April 30, 1940. C. C. JESSUP 2,198,821

SAMPLE-TAKING APPARATUS

Filed July 6, 1938 2 Sheets-Sheet 1

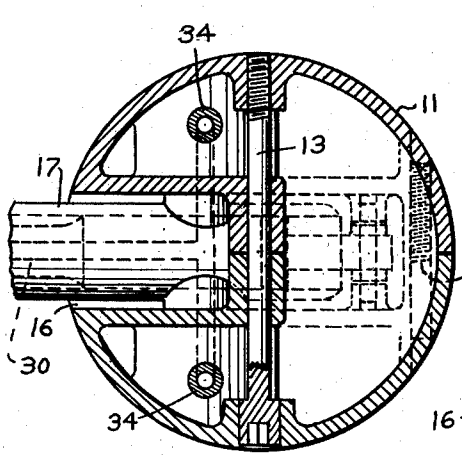


Fig. 2.

Fig. 1.

Inventor

Charles C. Jessup

By

Edward V. Hardway

Attorney

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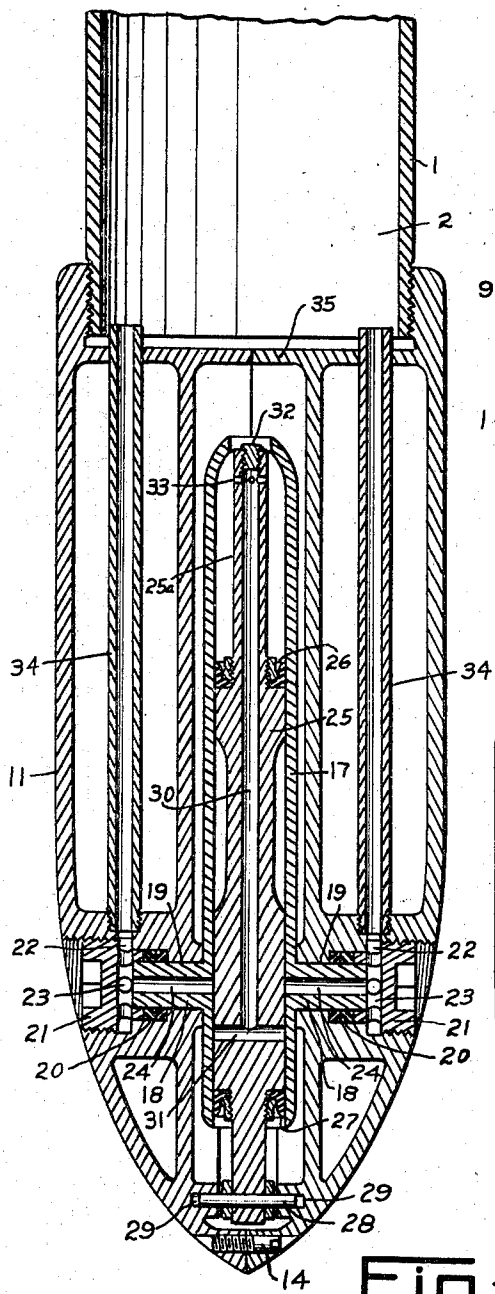


Fig. 3.

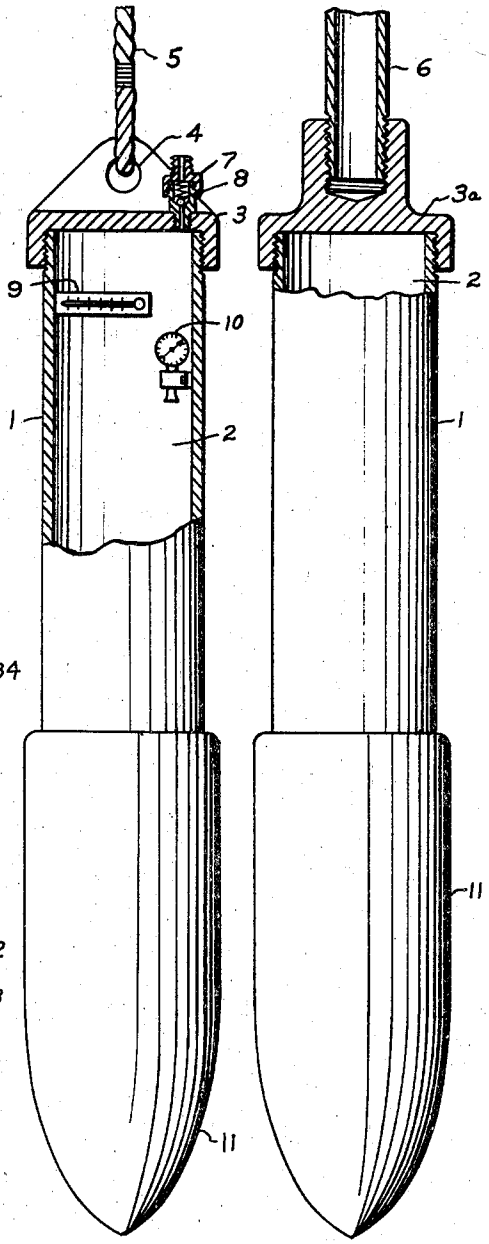


Fig. 4.

