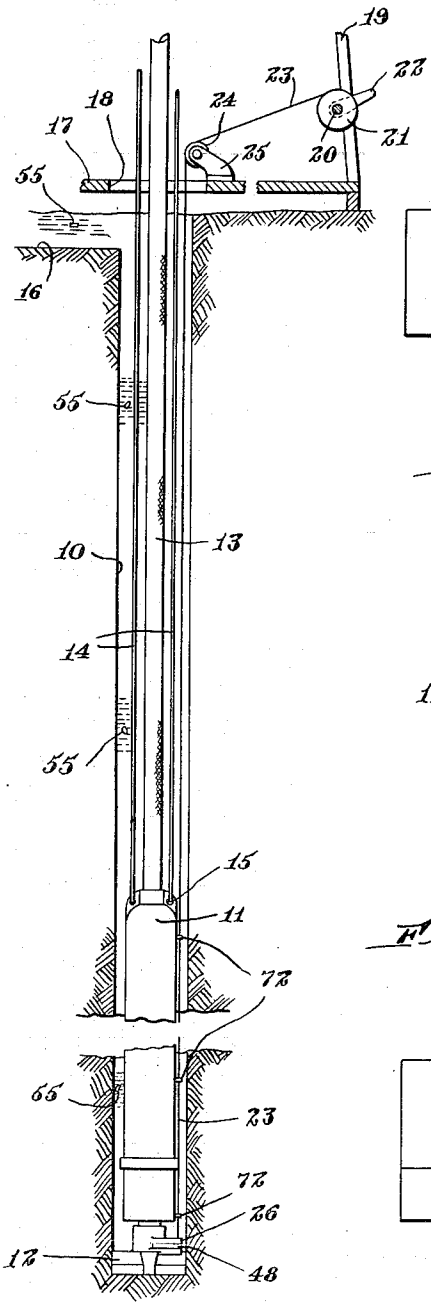
April 17, 1934. C. E. BANNISTER 1,955,166

DEVICE FOR TAKING CORES OR SAMPLES FROM WELLS

Original Filed July 20, 1931 2 Sheets-Sheet 1

Fig. 1.



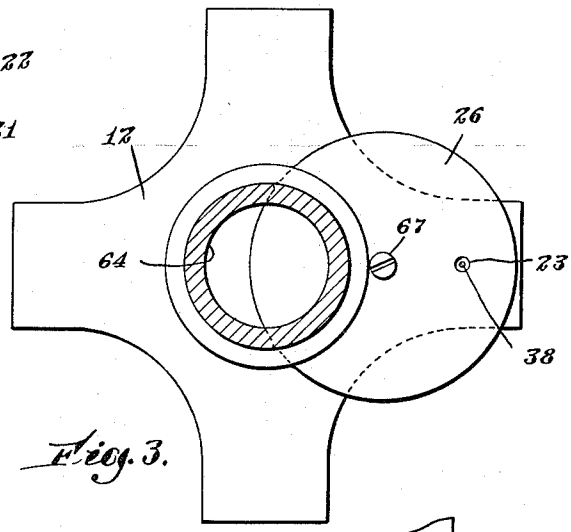
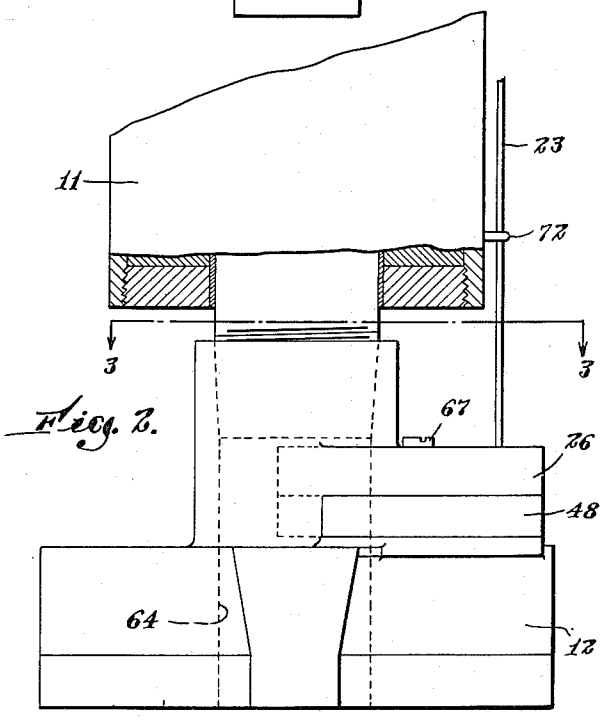


Fig. 3.

Fig. 2.



