

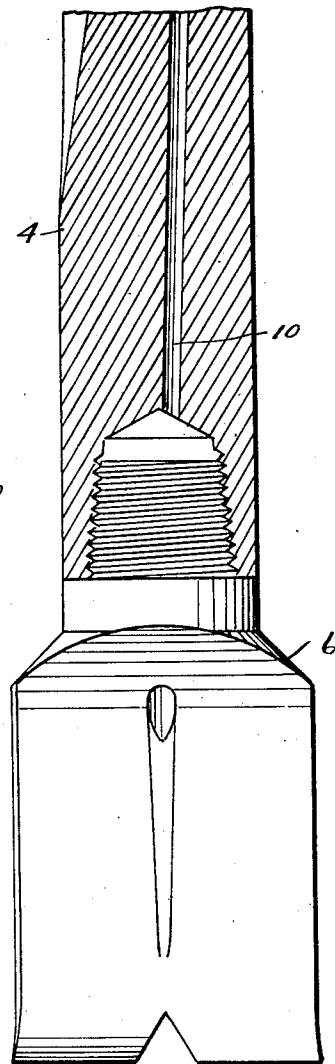
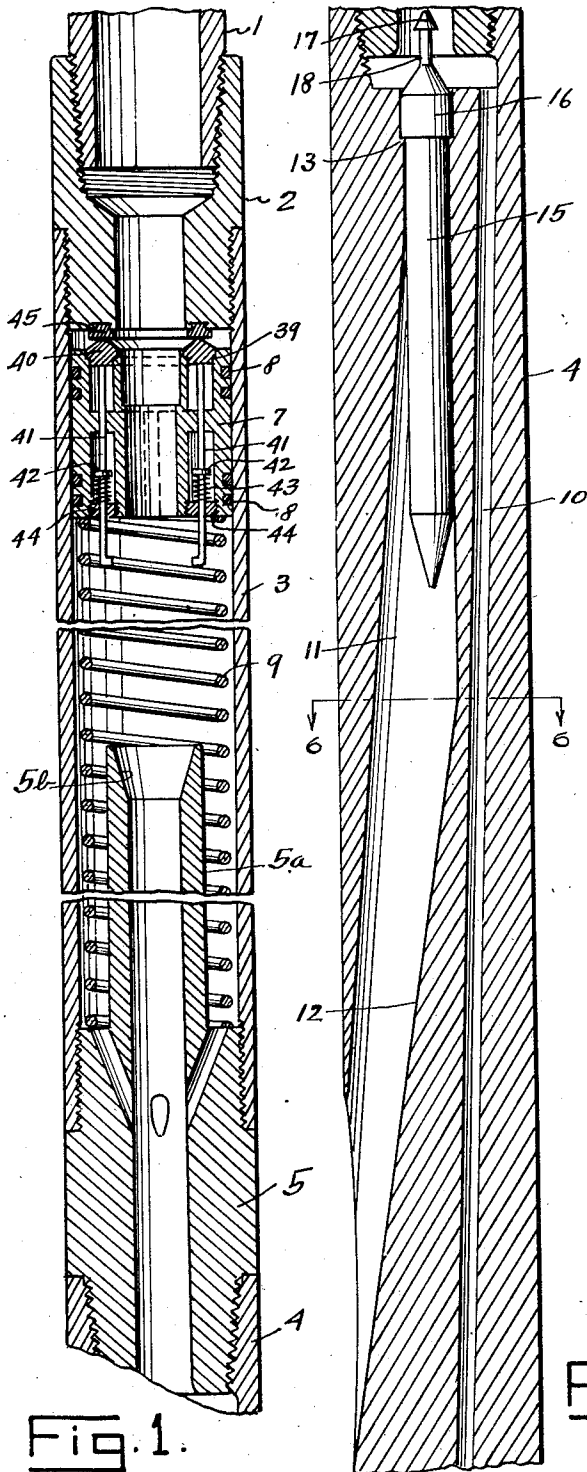
Oct. 17, 1939.

