Aug. 9, 1932. F. G. KUNZ 1,871,328

SAMPLE TAKING DEVICE

Original Filed Jan. 16, 1930

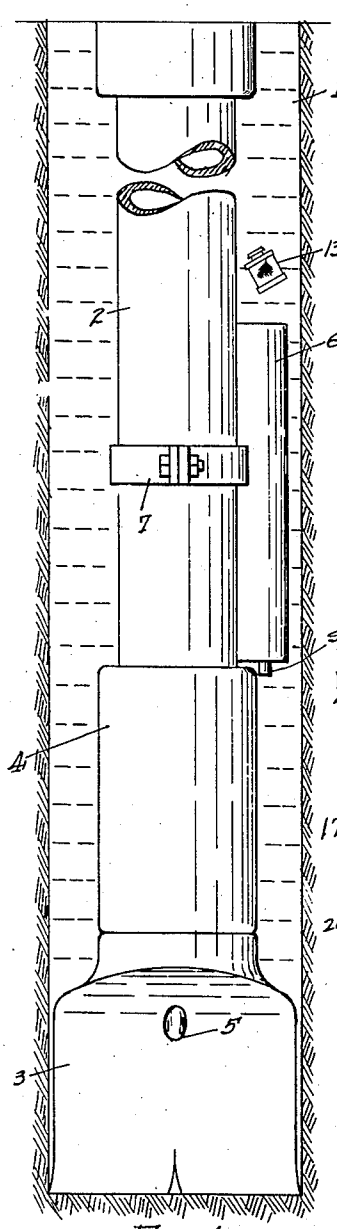


FIG. 1.

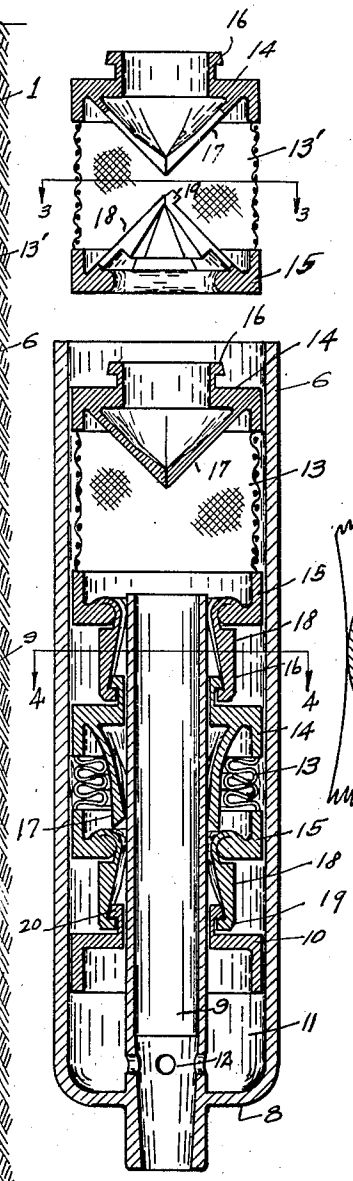


FIG. 2.

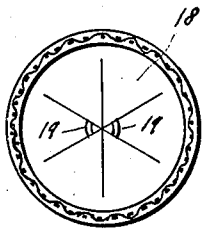


FIG. 3.

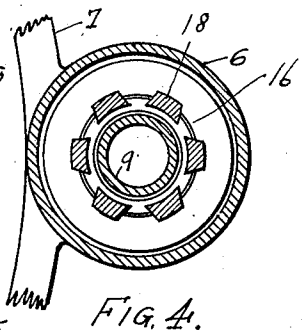


FIG. 4.

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UNITED STATES PATENT OFFICE

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SAMPLE TAKING DEVICE

Refiled for abandoned application Serial No. 421,116, filed January 16, 1930. This application filed September 14, 1931. Serial No. 562,658.

This invention relates to a sample taking apparatus.

One object of the invention is to provide apparatus of the character described whereby samples of the cuttings from the drill, in well drilling, may be collected and carried to the ground surface for inspection.

A further feature of the invention resides in the provision of means whereby the said cuttings may be collected in a detachable receiver therefor, and the receiver then detached and conveyed, by the drilling fluid, to the ground surface for inspection, in a substantially uncontaminated state.

The invention also comprehends a novel method whereby samples of the cuttings of the drill, in well drilling, may be collected and delivered to the ground surface.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, as well as to a novel method, an example of which is given in this specification and illustrated in the accompanying drawing, wherein:

Figure 1 shows a side view of the apparatus located in a well bore.

Figure 2 shows a vertical sectional view of the sample collecting and receiving apparatus.

Figure 3 shows a cross sectional view taken on the line 3—3 of Figure 2, and

Figure 4 shows a cross sectional view taken on the line 4—4 of Figure 2.