Inventor
Clyde E. Bannister
by James R. Hodder
Attorney

April 17, 1934. C. E. BANNISTER 1,955,166

DEVICE FOR TAKING CORES OR SAMPLES FROM WELLS

Original Filed July 20, 1931 2 Sheets-Sheet 2

Fig. 4.

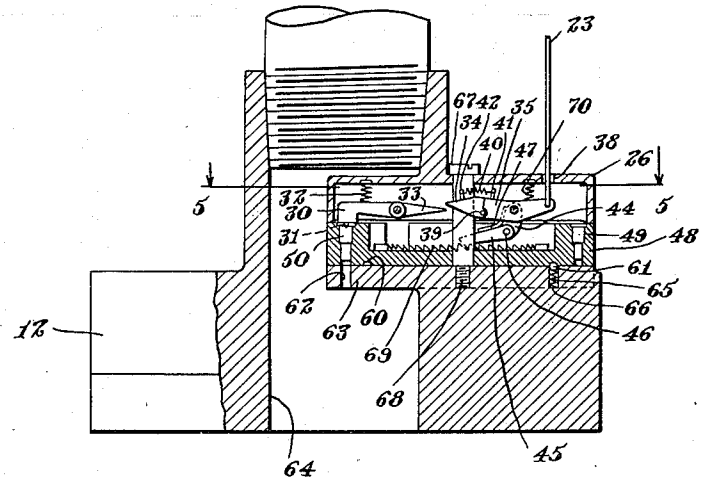


Fig. 5

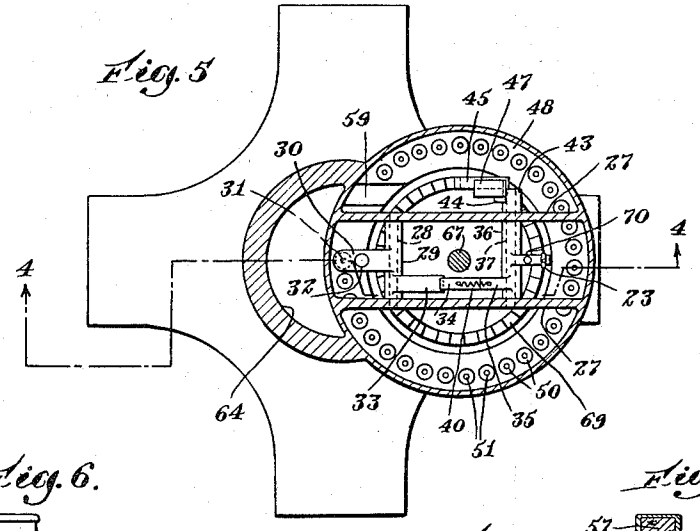


Fig. 6.

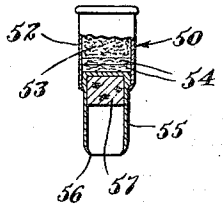


Fig. 7.

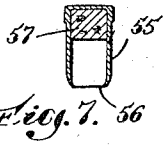


Fig. 8.

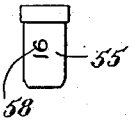
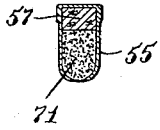


Fig. 9.



Inventor.
Clyde E. Bannister
by James R. Hodges
attorney

Patented Apr. 17, 1934

1,955,166

UNITED STATES PATENT OFFICE

1,955,166

DEVICE FOR TAKING CORES OR SAMPLES FROM WELLS

Clyde E. Bannister, Houston, Tex.

Application July 20, 1931, Serial No. 551,948
Renewed September 13, 1933

20 Claims. (Cl. 255—1)

My present invention relates to oil well drilling or boring apparatus and more particularly to a novel and improved device for the taking of cores or samples during the drilling operation.

It is essential that the operators who are drilling a well keep informed as to the geological nature of the various strata through which the boring machine passes in its descent. This is accomplished, at present, in several different manners.

Many well drillers are sufficiently experienced to determine by the feel of the drill string just the nature of the material through which the drill is working.

Another method is to watch the slushings or cuttings as they are washed out of the bore. This latter method is inaccurate and unsatisfactory.

Still another method is the actual taking of a core by a core barrel. This method is a tedious, drawn out operation, particularly at considerable depth, as it requires the breaking down of the entire drill string, the removal of the drill, the coupling on of a core barrel, the making up of the drill string as it descends into the bore, the taking of the core, and the subsequent withdrawal of the core barrel, which again necessitates the breaking down of the entire drill string, removal of the core barrel, replacement of the drill, and a subsequent making up of the entire drill string. At considerable depths an entire day is frequently consumed in the taking of a single core. As it is essential that these cores or samples be taken at frequent intervals as the depth of the core increases, it will be seen that the taking of cores consumes a considerable portion of the time required to drill a well. This essential operation can not be eliminated, as the driller's log must be kept complete from the time of spudding in until the time of completion of the well.