J. McCLINTON
SIDE WALL SAMPLER

2,176,375

Filed May 23, 1938

2 Sheets-Sheet 1



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Fig 2. By

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2 Sheets-Sheet 2

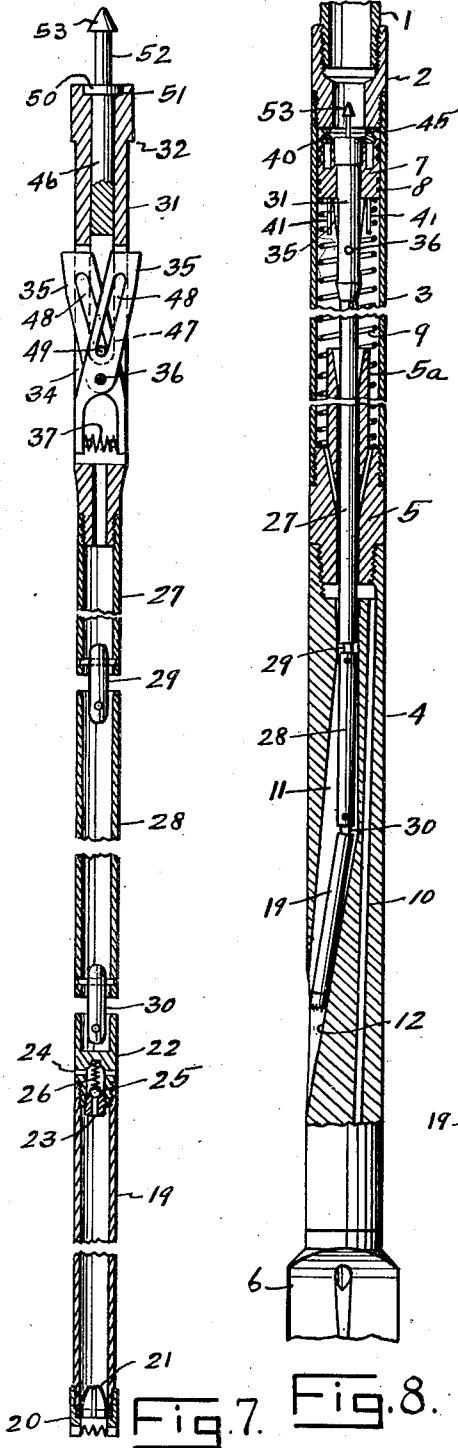


Fig. 7.

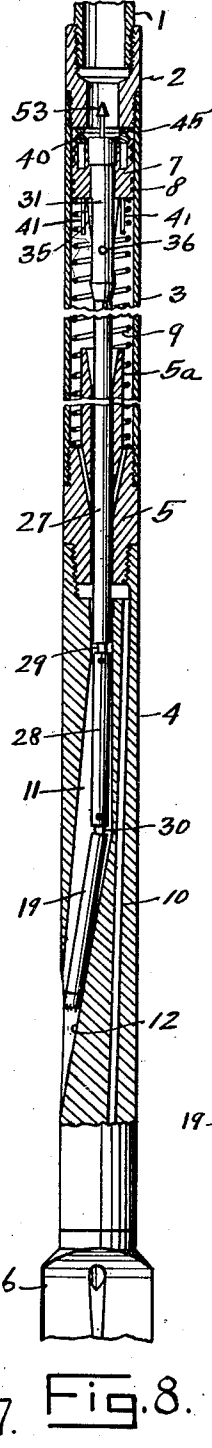


Fig. 8.

