Aug. 17, 1943. P. T. BYNUM 2,326,827

CORING APPARATUS

Original Filed Oct. 18, 1938

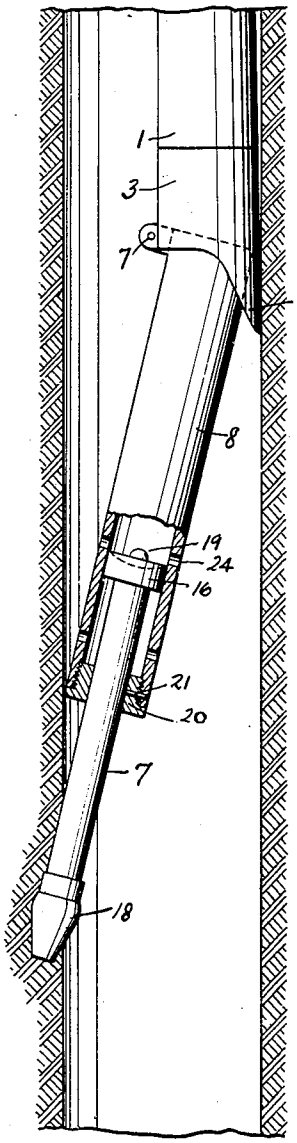

Fig. 4.

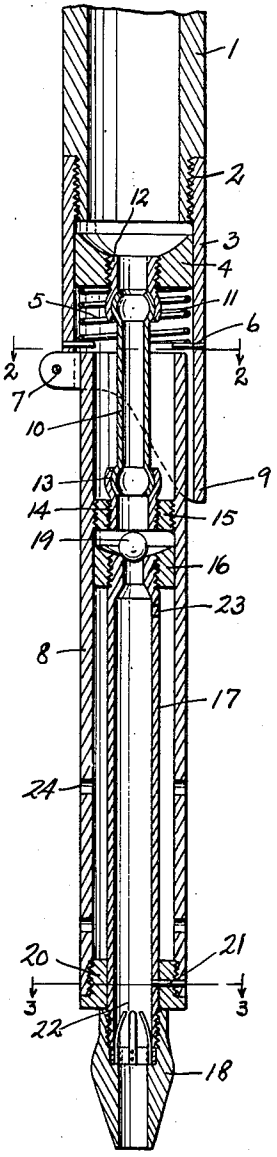

Fig. 1.

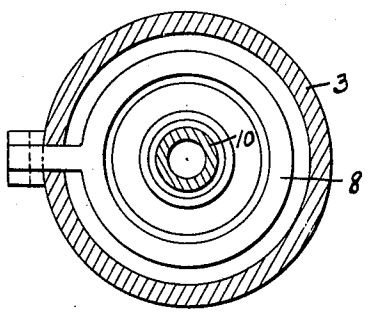

Fig. 2.

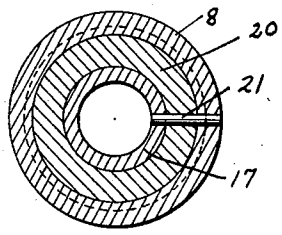

Fig. 3.

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CORING APPARATUS

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Continuation of application Serial No. 235,652, October 18, 1938. This application April 15, 1940, Serial No. 329,663

10 Claims. (Cl. 255—1.4)

This invention relates to well drilling equipment and particularly to a means by which samples of the formation through which the well bore passes may be secured. This application is a continuation of my co-pending patent application, Serial No. 235,652, filed October 18, 1938, for Hydraulically operated coring device.

The general object of this invention is to provide a means whereby a sample of the formation may be taken from a side wall of a well bore.

Another object of this invention is to provide a device by which a sample of the formation may be secured without rotation of a drill stem or the like and merely by the exertion of hydraulic pressure.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a longitudinal sectional view through a device constructed in accordance with this invention showing the parts in the position they occupy during the lowering of the device into operating position in a well bore.

Fig. 2 is an enlarged transverse sectional view of the same device taken along the line 2—2 of Fig. 1.

Fig. 3 is an enlarged transverse sectional view taken along the line 3—3 in Fig. 1.

Fig. 4 is a side elevation of the same device showing the parts in operative position for taking a core.

Referring first to Fig. 1, the numeral 1 designates the carrier body which may be either a drill stem or any other body upon which the device constructed in accordance with this invention is adapted to be lowered into the well. Such body 1 is adapted for connection to the source of fluid pressure used in securing fluid through a well bore in customary manner so that fluid may be forced from such source of pressure down through the interior of the body 1.

Secured to the lower end of the body 1 by means of threads 2 or the like is a primary cylinder 3 having a primary piston 4 therein. A spring 5 is provided within the lower portion of the primary cylinder 3 for constantly urging the piston 4 upwardly. The lower end of this spring 5 bears on any suitable abutment such as the pins 6 also carried by the primary cylinder 3.