An important object of the present invention, therefore, resides in the provision of means to shoot or take a core or sample at any desired depth, without interrupting the operation of the cutting bit.

Another object of the present invention resides in the provision of means by which a great number of cores or samples can be taken as the boring of the well progresses, without any delay or cessation of work.

Another object of the present invention resides in the provision of means which is simple to construct, install, and operate.

Other objects and features of the present invention reside in the particular construction and arrangement of my novel device.

In carrying out my present invention I provide firing mechanism attached directly to the bit, provided with means for the insertion of a removable projectile-carrying magazine, which may be removed and replaced in a short interval of time. Said magazine is horizontally disposed relative to the bore being formed, and the firing mechanism is so constructed and arranged that the projectile being fired is in line with the fluid discharge aperture in the bit. Therefore, on operation of the firing mechanism, the projectile will be discharged directly into the stratum being cut, and will thereafter be washed out with the cuttings.

A still further object of the present invention resides in utilizing a numbered series of projectiles, record being kept of the depth at which each projectile is fired, and on subsequent recovery of said projectile from the slush pit or ditch leading thereto, the exact nature of the stratum being drilled can be determined with great accuracy.

Still another object of the present invention resides in the particular construction of the projectile utilized. This comprises a shell provided with a percussion cap, and a predetermined charge of explosive powder. Crimped in the open end of the shell is the core or sample-taking projectile which comprises a sleeve closed at one end and provided with a cutting edge at its opposite end. This second sleeve is provided with buoyant material or means so that, after a core has been shot and the cutting edge of the projectile crimped inwardly by the impact, the buoyant material will assist in the raising of the projectile out of the bore with its core or sample intact on the interior thereof.

Operation of the firing mechanism is effected by means of a suitable lanyard or wire extending from the bit vertically through the bore to a suitable winding reel or drum.

My invention is particularly applicable in well drilling apparatus of the type illustrated in my prior and copending application, Ser. No. 271,923, filed April 21, 1928, wherein an oscillating movement is imparted to the cutting bit, instead of the customary rotary movement. The firing lanyard is slidably guided along the inertia or working barrel, and because of the oscillation rather than rotation of the cutting bit to which said lanyard extends, twisting or tangling of the lanyard around the boring machine is obviated.

I believe that the core shooting or sample taking device illustrated herein and above briefly described is novel, and I have therefore claimed the same broadly in the present application.

I also believe that the particular projectile utilized is novel, and have therefore also claimed this projectile herein.

All of the above, together with other objects and features of the invention, details of construction, combinations of parts and advantages,

will be hereinafter more fully pointed out, described and claimed.

Referring to the drawings, illustrating a preferred embodiment of the present invention,

Fig. 1 is a side elevation of a well drilling machine in which my invention is embodied;

Fig. 2 is a side elevation of a cutting bit and lower portion of the working barrel illustrating the application of my novel device;

Fig. 3 is a plan sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a vertical sectional view on the line 4—4 of Fig. 5;

Fig. 5 is a plan sectional view on the line 5—5 of Fig. 4;

Fig. 6 is a side elevation, partly in section, illustrating my novel combined shell and projectile, constructed in the form of a cartridge;

Fig. 7 is a vertical sectional view of the projectile portion of said cartridge;

Fig. 8 is a side elevation of said projectile; and

Fig. 9 is a vertical sectional view of the projectile after the taking of a core or sample, with said core or sample held in said projectile by the crimping over of the open ends thereof.

Referring now to the drawings for a particular description of the invention, its construction and operation, 10 designates a bore being formed by a drilling machine which comprises an inertia or working barrel 11 contained within which is a fluid pressure motor imparting an oscillatory movement to a cutting bit 12, as clearly described in my said prior and copending application. Fluid under pressure is conducted to the said motor by means of the hose 13, and the machine is supported by means of flexible cables 14 fixed to the eyes 15 on the working barrel. 16 designates the ditch leading to the slush pit at the ground surface, and 17 designates the derrick floor having a port 18 therethrough, through which the hose 13 and cables 14 descend. Fixed to the derrick 19 on a shaft 20 is a reel or drum 21 provided with an operating handle 22. This reel or drum contains the lanyard 23, which is preferably comprised of piano wire or similar material, and which passes over a vertical guiding wheel 24 mounted in brackets 25 which are in turn fixed to the derrick floor 17. This insures a vertical descent of the lanyard 23 into the bore 10.