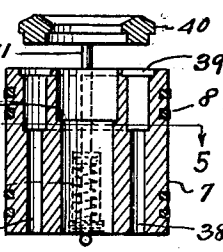
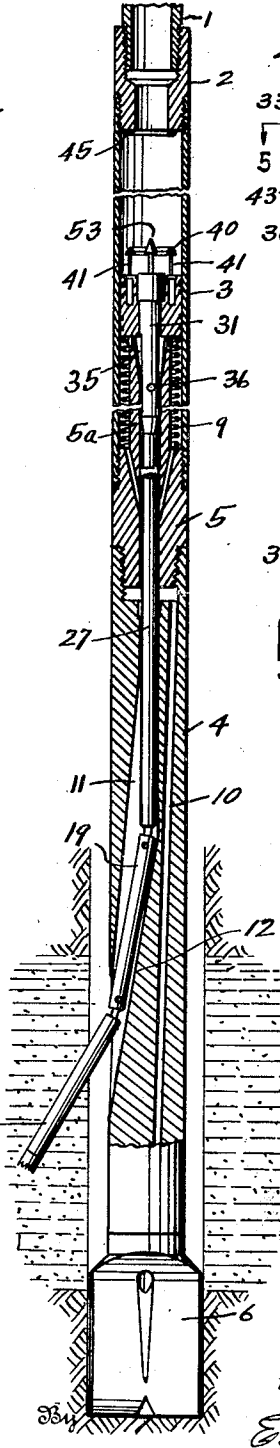


Fig. 4.

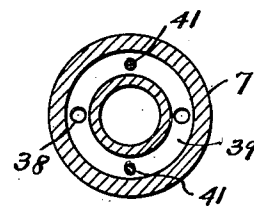


Fig. 5.

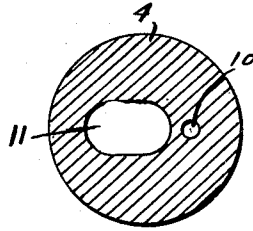


Fig. 6.

Fig. 9.

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2,176,375

SIDE WALL SAMPLER

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15 Claims. (Cl. 255—1)

This invention relates to a sample taking apparatus designed particularly for the purpose of taking a sample, of the formation being pierced in well drilling, from the side wall of the bore and for withdrawing the same to the ground surface for inspection without withdrawing the drill stem from the bore.

An object of the invention is to provide a novel type of sample taking apparatus including a sample receiving barrel adapted to be lowered into a drill stem and to be projected out laterally therefrom into the formation to be tested and which thereafter may be withdrawn through the stem to the ground surface for an inspection of the sample.

The invention also embodies novel means for latching the core, or sample, taking device in the drill stem and for thereafter projecting the sample receiving barrel laterally from the stem by the pressure of an operating fluid and for controlling the flow of such fluid during the operations incident to the taking of the sample and the withdrawal of the same from the well.

It is a further object of the invention to provide in combination with a drill stem having a deflector of a sample taking apparatus embodying a sample receiving barrel mounted to be deflected by said deflector into the formation at the side of the bore.

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

Figures 1, 2 and 3 show vertical sectional views of upper, intermediate and lower sections of the drill driving shaft which is connected to the lower end of the drill stem proper.

Figure 4 shows a vertical sectional view of a type of plunger employed.

Figure 5 shows a cross sectional view taken on the line 5—5 of Figure 4.

Figure 6 shows a cross sectional view taken on the line 6—6 of Figure 2.

Figure 7 shows a vertical sectional view of the sample taking barrel and the supporting and anchoring means therefor.

Figure 8 shows a vertical sectional view of the driving shaft attached to the lower end of the drill stem and to which the drill is secured showing the sample taking apparatus therein in inactive position, and

Figure 9 shows a view similar to that shown

in Figure 8, showing the sample taking apparatus therein in active position.

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 drill stem, to the lower end of which the coupling 2 is connected. Attached to the lower end of the coupling there is a tubular section of pipe 3 forming a cylinder. A shaft forming an elongated drill collar is attached to the lower end of the cylinder 3 by means of a tubular coupling 5. Attached to the lower end of the drill collar 4 there is a suitable drill 6 of any selected design. In the cylinder 3, is a tubular plunger 7 having the external packing rings 8, 8. This plunger is mounted on a strong coil spring 9 which is seated on the upper end of the coupling 5 and is confined within the cylinder 3. The upper end of the coupling 5 is reduced thus forming a tubular extension 5a which extends up into and forms a guide for the spring 9. The upper end passageway through said coupling is flared forming a guide 5b.

Leading downwardly from the upper end of the drill collar 4 there is a channel 10 through which a drilling fluid, passing downwardly through the drill stem and through the plunger 7 and coupling 5, may be delivered to the cutting tool during normal drilling operations.

