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SIDE WALL CORING TOOL

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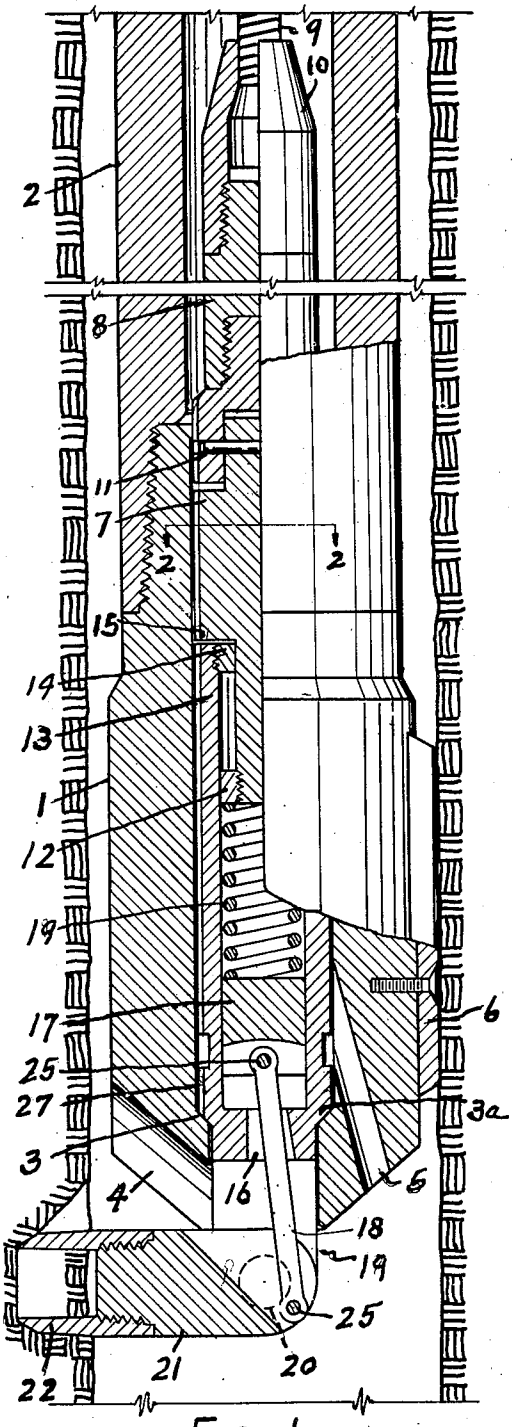


FIG. 1.

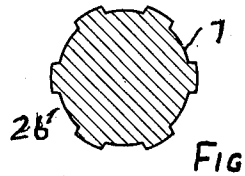


FIG. 2.

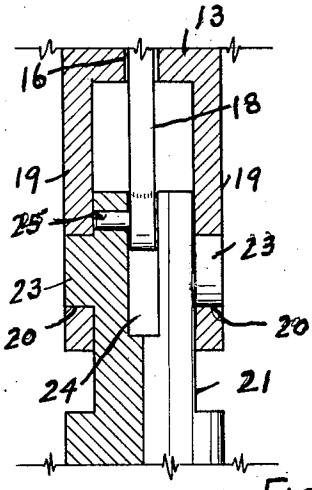


FIG. 3.

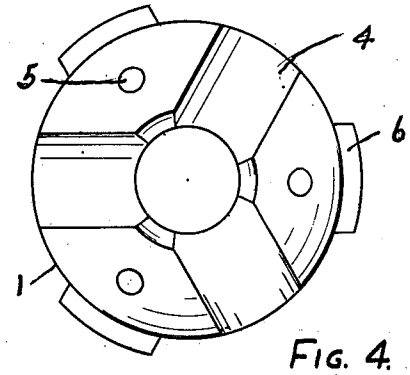


FIG. 4.

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SIDE WALL CORING TOOL

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7 Claims. (Cl. 255—1.4)

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This invention relates to a side wall coring tool.

An object of the invention is to provide a tool of the character described, which has been especially designed for penetrating, and taking a sample of, the side wall of a bore hole in order to determine the contents of the stratum from which the sample is taken.