Fig. 5.

Inventor
Charles C. Jessup
By
Edward V. Hardway
Attorney

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SAMPLE-TAKING APPARATUS

Charles C. Jessup, Jeanerette, La.

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6 Claims. (Cl. 255—1)

This invention relates to a sample-taking apparatus or well tester.

An object of the invention is to provide apparatus of the character described of such construction that it may be readily lowered into a well, either by a wire line or by a string of tubing, such as a drill stem and a sample of the fluid in a selected stratum taken and trapped in the sample receiving chamber of the apparatus and withdrawn to the ground surface for inspection.

It is a further object of the invention to provide apparatus of the character described having a sample receiving chamber with novel means for maintaining said chamber closed while the apparatus is being lowered into the well and means adapted to penetrate into the formation of the stratum to be tested and to simultaneously open a channel leading into said chamber whereby the fluid in the stratum may flow into the chamber with means for closing the inflow channel and maintaining the same closed upon withdrawal of the apparatus from the well.

It is a further object of the invention to provide apparatus of this character equipped with means whereby a vacuum or partial vacuum may be created and maintained in the sample chamber to the end that the fluid in the stratum being tested will readily flow into the sample receiving chamber irrespective of the pressure of the fluid in the stratum.

It is a further object of the invention to provide means whereby the pressure and temperature of the entrapped sample may be readily ascertained upon withdrawal of the apparatus from the well.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, examples of which are given in this specification and illustrated in the accompanying drawings, wherein—

Figure 1 shows a fragmentary, vertical, sectional view of the lower end of the apparatus in sample receiving position, as indicated in dotted lines.

Figure 2 shows a cross-sectional view taken on the line 2—2 of Figure 1 and partly broken away, in sample receiving position, as shown in full lines.

Figure 3 shows a fragmentary, vertical, sectional view taken at right angles to the view shown in Figure 1 showing the parts in position to close the inlet channels.

Figure 4 shows a side elevation, partly in section, of the apparatus as adapted for operation by a wire line, and

Figure 5 shows a similar view of an embodiment adapted to be connected to a string of pipe and operated thereby.

Referring now more particularly to the drawings wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates a tubular container containing the sample-receiving chamber 2. The upper end of the chamber may be closed by a cap 3 having an eye 4 for the connection of a wire line 5 thereto, or the upper end of the chamber may be closed by a cap 4a, as shown in Figure 5, adapted for connection to an operating string of pipe 6. The cap closing the upper end of the chamber 2 is equipped with a suction pump connection 7 having an exhaust passageway therethrough which is controlled by the back pressure valve 8. If there is no pressure, or low pressure in the stratum to be tested a suction pump may be applied to the connection 7 and a vacuum formed in the chamber 2 to induce the inflow of the fluid from the stratum into said chamber.

A suitable thermometer 9 and suitable pressure gauge 10 may be installed in the chamber and used for ascertaining the temperature and pressure, respectively, of the sample received by said chamber.

Screwed onto the lower end of the chamber 2 there is a guide 11 which is tapered at its lower end so as to readily enter the well bore.

For ease in assembly this guide is formed of two sections which are similar and which, when assembled may be secured together by suitable screws as 12, 13, 14, 15.

The guide 11 is formed with a deep side slot 16 extended approximately from the upper to the lower end thereof to receive a cylinder 17. This cylinder has the opposing radially extended tubular trunnions 18, 18 which work in the corresponding bearings 19, 19 of the respective halves of the guide 11 as clearly shown in Figure 3. The outer ends of these trunnions are surrounded by stuffing boxes 20, 20 which include the annular clamps 21, 21 screwed into the guide and whose inner ends fit around the outer ends of the trunnions to clamp the packing of the stuffing boxes in place. Each clamp has an external, annular channel 22 therearound and also has the radial channels 23 which communicate with the corresponding channels 22 and also with the axial channels 24 leading outwardly through said trunnions.

In the cylinder 17 there is a tubular plunger 25 whose ends are in sealed engagement with the inner wall of the cylinder by means of the cup shaped packings 26, 27 at the respective ends of the plunger. The lower end of the plunger is extended and provided with a cross-pin 28 whose ends fit into the arcuate guides 29, 29 in the respective halves of the guide 11. The axis on which the trunnions 18 turn is eccentric with respect to the axis of the arcuate guides 29.

The plunger has a reduced extension 25*a*, beyond the packing ring 26 and said plunger has an axial channel 30 leading from its outer end and whose inner end terminates in a cross-channel 31. The outer end of the channel 30 may be closed, if desired, by a plug as 32 and may have the radial ports as 33 leading inwardly through the wall thereof and communicating with the channel 30 for the entrance of the fluid sample to be trapped.