There is a guideway 11 extending downwardly through the shaft 4 from the upper end thereof which diverges downwardly relative to the axis of the shaft. The upper end of this guideway is approximately coaxial with the passageway through the coupling 5. The inner side of the guideway 11 at its lower end is formed with a deflecting face 12.

The upper end of the guideway 11 is enlarged forming an inside annular upwardly facing shoulder 13, forming a seat.

During normal drilling operations an elongated plug 15 is dropped through the drill stem, passing on downwardly through the plunger 7 and being guided by the flared face 5b through the coupling 5 into the guideway 11. This plug has an enlarged head 16 which fits into the enlarged upper end of the guideway 11 and closes the same and lands on the seat 13. The drilling fluid will thus be forced to pass downwardly through the channel 10 to the drill under the required pressure. When it is desired to take a core, or sample, the plug 15 may be removed by means of a conventional fishing tool which may be engaged over the enlarged upper end 17 of the stem 18 which upstands from the head 16. This fishing

tool may be operated by a cable in the well known manner.

Upon removal of the plug 15 the sample taking apparatus shown in Figure 7 may be then dropped through the drill stem into the position shown in Figure 8.

The lower end of the sample taking apparatus, as illustrated in Figure 7, embodies a sample receiving barrel 19 whose lower end may be provided with a tubular shoe 20, which may be of any selected formation to readily penetrate the wall of the bore. The sample receiving barrel should be equipped with any suitable type of core catcher or sample retainer such as 21. The upper end of the barrel 19 is equipped with a coupling 22 having the outlets 23, 24 controlled by a back pressure valve 25 normally held closed by a spring 26 but adapted to yield as the sample enters the barrel to permit the escape of air or other fluid in the barrel. The numeral 27 designates a tubular stem and between the stem 27 and barrel 19 there is a tubular pipe section 28. This section 28 is connected at one end to the coupling 22 and at its other end to the lower end of the stem 27. These connections are formed by the upper and lower links 29, 30. The link 29 is pinned, at its respective ends, to the stem 27 and the section 28, the connecting pins being at right angles to each other to form a universal connection and the link 30 is pinned to adjacent ends of the coupling 22 and the section 28, the pins being at right angles to form a universal connection. The sample taking unit shown in Figure 7 is thus made flexible.

Attached to the upper end of the stem 27 there is a tubular head 31 whose upper end is enlarged forming the downwardly facing shoulders 32. The assembly above described and shown in Figure 7 may be dropped from the ground surface through the drill stem and will pass through the tubular plunger 7 and through the coupling 5. The passageway through the plunger 7 is enlarged at its upper end forming an annular upwardly facing shoulder 33. The enlarged upper end of the head 31 will fit into the enlarged upper end of the passageway through the plunger 7 and the shoulder 32 will land on the shoulder 33 as shown in Figure 8. In this position the core barrel or sample receiving barrel 19 will be located within the guideway 11 as also shown in Figure 8. The head 31 has a transverse slot 34 therethrough in which is located the latches 35, 35, which are pivoted on the pin 36. Between the lower ends of the latches there is a pressure spring 37 which normally holds said lower ends apart and the upper ends of the latches in extended or outer position as shown in Figure 7. As the head 31 passes through the plunger 7, the upper ends of the latches will be forced inwardly to permit such passage and the spring 37 yielding for that purpose. When the upper or free ends of the latches clear the lower end of the plunger, the spring 37 will force the lower ends of the latches apart thus moving the upper ends of the latches outwardly into engagement with the lower end of the plunger as shown in Figures 8 and 9. The plunger will thus be locked to the head.

The plunger 7 has the vertical channels 38 therethrough whose upper ends merge into an annular seat 39 in the upper end of the plunger and an annular valve 40 is shaped to fit into said seat 39 to close the channels 38. Attached to the valve and depending therefrom and working through suitable bearings in the plunger

there are the push rods 41, 41 whose lower ends are extended beneath the plunger and are inwardly turned. On the push rods 41 are the stops 42. Coil springs 43 surround the rods 41 and are interposed between said stops and the ring nuts 44 which are screwed into the lower end of the plunger and which have bearings through which the rods 41 extend. The lower end of the coupling 2 has an annular seat 45 countersunk therein with which the valve 40 contacts when the plunger is in its upper position as shown in Figure 1. The valve 40 and seat 45 may be formed of suitable resilient material so as to form a close fitting joint between them when in contact with each other.