Hinged at a point 7 to one side of the center of the primary cylinder 3 is a secondary cylinder 8 which extends downwardly a substantial distance below the primary cylinder. This secondary cylinder may swing laterally with respect to the primary cylinder toward the left as seen in Fig. 1, but may not swing out of the alignment with the primary cylinder to the right because of the lower extension 9 on the primary cylinder which serves as an abutment and limits the swinging movement of the secondary cylinder toward the right as seen in Fig. 1.

The primary piston is connected with the secondary cylinder by a flexible thrust transmitting connection which in the illustration shown is in the form of a jointed conduit having a hollow major section 10 connected by a ball and socket joint at 11 to a minor section 12, which is threaded into the piston 4 and having a ball and socket joint connection 13 with a minor section 14 threaded into a ring 15 which is rigidly mounted within the secondary cylinder by any suitable means such as the threaded connection shown. The jointed conduit just described serves the double purpose of transmitting thrust from the primary piston 4 to the secondary cylinder 8 and of transmitting pressure fluid from the space above the primary piston 4 into space within the secondary cylinder 8. It will be noted that the piston 4 and the member 15 are both provided with central openings so that pressure fluid may pass entirely through this assembly.

Slidably mounted within the secondary cylinder 8 is a secondary piston 16 to which is connected a downwardly extending core barrel 17 having a core cutting head 18 projecting beyond the lower end of the secondary cylinder 8 and adapted to cut a core in the operation of the device. The piston 16 is provided with an opening therethrough the upper end of which is adapted to form a seat for a ball valve 19 for shutting off the passage of fluid downwardly through the core barrel 17. The ball 19 and the opening which it closes are of such size with respect to the opening through the jointed conduit 10 that this ball may be dropped through the jointed conduit from the top of the well.

The lower end of the secondary cylinder 8 is closed about the core barrel by means of a head or bushing 20 which is secured within the lower end of the cylinder and the core barrel itself is normally held in its uppermost position as illustrated by means of a shear pin 21 or the like. The core barrel is provided with the usual core catcher 22 just above its lower end and is provided with a vent opening 23 adjacent its upper end through which fluid may be vented during the taking of a core.

The secondary cylinder 8 is provided with lat-

eral openings 24 adjacent the lower end of the cylinder. The fluid passing out through the opening 23 is vented to the exterior of the device through the openings 24 and it is noted that when the secondary piston 16 has passed downwardly to a position below the uppermost of the openings 24 the pressure fluid will be vented from above this piston, thus making it possible for the operator to tell when the core barrel 17 is fully extended.

In operation the device is lowered into the well bore to the position where it is desired to take a core. During this time the ball 19 will not be in place in the device. Pressure will then be applied from the usual source of pressure, such as above referred to, and may be circulated through the core barrel in order to insure that no debris, cuttings or the like are lodged therein. The ball 19 will then be dropped into the device from above seating in the position shown in the drawings and closing the core barrel against further passage of fluid therethrough.

The pressure will again be applied to the device and because the core barrel will be held in its uppermost position by means of the shear pin 21, this pressure will act upon primary piston 4 to force the same downwardly against the tension of the spring 5 and to act through the connection 10 to swing the secondary cylinder 8 together with the core barrel 17 into a lateral position at an angle to the primary cylinder 1. Application of further pressure will act upon the piston 16 and apply force tending to move the core barrel downwardly within the secondary cylinder 8 and when this force becomes great enough it will shear the pin 21 and the core barrel 17 will be forced downwardly and sidewardly by virtue of the inclined position of the secondary cylinder. Because of this direction of movement the cutting head 18 of the core barrel will be caused to enter the formation forming the side wall of the well bore and as this cutting head extends into the formation a core from the formation will be received into the core barrel. During this reception of the core into the core barrel, fluid within the core barrel will be vented therefrom and through the lateral openings 24 in the secondary cylinder 8 when the core barrel has moved downwardly by the desired amount the secondary piston 16 will have passed to a point below the uppermost of the openings 24 in the secondary cylinder and when this piston passes below these openings it will permit the venting or release of the pressure fluid which is forcing the piston downwardly. This will be indicated to the operator by a speeding up of the pumps which usually provide the source of fluid pressure and the operator will thereupon know that the device has been extended as far as possible. He will thereupon release the pressure and the spring 5 will tend to move the primary piston 4 back to its original position and realign the secondary cylinder 8 with the primary cylinder 3. As soon as the core barrel is freed from the formation this realignment will occur, after which the device may readily be removed from the well.

It will be seen from the foregoing that a device has been provided which is capable of taking samples from the side walls of a well bore at any point within a well and that such samples may be taken without any rotation of the drill stem or the like but merely by the use of hydraulic pressure.

It will further be appreciated that while one specific means has been illustrated for accomplishing the object sought the same is by way of example only and the scope of this invention is to be limited only by the prior art and by the terms of the appended claims and the illustration given may, therefore, be illustrated both as to its parts and its combination parts. It will be understood that many changes and alterations may be made in the parts and combinations set forth within the spirit and scope of the appended claims.

I claim:

1. In a coring device, a core barrel, hydraulic means for deflecting said core barrel to a position at an angle with respect to a well bore, and hydraulic means for forcing the core barrel so deflected in a direction substantially parallel with its axis.