Referring now more particularly to the drawing wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates the well bore and the numeral 2 designates the tubular drill stem therein. The numeral 3 designates a drill, which may be of any preferred type and which is connected to the lower end of the stem by means of the tubular drill collar 4. The drill has the water courses 5 leading downwardly through the shank thereof, through which the drilling fluid from the stem may be delivered to the drill to carry out the cuttings of the drill. This drilling fluid is forced under pressure down through the drill stem and out through the courses 5 and is returned up through the well bore to the ground surface outside of the stem. Above and preferably adjacent the collar 4 there is a tubular housing 6 which is clamped to the stem by a clamp, as 7, of any selected type.

The upper end of the housing 6 is open and its lower end is closed. Anchored to and extending downwardly through said closed lower end 8 there is a collecting tube 9 whose upper end terminates beneath the upper end of the housing 6, and whose lower end may be slightly restricted, and slidably on said tube and fitted closely within said housing there is a plunger 10. A pressure chamber 11 is thus formed within the lower end of the housing and the collector tube 9 has one or more ports 12 through which fluid may pass from said tube into said chamber.

Slidably mounted on said tube above said plunger are the collapsible receivers, as 13, to receive the cuttings or samples. Each receiver has an upper and a lower end, as 14 and 15, and which fit slidably over the collecting tube 9 and inside the housing 6. These ends 14 and 15 are preferably made of molded rubber or other firm yet resilient material molded in the shapes shown in the discharged receiver 13. The upper and lower ends of the flexible walls of the receivers are attached to said respective ends 14 and 15. Said walls are formed of fabric or other suitable porous, flexible material. These receivers are detachably anchored in any approved manner. One method of detachably anchoring the receivers will be hereinafter explained. The ring 16 is formed on the upper end of the receiver end 14, and the conical center of the end 14 is cut into gores forming the fingers 17. The conical center of the lower end 15 is cut into gores forming the fingers 18, of which two opposite ones have the hooks 19. The plunger 10 has the ring 20 on its upper end similar to the receiver end 14. When the lower receiver is slipped over the collector tube 9 its fingers 18 are distended outwardly from the receiver and incase the ring 20 of the plunger 10. The fingers 17 are spread inside the receiver. The succeeding receivers are similarly fitted

over the tube 9 except that the lower end fingers 18 incase the rings 16 of the receiver ends 14. The upper receiver is installed with only the fingers 18 distended to receive the tube 9, with the end of the tube terminating inside the receiver as shown in Figure 2. The fingers 17 are in their originally formed position closing the receiver end 14 to trap the cuttings in the corresponding receiver.

In use the receivers 13 are assembled as shown in Figure 2 on the upper end of the collector tube in collapsed position with fingers 18 of lower receiver in retracted or withdrawn position and held in such position by engagement with the ring 20 on plunger 10 by means of hooks 19, and the fingers 18 of the receivers above are held in retracted position by engagement with the rings 16 of the receiver beneath, by the hooks 19.

These receivers are assembled in collapsed position with the upper end of the collector tube 9 terminating in the upper receiver and with the fingers 17 of the said receiver in position to close the receiver end 14 above. As drilling progresses the drilling fluid is forced downwardly through the drill stem to the drill under pressure and passes back up through the bore around said stem as hereinafter explained. The cuttings from the drill will be carried upwardly in this fluid and a portion of the fluid will pass up through the collector tube 9 and will deposit solid cuttings in the upper collector 13, the fluid passing on out through the walls and around the receiver end 14 of said upper receiver. The upper receiver will collect the solid cuttings which will eventually tend to retard the flow of fluid therethrough exerting a pressure simultaneously in said receiver and in the chamber 11, due to a velocity head which equals the fluid velocity squared divided by twice the acceleration due to gravity. This pressure will force the assembled receivers upwardly, until the lower end 15 of the filled receiver is projecting above the end of the housing 6 where it is dragged about by the rotation of the drill stem causing the two fingers 18, having the hooks 19, to slide off sideways from the ring 16 of the receiver beneath. The fingers 18 of the filled receiver then spring inward to their originally formed position closing the bottom end of the receiver and trapping the cuttings. At the same time that the filled receiver end 15 projects from the housing 6, the fingers 17 of the receiver beneath slide off the end of the tube 9 and spring into their originally formed position, closing up the end of said receiver. The discharged upper receiver 13′ will be forced on upwardly by the current of fluid flowing upwardly through the bore, as indicated in Figure 1, to the ground surface leaving the next succeeding receiver beneath in position to receive the cuttings from the upper end of the collector tube. This process will be repeated until all of the receivers are filled and discharged, and they will be carried, one after another, to the ground surface for inspection with the cuttings from the drill collected therein in substantially an uncontaminated state.

The cuttings thus obtained represent the formations in which the drilling has been taking place. The sacks, or receivers can be marked, showing their relative positions, and the respective locations of the formations drilled can then be determined since the time required for the receivers to reach the surface is known or can be readily ascertained. The supply of sacks, or receivers in the housing 6 can be replenished when the drill is brought to the surface.

The drawing and descriptions disclose what is now considered to be a preferred form of the invention by way of illustration only.

What I claim is:—

1. Apparatus for taking samples from a well bore including a drilling device for disintegrating the formation at the bottom of the bore and having a passage way for drilling fluid through which said fluid may be supplied to the bottom of the bore to carry the disintegrated formation out of the bore around said drilling device, a detachable receiver on said drilling device, arranged to intercept and confine some of said disintegrated formation and, when detached, to carry the same, in a collected mass, to the ground surface.