When the sample taking, or core taking assembly is dropped into position as shown in Figure 8, pressure may be applied against the upper end of the plunger 7. This pressure will usually be applied by the application of drilling fluid from a pump at the ground surface down through the drill stem 1, it will force the core taking assembly downwardly into the position shown in Figure 9, the spring 9 yielding to permit this. The barrel 19 will be deflected by the deflecting face 12 outwardly and will pierce the side wall of the bore as indicated in Figure 9 and a sample of said side wall will enter the barrel 19 and will be trapped therein by the catcher or trap 21. Upon downward movement of the plunger 7, the inwardly turned ends of the rods 41 will engage the upper end of the extension 5a and, as the plunger moves on down, the valve 40 will be held stationary thus opening the passageways 38. This is desirable for the reason that before removing the core taking apparatus from the drill stem, the drill stem must be elevated a sufficient distance to permit the breaking out and removal of the grip pipe at the upper end of said stem. The drill stem at this time is filled with drilling fluid and upon such elevation, the drilling fluid above the plunger may flow down through the passageways 38 so that it will not be necessary to lift the entire weight of the column of drilling fluid within the drill stem upon such elevation of said stem.

As hereinabove stated, the head 31 is tubular. A latch actuator 46 is fitted downwardly through said head and its lower end is formed with spaced fingers 47 which embrace the latches. The latches have the upwardly diverging slots 48, 48 and a cross pin 49 is anchored to said fingers and extends through the slots 48. The latch actuator is formed with a valve 50 thereon which normally seats in the seat 51 in the upper end of the head 31 so as to form a water tight joint therewith and upstanding from the actuator 46 there is a stem 52 whose upper end has the enlargement 53 thereon.

In order to remove the sample taking apparatus from the drill stem, a grappling tool may be lowered by means of a wire line through the stem and engaged with the enlargement 52. Upon upward movement of the grappling tool, the pin 49 will first be elevated and will operate to retract the latches 35 and disengage them from the plunger 7 and thereupon the sample taking device may be withdrawn from the drill stem to the ground surface and the barrel 19 detached for an inspection of the sample therein. The spring 9 will return the plunger 7 to its upper position, the springs 43 closing the valve 40 which will seat against the seat 45 which acts as a bumper and drilling may be proceeded with, the drilling fluid passing downwardly through the

plunger 7. If it be desired to take additional samples from the same sand, the drill stem may be partly turned and the sample taking apparatus again dropped into place and another sample taken. In this manner, samples of a sand formation may be taken from different sides of the bore and the sand thus thoroughly tested before drilling deeper.

The foregoing description and the drawings are illustrative of one form of the invention, but the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. The combination with a tubular driving member for a well drill, having a guideway therein forming a deflector, of a sample taking device adapted to be dropped through the driving member and including a sample receiving barrel arranged to be deflected through said guideway into the side wall of a well bore, and means adapted to close said guideway.

2. The combination with a tubular driving member for a well drill, having a deflector, of a support therein, a sample taking device adapted to be dropped through said driving member and to land on said support and including sample entrapping means, said device and support being downwardly movable in response to fluid pressure to cause said entrapping means to be directed, by said deflector, into the side wall of a well bore to entrap a sample thereof.

3. The combination with a tubular driving member, for a well drill, having a deflector, of a support therein, a sample taking device adapted to be dropped through said driving member and to land on said support and including sample entrapping means, said device and support being downwardly movable in response to fluid pressure to cause said entrapping means to be directed, by said deflector, into the side wall of a well bore to entrap a sample thereof, and means for withdrawing said sample taking device and entrapped sample from the driving member.

4. The combination with a tubular driving member for a well drill shaped to be lowered into a well and having a guideway and a yieldingly mounted support above the guideway, of a sample taking device shaped to be dropped through the driving member and to land on said support and including sample entrapping means, said support and sample taking device being downwardly movable in response to fluid pressure exerted downwardly through the driving member to cause said entrapping means to be directed by the guideway laterally from the driving member into the side wall of the well bore to entrap a sample of the wall formation.