It is another object of the invention to provide a tool of the character described including a guide adapted to be attached to the lower end of an operating string and a sample retainer mounted on an operating mechanism which is adapted to be lowered through the string and guide and manipulated from the ground surface in such a manner that the retainer will pierce the wall of the bore and take and retain a sample of said wall, which may be brought to the ground surface for inspection.

The sample retainer is of such construction and is so mounted that it may be readily caused to penetrate the side wall of the bore by merely lowering the operating stem and guide in which the sample retainer is mounted.

Other objects and advantages will be apparent from the following specification which is illustrated by the accompanying drawings wherein:

Figure 1 is a side elevation of the coring tool partly in section, and shown in core-taking position.

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

Figure 3 is a fragmentary elevation view of the mounting of the sample retainer, or core barrel employed, shown partly in section and

Figure 4 is a bottom end view of the guide.

Referring now more particularly to the drawing, the numeral 1 designates a tubular guide adapted to be connected to the lower end of an operating string of pipe 2, which extends to the ground surface.

This guide has an inside annular seat 3 near its lower end and said lower end is tapered downwardly and is provided with radial, half-round seats as 4. It also has the downwardly diverging discharge channels 5.

The guide 1 should be of substantially the same diameter as the transverse diameter of the bore hole and this diameter may be maintained by the use of removable, external shims 6, secured to the outside of the guide and of the required thickness.

The stem 2 and guide 1 are first lowered into the well to the desired point at which a sample is to be taken and the sample taking equipment is then lowered through the stem.

This equipment will now be described:

It includes a plunger 7, which is supported by a sinker bar 8, and a cable 9 is connected to the upper end of the sinker bar by means of the cable

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socket 10 in the usual way. A coupling is connected, preferably by threads, to the lower end of the sinker bar and is fitted over the upper end of the plunger 7 and secured thereto by means of a shear pin 11, so that in case the core taking apparatus should become stuck, the pin 11 can be sheared and the cable and sinker bar recovered. The lower end of the plunger 7 is reduced in diameter and has an external ring nut 12 screwed thereon and fitted thereover there is a cylinder 13 whose upper end has an internal ring nut 14 screwed therein.

The cylinder is movable longitudinally on the plunger but its movement is limited in one direction by the ring nuts 12 and 14, and in the other direction by the external shoulder 15 of the plunger and which is formed by the reduction of the lower end of the plunger.

The lower end of the cylinder 13 is closed except for the slot 16, and mounted in the cylinder there is a piston 17 to the lower end of which the piston rod 18 is connected, and this piston rod works through the slot 16.

Within the cylinder 13 between the plunger and the piston 17 there is a coil spring 19'.

Depending from the cylinder 13 on opposite sides of the slot 16 there are the spaced jaws 19, 19. These jaws have the transversely aligned bearings 20, 20 and the shank 21 of the core retainer or barrel 22 is flattened and fitted between said jaws 19.

As will be noted from inspection of Figure 3, the shank 21 is provided with laterally extending pintels 23, 23 which are fitted into the bearings 20, 20 and the upper end of this shank also is provided with a slot 24 to receive the lower end of the rod 18. This rod is connected to the piston 17 and the shank 21 by the respective pins 25, 25. In assembling the shank 21 with the jaws 19 the cylinder will be first constructed with only one jaw and the other jaw thereafter assembled therewith after the shank 21 has been assembled with the permanent jaw 19 and the other jaw will then be welded in place. This is the preferred and practical method of assembling these parts together.

The outer end of the core retainer or barrel 22 may be tapered inwardly and formed with a sharp cutting edge.

In lowering the coring equipment through the string 2 and guide 1, the shank 21 and barrel 22 will hang in approximately vertical position, but the lower end of the piston rod 18 is off center relative to the pintels 23.

The lower end of the cylinder 13 is reduced forming an external, annular shoulder 3a which lands on the internal shoulder 3.

The lowering cable 9 may then be slacked off somewhat, and the load of the sinker bar 8 and plunger 7 on the spring 19' will compress said

spring and move the piston 17 downwardly, thus operating through the rod 18 to swing the sample retainer or core barrel over against the wall of the bore. The complete unit including the operating string 2 and the guide 1 are then lowered, and this will cause the outer end of the core barrel 22 to engage against said side wall, and as the apparatus moves downwardly, said retainer will penetrate into the side wall, as illustrated in Figure 1, and a sample of the side wall will be forced into the retainer, and packed tightly therein, and upon further downward movement the shank 21 and retainer or barrel 22 will assume a reverse position and will seat in one or the other of the seats 4.