2. Apparatus for taking samples from a well bore which includes a drilling device comprising a tubular drill stem, and a drilling tool at the lower end of the stem, there being a passageway for drilling fluid leading out from the stem through which said fluid may be supplied to the bottom of the bore for flushing out the disintegrated formation and carrying the same up through the bore around said stem, a receiver independent of, and carried by, and detachable from the drilling device arranged to collect some of the disintegrated formation passing upwardly in said fluid.

3. Apparatus for taking samples from a well bore including a drilling device for disintegrating the formation at the bottom of the bore and having a passageway for drilling fluid through which said fluid may be supplied to the bottom of the bore to carry the disintegrated formation out of the bore around said drilling device, a detachable receiver on said drilling device arranged to intercept, and confine some of said disintegrated formation and, when detached, to carry the same, in a collected mass, to the ground surface, means for collecting a portion of said disintegrated formation and directing the same into said receiver.

4. Apparatus for taking samples from a well bore including a drilling device for dis-

integrating the formation at the bottom of the bore and having a passageway for drilling fluid through which said fluid may be supplied to the bottom of the bore to carry the disintegrated formation out of the bore around said drilling device, a detachable receiver on said drilling device arranged to intercept and confine some of said disintegrated formation and, when detached, to carry the same, in a collected mass, to the ground surface, and means operable by the pressure of said fluid and effective to detach said receiver, when loaded from said device, to permit the loaded receiver to be carried by the upwardly moving fluid to the ground surface.

5. Apparatus for taking samples from a well bore which includes a drilling device comprising a tubular drill stem, and a drilling tool at the lower end of the stem, there being a passageway for drilling fluid leading out from the stem through which said fluid may be supplied to the bottom of the bore for flushing out of the disintegrated formation and carrying the same up through the bore around said stem, a receiver carried by the drilling device arranged to collect some of the disintegrated formation passing upwardly in said fluid, said receiver being arranged to be detached by the pressure of the fluid while the device is in the well bore, and a collector for diverting such formation into the receiver.

6. Apparatus for taking samples from a well bore which includes a drilling device comprising a tubular drill stem, and a drilling tool at the lower end of the stem, there being a passageway for drilling fluid leading out from the stem through which said fluid may be supplied to the bottom of the bore for flushing out the disintegrated formation and carrying the same up through the bore around said stem, a detachable receiver carried by the drilling device arranged to collect some of the disintegrated formation passing upwardly in said fluid, a collector for directing such formation, suspended in the fluid, into the receiver, and means operable by the pressure of the drilling fluid and effective to release the receiver from the drilling device to permit said receiver to move with said fluid to the ground surface.

7. A sample taking apparatus including a tubular drill stem adapted to be let down into a well bore, a drilling tool at the lower end thereof, there being a passageway for drilling fluid located so as to supply said fluid from said stem to the bottom of the bore to carry the cuttings from the drill up through the bore to the ground surface, an external, detachable receiver for the cuttings, independent of but attached to the stem adjacent the lower end thereof.

8. A sample taking apparatus including a tubular drill stem adapted to be let down into a well bore, a drilling tool at the lower end thereof, there being a passageway for drilling fluid located so as to supply said fluid from said stem to the bottom of the bore to carry the cuttings from the drill up through the bore to the ground surface, an external receiver for the cuttings carried by the stem adjacent the lower end thereof, and means for directing said cuttings held in suspension in the fluid, upwardly into said receiver.

9. A sample taking apparatus including a tubular drill stem, adapted to be let down into a well bore, a drilling tool at the lower end thereof, there being a passageway for drilling fluid, located so as to supply said fluid from said stem to the bottom of the bore to carry the cuttings from the drill up through the bore to the ground surface, an external, detachable receiver for the cuttings incorporated into the apparatus adjacent the lower end thereof, and means operable by the pressure of said fluid and effective to release said receiver from the stem.

10. A sample taking apparatus including a drill stem adapted to be let down into a well bore, a drilling tool at the lower end thereof, a tubular housing attached to the stem and open at one end and closed at its other end, a detachable receiver in said housing, a collecting tube through the closed end of the housing one end of which enters the receiver, a plunger in said housing and forming a pressure chamber between said plunger and the closed end of the housing, said tube having a port leading into said chamber.

11. A sample taking apparatus including a drill stem adapted to be let down into a well bore, a drilling tool at the lower end of said stem, a housing attached to the stem, a detachable receiver in the housing, means for collecting cuttings from said tool and delivering same into said receiver, and means operable by fluid under pressure and effective to release said receiver from said housing.

12. In a device of the character described a housing, means for attaching the housing to a drill stem, a collector tube anchored to the housing and whose upper end terminates therein, a plurality of collapsible receivers arranged, one above the other, on the tube, the upper end of said tube terminating in the upper receiver, said receivers being movable upward on said tube and detachable in succession therefrom.

In testimony whereof I have signed my name to this specification.

FRANK G. KUNZ.