5. The combination with a tubular drill driving member shaped to be lowered into a well bore, of a tubular support therein, the yieldable seat sustaining the support, said driving member having a deflector, a sample taking device adapted to be dropped through the driving member and shaped to land on the support and including sample entrapping means, said support and sample taking device being movable downwardly in response to fluid pressure exerted downwardly through the driving member to cause the entrapping member to be directed by the deflector laterally from the driving member into the side wall of the bore to entrap a sample of the formation of said side wall.

6. The combination with a tubular drill driving member shaped to be lowered into a well bore, of a tubular support therein, the yieldable seat

sustaining the support, said driving member having a deflector, a sample taking device adapted to be dropped through the driving member and shaped to land on the support and including sample entrapping means, said support and sample taking device being movable downwardly in response to fluid pressure exerted downwardly through the driving member to cause the entrapping member to be directed by the deflector laterally from the driving member into the side wall of the bore to entrap a sample of the formation of said side wall, and means for withdrawing said sample taking device from the driving member.

7. The combination of a tubular driving member for a drill shaped to be lowered into a well bore and having deflecting means and a downwardly movable support, of a sample taking device shaped to drop through said driving member and to land on said support including sample entrapping means arranged to be deflected, by the deflector, into the side wall of the bore to entrap a sample thereof upon further downward movement of the support and sample taking device.

8. The combination of a tubular driving member for a drill shaped to be lowered into a well bore and having deflecting means and a downwardly movable support, of a sample taking device shaped to be dropped through said driving member and to land on said support including sample entrapping means arranged to be deflected, by the deflector, into the side wall of the bore to entrap a sample thereof upon further downward movement of the support and sample taking device, said support having a liquid passageway therethrough, means normally closing said passageway and means adapted to open said passageway upon further downward movement of said support.

9. The combination of a drill bit for drilling a well bore, and a tubular driving member secured in driving relation to said bit to drive the same, said driving member being adapted to be lowered into said bore, of a sample taking device adapted to be dropped through said driving member and to be projected laterally therefrom into the wall formation of the bore and having means thereon for entrapping a sample of said formation.

10. The combination of a drill bit for drilling a well bore, and a tubular driving member secured in driving relation to said bit to drive the same, said driving member being adapted to be lowered into said bore, sample entrapping means shaped to be lowered through the driving member and projected laterally therefrom into the wall of the bore to entrap a sample of the wall formation.

11. A sample taking device comprising a tubular driving member for a drill shaped to be lowered into a well bore and having a lateral guideway, a sample entrapping means shaped to be dropped through said driving member and to be directed by said guideway into the wall of the bore to entrap a sample of the wall formation, said sample entrapping means being withdrawable through the driving member, and means adapted to close said guideway.

12. The combination of a driving member for a drill, having a fluid passage therethrough, and an outwardly diverging guideway leading from said passage, means for sealing said guideway from the passage, core taking apparatus adapted

to be moved through said guideway into the wall of a well bore.

5 13. The combination of a driving member for a drill having a fluid passage therethrough and having a guideway diverging outwardly from said passage, means for closing said guideway where-
10 by drilling fluid will be excluded therefrom, and a sample receiving device adapted to be dropped through the driving member and including a
15 sample receiving barrel arranged to be deflected through said guideway.

14. The combination of a driving member for a drill having a fluid passage therethrough and having a guideway diverging outwardly from said
15 passage, means for closing said guideway where- by drilling fluid will be excluded therefrom, and a sample receiving device adapted to be dropped

through the driving member and including a sample receiving barrel arranged to be deflected through said guideway and said device being also adapted to seal said passage and guideway whereby fluid will be excluded therefrom. 5

15. The combination of a drill bit for drilling a well bore, and a tubular driving member se- cured in driving relation to said bit to drive the same, said driving member being adapted to be lowered into said bore and extending to the ground surface, of a sample taking device adapt- 10 ed to be dropped through said driving member from the ground surface and to be projected lat- erally therefrom into the wall formation of the bore to entrap a sample of said formation. 15

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