As will be noted, the areas of the lower end of the guide between the seats 4 are substantially wedge-shaped with their apexes chamfered internally so that irrespective of the initial position of the shank and retainer, relative to a seat 4, as the guide and string move downwardly, the guide will be turned so as to align a seat 4 with the shank so that the latter will seat therein. When the core has been taken, string 2 may be pulled upwardly, causing a reverse movement of the retainer or core barrel, which will thereupon assume the original vertical position and by an upward pull on the cable 9 the equipment supporting the core barrel and the barrel may be withdrawn from the bore for inspection of the sample.

It will be noted from an inspection of Figures 1 and 2 that the plunger and its coupling above and the cylinder 13 beneath are provided with external longitudinal channels 26, whose lower ends terminate in an external annular groove 27 around the cylinder, and which communicates with the upper ends of the channels 5. These channels 26 have been provided so that water may be freely circulated downwardly through string 2 and through the channels 26 and 5 so that the well can be washed beneath the tool if it be desired to do so, or for the circulation of liquid upwardly about the tool in case it should become stuck within the wall bore.

What I claim is:

1. A side wall coring tool including, a tubular guide having an inside seat and also having radial lower end seats, a cylinder adapted to be inserted into the guide and having an external seat to land on said inside seat, a sample retainer having a shank which is pivotally connected with the lower end of said cylinder, a piston in the cylinder, a piston rod connecting said piston with the pivoted end of the shank whereby, upon downward movement of the piston, the core retainer will be moved against the side wall of the bore hole.

2. A side wall coring tool including, a tubular guide having an inside seat and also having radial lower end seats, a cylinder adapted to be inserted into the guide and having an external seat to land on said inside seat, a sample retainer having a shank which is pivotally connected with the lower end of said cylinder, a piston in the cylinder, a piston rod connecting said piston with the pivoted end of the shank whereby, upon downward movement of the piston, the core retainer will be moved against the side wall of the bore hole, and means including a weight which is supported by said piston.

3. A side wall coring tool including, a tubular guide having an inside seat and also having a radial lower end seat, a cylinder adapted to be inserted into the guide from above and having an external seat to land on said inside seat to support the cylinder, a sample retainer having a shank which is pivotally connected with the lower end of the cylinder, a piston in the cylinder, a piston rod connecting the piston with the pivoted end of the shank whereby, upon downward movement of the piston the core retainer and shank will be moved radially into position to be received by the lower end seat upon downward movement of the guide.

4. A side wall coring tool including a tubular guide having an inside seat and a radial lower end seat, a cylinder adapted to be inserted into said guide from above and to land on said inside seat, a sample retainer having a shank which is pivotally connected with the lower end of the cylinder, operating means in the cylinder including a piston and piston rod connected to the shank and means in the cylinder yieldably engaging the piston whereby, upon downward movement of said operating means, the core retainer will be swung radially to engage the side wall of the bore hole and into position to be received by the lower end seat upon further downward movement of said guide.

5. In a side wall coring tool, sample taking equipment comprising, a sample retainer, a cylinder means pivotally connecting the retainer to the lower end of the cylinder, an upper plunger and a lower piston in the cylinder, a yieldable element in the cylinder between the plunger and the piston, a piston rod connecting the piston and retainer and means for connecting a cable to the plunger whereby the tool may be lowered into and withdrawn from an operating string in a well bore.

6. In a side wall coring tool, sample taking equipment comprising, a sample retainer, a shank to which the retainer is secured, a cylinder, means pivotally connecting the shank to the cylinder, a piston rod connected to the shank and extended into the cylinder, a piston in the cylinder to which said piston rod is connected, means longitudinally movable in the cylinder and yieldably supported by the piston and tending to move the piston downwardly in the cylinder and also forming means for the connection of an operating cable to the cylinder.

7. In a side wall coring tool, a core retainer including a shank and a cylinder to which said shank is pivoted, a plunger in the cylinder, a weight on the plunger forming also means for the connection of a cable, means in the cylinder supporting the plunger and including a piston and piston rod connected to said shank and arranged, upon downward movement, to actuate the core retainer into contact with the side wall of a well bore.

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