2. In a coring apparatus, a core barrel, hydraulic means operative by a relatively low fluid pressure for deflecting said core barrel to a position at an angle with respect to a well bore, and hydraulic means operative by a higher fluid pressure for forcing said core barrel ahead in a direction substantially parallel to its axis in such deflected position.

3. In a coring apparatus, a core barrel, hydraulic means operative by a relatively low fluid pressure for deflecting said core barrel with respect to a well bore, means for retaining said core barrel against axial movement by such relatively low pressure and adapted to be overcome by a higher pressure to permit said core barrel to be thereafter moved in an axial position, and hydraulic means operative by such higher pressure for forcing said core barrel in an axial direction in its deflected position.

4. In a coring apparatus, a core barrel, hydraulic means operative by relatively low fluid pressure for deflecting said core barrel to a position at an angle to the axis of a well bore, hydraulic means operative by a higher pressure for forcing said core barrel ahead in a direction substantially parallel to its axis in its deflected position, and means for releasing said fluid pressure when said core barrel has been extended a predetermined amount.

5. In a coring apparatus, a carrier, a core barrel guide hinged to said carrier, a core barrel slidably mounted in said guide and having a cutting head, means for deflecting said guide with said core barrel therein to a position out of alignment with said carrier, and means for urging said core barrel outwardly in a direction towards its cutting head when in such deflected position.

6. A hydraulically operated well coring device, said device comprising an upper cylinder having a piston working therein, a lower cylinder normally axially aligned with the upper cylinder, an eccentric hinge connection between the upper cylinder and the lower cylinder enabling the lower cylinder to swing relative to the upper cylinder to a diagonal position in a well in which the device has been lowered for a coring operation, a cylinder head in said lower cylinder, conduit means between said piston and said cylinder head jointed thereto and establishing hydraulic communication between the upper cylinder above said piston and the lower cylinder below said cylinder head, and a core barrel projectable through the lower end of said lower cylinder and having a piston working in said lower cylinder.

7. A hydraulically operated well coring device,

said device comprising an upper cylinder having a piston working therein, a lower cylinder normally axially aligned with the upper cylinder, an eccentric hinge connection between the upper cylinder and the lower cylinder, enabling the lower cylinder to swing relative to the upper cylinder to a diagonal position in a well in which the device has been lowered for a coring operation, a cylinder head in said lower cylinder, conduit means between said piston and said cylinder head jointed thereto and establishing hydraulic communication between the upper cylinder above said piston and the lower cylinder below said cylinder head, a core barrel projectable through the lower end of said lower cylinder and having a piston working in said lower cylinder, and shearable means on said lower cylinder holding said core barrel in retracted position.

8. A hydraulically operated well coring device, said device comprising an upper cylinder having a piston working therein, a lower cylinder normally axially aligned with the upper cylinder, an eccentric hinge connection between the upper cylinder and the lower cylinder enabling the lower cylinder to swing relative to the upper cylinder to a diagonal position in a well in which the device has been lowered for a coring operation, a cylinder head in said lower cylinder, conduit means between said piston and said cylinder head jointed thereto and establishing hydraulic communication between the upper cylinder above said piston and the lower cylinder below said cylinder head, a core barrel projectable through the lower end of said lower cylinder and having a piston working in said lower cylinder, and shearable means in said lower cylinder holding said core barrel in retracted position, the side walls of said lower cylinder being formed with vent holes in longitudinally spaced arrangement to indicate the progress of the projection of the core barrel from the lower cylinder subsequent to the shearing of said shearable means.

9. A hydraulically operated well coring device, said device comprising an upper cylinder having a piston working therein, a lower cylinder normally axially aligned with the upper cylinder, an eccentric hinge connection between the upper cylinder and the lower cylinder enabling the lower cylinder to swing relative to the upper cylinder to a diagonal position in a well in which the device has been lowered for a coring operation, a cylinder head in said lower cylinder, conduit means between said piston and said cylinder head jointed thereto and establishing hydraulic communication between the upper cylinder above said piston and the lower cylinder below said cylinder head, a core barrel projectable through the lower end of said lower cylinder and having a piston working in said lower cylinder, upholding spring means under said piston in the upper cylinder, and means on said upper cylinder holding said spring means in place.

10. A hydraulically operated well coring device, said device comprising an upper cylinder having a piston working therein, a lower cylinder normally axially aligned with the upper cylinder, an eccentric hinge connection between the upper cylinder and the lower cylinder enabling the lower cylinder to swing relative to the upper cylinder to a diagonal position in a well in which the device has been lowered for a coring operation, a cylinder head in said lower cylinder, conduit means between said piston and said cylinder head jointed thereto and establishing hydraulic communication between the upper cylinder above said piston and the lower cylinder below said cylinder head, a core barrel projectable through the lower end of said lower cylinder and having a piston working in said lower cylinder, said conduit means comprising a nonflexible tube and ball and socket joint connections at its opposite ends with said piston and said cylinder head respectively.

PINK T. BYNUM.