The bit 12 is provided with a housing member or cover 26 in which are formed a pair of parallel webs 27. A shaft 28 is mounted between said webs and carries a sleeve 29. Projecting from this sleeve 29 to one side thereof is a hammer 30 carrying the firing pin 31, and normally held in lowered position, as illustrated in Fig. 4, by a coiled spring 32. Projecting from the sleeve 29 to the side opposite the hammer 30 is a sear 33 in line with the outer end 34 of a trigger 35, said trigger being formed on a sleeve 36 rotatably mounted on a shaft 37 which is likewise mounted between the webs 27 with one end of said shaft projecting beyond one of said webs.

The lanyard 23 projects through a port 38 in the housing 26 and is connected to the outer end of the trigger 35. The end 34 of the trigger 35 is separated from said trigger, being pivotally attached thereto at 39, and being normally held in contacting relation, as illustrated in Figs. 4 and 5, by the spring 40 connected to a pin 41 on the trigger 35 and to a pin 42 on the forward end 34 of said trigger. On the projecting end of the shaft 37 is a sleeve 43, this sleeve carrying a bracket 44 to which a pawl 45 is pivotally attached at 46.

A leaf spring 47 fixed to the bracket 44 normally tends to depress said pawl 45.

I also provide a removable magazine 48, having a plurality of chambers 49 therein, and in each of these chambers is located a cartridge designated generally at 50, Fig. 6. In the head of each of these cartridges is a percussion cap 51, and in the shell 52 of said cartridge is the explosive powder 53, wads 54 being provided to protect said powder against dampness. Crimped into the open end of the shell 52 is a projectile comprising a shell 55 and an open end having a cutting edge 56.

Housed within the projectile 55 is cork or other buoyant material 57, and each projectile is provided with a number, as illustrated at 58 in Fig. 8. The magazine 48 is provided with a slot 59 to permit insertion and removal of said magazine past the pawl 45 and bracket 44. The magazine 48 is also provided, on its lower face adjacent to the outer edge thereof, with a plurality of notches 60, a ball 61 being adapted to engage one of said notches when a cartridge 50 is in line with the barrel 62 in the shoulder 63 of the bit 12 which projects inwardly into the fluid discharge channel 64. The ball 61 is pressed into said notch 60 by means of a coiled spring 65 housed in a recess 66 in the bit 12. When the magazine is inserted into the bit, it is held in place by a bolt 67 passing through the cover or housing 26, and having its threaded end 68 threaded into the body of the bit 12.

The magazine 48 carries a ratchet 69 adapted to be engaged by the pawl 45. The trigger 35 is held in the normal position illustrated in Fig. 4 by a coiled spring 70.

The operation of my novel device is simple, and will be readily understood by those skilled in this art.

As the bit 12 descends into its bore, samples must be taken at predetermined depths. Therefore, when it is desired to take a core or sample, it being assumed that serially numbered cartridges 50 are positioned in the magazine 48, the operator, at the surface of the ground, manipulates the lanyard 23. This will rock the trigger 35 about its pivot, and will depress the sear 33, raising the hammer 30 and firing pin 31 against the tension of the coiled spring 32. When the pivoted end 34 of the trigger 35 has passed beyond the sear, the hammer will be depressed by the spring 32, and the firing pin 31 will be impacted against the percussion cap 51 of the cartridge which is then in line therewith.

On explosion of the powder 53, the projectile 55 will be projected through the barrel 62, through the hollow interior 64 of the bit 12, and into the stratum at the bottom of the well. On impact with the bottom of the well, the cutting edge 56 will be crimped over by the pressure of said impact, but will confine a sufficient sample 71 therein to give a reading to the operator. The fluid which is used for flushing the bore will wash the projectiles 55 to the surface, being aided and assisted in this by the presence of the buoyant material 57 in said projectile.

On pulling of the lanyard 23, of course, the pawl 45 will engage one of the teeth of the ratchet 69, and will rotate said magazine until an unfired cartridge is in line with the hammer, said pawl 45 returning to normal position on release of the lanyard.

The operation of the bit 12, as above explained, is purely oscillatory and not rotative, and hence

there is no likelihood of entangling the lanyard 23 about the machine 11 or its cooperating hose and cables. However, to insure against disalinement of the lanyard 23, I provide guiding eyes 72 fixed to the barrel 11, through which eyes the lanyard 23 passes, and is guided and retained in proper position.

Thus, at any point during the progress of drilling a well, when utilizing my novel system and device, the operator has before him a serially numbered series of projectiles 55, together with a record of the depth at which said projectiles were fired. This gives a complete history of the strata through which the machine has bored, during its descent.