Tubes as 34, 34 are anchored at their lower ends to the guide 11 so that the passageways therethrough will register with the corresponding channels 22 and their upper ends extend through the transverse web 35 of the guide which closes the lower end of the sample chamber 2. The outer or free end of the cylinder is contracted so as to allow the plunger extension 25*a* to fit closely therethrough and so as to prevent the accumulation and packing of solid material within the cylinder.

The free end of the cylinder has an outwardly diverging barb 36 for a purpose presently to be explained.

The apparatus is assembled as shown with the cylinder 17 retracted into the slot, or pocket 16 and lowered into the well. When so retracted the cross-channel 31 will be out of alignment with the channels 24 and the latter are closed by the plunger 25. The drilling fluid with which the well is filled will thus be excluded from the sample chamber.

When it is desired to test a stratum the apparatus is pulled upwardly and the barb 36 will engage the wall of the bore and cause the cylinder to swing outwardly as shown in Figure 1 and penetrate into the formation to be tested. As the cylinder is so swung the pin 28 moving in the tracks 29 will force the plunger outwardly and bring the cross-channel 31 into registration with the channels 24 as shown in dotted lines in Figure 2. The fluid in the stratum may then enter through the ducts 23 into the channel 30 and pass thence through the cross-channel 31 and the channels 24 outwardly through the ports 23 and channels 22 and thence through the tubes 34 into the sample chamber.

Ordinarily, the fluid will be forced into the sample chamber under the natural pressure of the fluid in the stratum. If this pressure is absent, or low, a vacuum should be created in the sample chamber, as hereinabove described, before the apparatus is lowered and this will facilitate the entrance of the sample.

After sufficient time has elapsed to allow a sample to enter the chamber the apparatus may be pulled upwardly swinging the free end of the cylinder 17 downwardly, the pin 28 moving on upwardly along the tracks 29 thus moving the cross-channel 31 out of alignment with the channels 24 and entrapping the sample in the sample chamber for withdrawal and inspection.

The drawings and description disclose what are now considered to be preferred forms of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. Sample-taking apparatus comprising a container having a sample receiving chamber provided with a fluid inlet, a guide on the container, a probe pivotally mounted in the guide, a portion of the probe being extended outside of the guide and engageable with the wall of the bore, upon upward movement of the apparatus, to cause the probe to rotate and be projected into the stratum, said probe including means normally closing said inlet and movable into position to open the inlet, upon projection of the probe into said stratum, to permit the inflow of fluid from the stratum into said chamber, said means being further movable to close said inlet upon further upward movement of the apparatus to entrap the sample in said chamber.

2. Sample-taking apparatus comprising a container forming a sample receiving chamber therein, a pivotally mounted probe operable to move, independently of said container, into position to penetrate into the stratum of the bore wall, said apparatus having an inlet channel leading inwardly through the probe and terminating in said chamber, means embodied in the probe normally in position to close said channel but movable into position to open the channel upon movement of the probe to stratum-penetrating position, said means being movable into position to close the channel to entrap the sample in the chamber upon further movement of the apparatus.

3. A sample-taking apparatus comprising a container having a sample receiving chamber therein, a guide, a probe, having a channel therethrough, pivotally mounted on the guide and adapted to be actuated into position to penetrate the wall of a well bore, said apparatus having a conduit connecting said channel and chamber, valve means in the probe adapted to normally obstruct the conduit, means connecting the valve means and the guide adapted to actuate said valve means at a predetermined angular position of said probe to allow fluid to pass from said channel to said chamber.

4. In a sample-taking apparatus a guide, a cylinder pivotally mounted in the guide adapted to be actuated into position to penetrate the wall of a well bore, a valve in the cylinder adapted to control flow of fluid through said cylinder, means connecting the valve means and the guide adapted to actuate said valve into open position at a predetermined angular position of said cylinder with respect to the guide.

5. Sample-taking apparatus comprising a container having a sample receiving chamber therein provided with a fluid inlet, a pivotally mounted probe operable to move, independently of said container, into position to penetrate into the stratum of the well bore, said apparatus having an inlet channel leading through the probe and terminating in said chamber at the inlet, valve means normally in position to close said channel, the valve means and the probe being operatively connected whereby the valve means is actuated to open the channel, upon movement of the probe to stratum penetrating position and further to again close the channel to entrap the sample in the chamber upon further movement of the probe.

6. A sample-taking apparatus adapted to be lowered in a well bore comprising a sample receiving container which is provided with a fluid inlet, a guide for guiding the apparatus through

the well bore connected to the lower end of the container, a probe pivotally mounted in the guide, said apparatus having an inlet channel leading inwardly through the probe and terminating in said chamber, means embodied in the probe normally in position to close said channel but movable into position to open the channel upon movement of the probe to stratum penetrating position, said means being movable into position to close the channel to entrap the sample in the chamber upon further movement of the apparatus.

CHARLES C. JESSUP