove throughout a limited range of axial movement whereby rotation of the drill may be imparted to the core barrel and whereby the core barrel is free for movement throughout said range and in an unlimited upward direction, said core barrel being limited in its downward movement by said shoulder at a point where said cutting means extends below said drill collar, and a piston connected to the core barrel fitting within the drill collar, said piston being responsive only to the predetermined application of fluid pressure to tend to move the core barrel to its downward limit to

project said cutting edge below said drill collar and into cutting position.

5. The combination of a drill collar and a core barrel for taking cores in a well, said core barrel having cutting means on its lower end and being movable axially in a drill collar and removable from the well without withdrawing the drill collar, one portion of the interior of the drill collar having a greater dimension than the remaining portion forming a shoulder at the junction of the two portions for limiting the downward movement of the core barrel, said drill collar being free from restrictions above said shoulder whereby the core barrel is free for unlimited movement in an upward direction in the drill collar, a piston connected to the core barrel and operated only by the pressure of the drilling fluid to force the piston and the core barrel axially downward in the drill collar and project out of the same, an axial groove on the interior of the drill collar, and means connected to the core barrel engageable in the groove whereby rotation of the drill collar is imparted to the core barrel.

6. In a device for taking cores in a well, a rotatable drill collar, a core barrel having cutting means on its lower end fitting within the drill collar and being movable freely therein and removable from the well without withdrawing the drill collar, means on said drill collar and said core barrel for imparting the rotation of the drill collar to the core barrel throughout a limited range of axial movement of the core barrel, said means permitting the core barrel to move freely throughout said range and in an unlimited upward direction, a stop on said drill collar for limiting the downward movement of the core barrel at a point where said cutting means extends below said drill collar, an upwardly extending stem on said core barrel, a cup on said stem fitting into the interior of the drill collar, and vents above and below said cup opening upon the exterior of the stem and core barrel, said core barrel through the action of said stem and cups being responsive to the application of fluid pressure to tend to move the core barrel in a downward direction to project said cutting edge below said drill collar and into cutting position.

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