The simplicity of my novel device, the speed with which cores or samples may be taken and read, the economy, time and labor saving, and other advantages, will be instantly apparent to those skilled in this art.

While I have necessarily described my present invention somewhat in detail, it will be appreciated that I may vary the size, shape, and arrangement of parts, within reasonably wide limits, without departing from the spirit of the invention.

My invention is further described and defined in the form of claims as follows:

1. Well drilling mechanism of the kind described, comprising a cutting bit, and a plurality of explosive actuated sample-taking devices carried by said bit and operable at will from a remote control station.

2. Well drilling mechanism of the kind described, comprising a cutting bit, and a plurality of explosively-actuated sample-taking devices associated therewith and operable at will from a remote control station.

3. Well drilling mechanism of the kind described, comprising a cutting bit, a magazine associated therewith, a plurality of explosive shells carried by said magazine, a hollow sample-taking projectile carried by each shell, and means operable from a remote control station to fire said shells at will.

4. Well drilling mechanism of the kind described, comprising a cutting bit, a magazine associated therewith, a plurality of serially numbered explosive shells carried by said magazine, a hollow sample-taking projectile carried by each shell, and means operable from a remote control station to fire said shells at will.

5. Well drilling mechanism of the kind described, comprising a cutting bit, a removable rotating magazine associated therewith, a plurality of explosive shells carried by said magazine, a hollow sample-taking projectile carried by each shell, and means operable from a remote control station to fire said shells at will.

6. Well drilling mechanism of the kind described, comprising a cutting bit, a housing thereon, a rotating magazine removably fixed in said housing, a plurality of explosive shells carried by said magazine, a sample-taking projectile carried by each shell, and means operable from a remote control station to fire said shells at will.

7. Well drilling mechanism of the kind described, comprising a cutting bit, a housing thereon, a rotating magazine removably fixed in said housing, a plurality of explosive shells carried by said magazine, a hollow sample-taking projectile carried by each shell, and means operable from a remote control station to fire said shells at will.

8. Well drilling mechanism of the kind described, comprising a cutting bit, a housing thereon, a rotating magazine removably fixed in said housing, a plurality of serially numbered explosive shells carried by said magazine, a sample-taking projectile carried by each shell, and means operable from a remote control station to fire said shells in sequence.

9. Well drilling mechanism of the kind described, comprising a cutting bit, a housing thereon, a rotating magazine removably fixed in said housing, a plurality of explosive shells carried by said magazine, a sample-taking projectile carried by each shell, and manually controlled means operable from a remote control station to fire said shells.

10. A sample-taking device, comprising a shell, explosive therein, and a hollow floatable projectile carried thereby.

11. A sample-taking device, comprising a shell, explosive therein, and a hollow open-ended floatable projectile carried thereby.

12. A sample-taking device, comprising a shell, explosive therein, and a hollow open-ended floatable projectile carried thereby, said projectile having a cutting edge at its open end.

13. A sample-taking device, comprising a shell, explosive therein, a hollow projectile carried thereby, and buoyant means in said projectile.

14. A sample-taking device, comprising a shell, explosive therein, a hollow projectile carried thereby, and buoyant means carried by said projectile.

15. A sample-taking device, comprising a shell, explosive therein, a hollow projectile carried thereby, and buoyant material in said projectile, said open end of said projectile being adapted to close after impact with the material against which it is fired, to retain a sample of said material within said projectile.

16. Well drilling mechanism of the kind described, comprising a cutting bit, a support therefor, a plurality of explosive actuated sample-taking devices operable from a remote control station, and a support for said sample-taking devices fixed adjacent to said bit.

17. In combination with an earth-boring device, a projectile-firing member so associated with said device as to advance therewith in the boring operation, and a projectile adapted to be fired from said member and formed with a sample-taking cavity in its front end.

18. A combination as defined in claim 17 in which the projectile is so shaped as to be at least partially closed at the front end of the sample-taking cavity by the resistance of the formation into which it is fired.

19. In apparatus for obtaining a sample of the formation at the bottom of a well, the combination of a projectile-firing device, means for lowering the same into the well, and a projectile for said firing device formed with a sample-taking cavity in its front end.

20. In combination with an oscillatory earth-boring bit, means for supporting and oscillating the same, a projectile-firing member so associated with said bit as to be advanced as the bit is advanced in the boring operation, a projectile for said firing device formed with a sample-taking cavity in its front end, and remote control means extending along the supporting and oscillating means for actuating the said firing device.

CLYDE E. BANNISTER.