June 16, 1942. L. A. DOUGLAS 2,286,673

MEANS FOR EXTRACTING THE PORE CONTENT OF SUBTERRANEAN STRATA

Filed June 10, 1941

Fig. 1

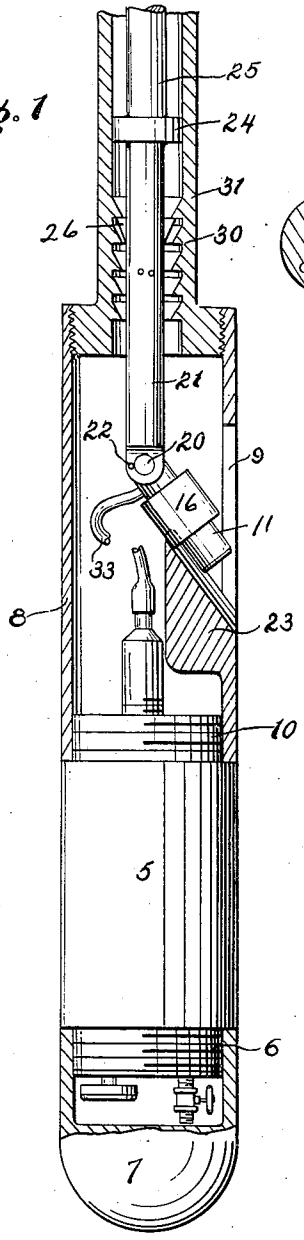
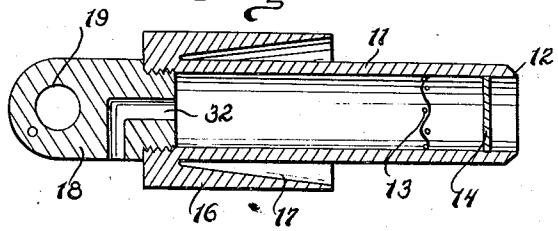


Fig. 2



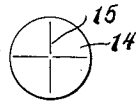


Fig. 3



Fig. 4

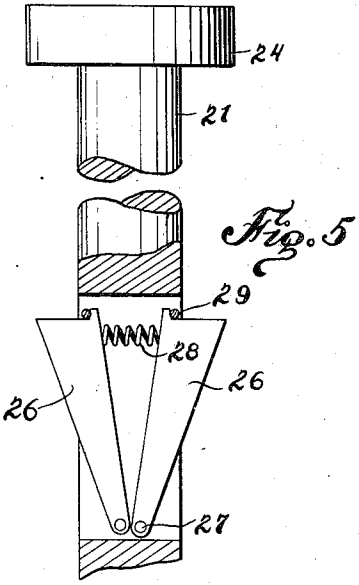


Fig. 5

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MEANS FOR EXTRACTING THE PORE CONTENT OF SUBTERRANEAN STRATA

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Application June 10, 1941, Serial No. 397,506

6 Claims. (Cl. 255—1.4)

The object of the present invention is to provide efficient and inexpensive means for testing subterranean strata for the liquid and/or gaseous content thereof. In my copending application, Serial No. 397,505, filed June 10, 1941, I have claimed both the method and an apparatus for accomplishing this general object.

It is recognized that it is common practice to lower into a deep well, such as an oil well, devices including core tubes and to forcibly project the core tubes laterally into the strata for the purpose of obtaining and bringing to the surface a relatively limited amount of the solid material of the strata, such, for example, as sand. It is apparent that under those methods only a relatively small amount of liquid or gaseous content can be obtained. Like the device of my application aforesaid, the present invention aims to provide means for withdrawing the liquid and/or gaseous pore content of the strata. This is done by providing a preformed vacum chamber, to which a strata penetrating tool in the nature of a core tube is attached in such manner that connection is maintained between the tool and the vacuum chamber after the tool has ben projected into the strata. Consequently, the liquid and/or gaseous pore content may be drawn from an area much greater than that which would be represented by an equivalent amount of solid matter trapped in a core tube, because the action of the vacuum may be exerted over a material period of time, and until the flow of the liquid or gas satisfies the vacuum.

The means by which these objects are accomplished will be better understood by reference to the accompanying drawing, wherein:

Fig. 1 is a view partly in side elevation and partly in vertical section of a testing device constructed in accordance with the invention;

Fig. 2 is a sectional view of the strata penetrating tool, which, for convenience, will be referred to as a core tube, though it does not actually remove a core of material from the strata;

Fig. 3 is an end view of a weakened disc which seals the outer end of the tool until ruptured by contact with relatively hard material;

Fig. 4 is a view of a screen which may be employed; and,

Fig. 5 is a view partly in side elevation and partly in section of a plunger which carries dogs or ratchets hereinafter described.

Like numerals designate corresponding parts throughout the several figures of the drawing.

In referring to the form of the invention illustrated, 5 designates a can-like receptacle constituting a vacuum chamber threaded at 6 for the reception of a bull plug 7. A tubular pipe section 8 having an opening 9 in its side wall has threaded engagement at 10 with the vacuum chamber.

The tool shown in Fig. 2 comprises a barrel 11 preferably having its outer end beveled at 12. This tool is preferably spanned by a screen 13, which prevents the tube from filling with sand, shale or other material of the strata penetrated.

A disc 14 is provided with weakening lines 15. This disc serves the function of closing the tube so that the vacuum may be maintained until the tube is forced into the strata to be tested and the disc is ruptured by contact with material more solid than mere mud.

The tool is preferably provided with an apron 16, the function of which is to impact the mud in the constricted space 17 and, in so doing, to impact the mud generally around the rear portion of the barrel 11. The purpose of this is to prevent the mud from flowing into the open end of the barrel 11 after the disc is ruptured.

A shank 18 is threaded into and constitutes a part of the tool and is provided with an eye 19, by which the tool as a whole may be pivoted by pivot 20, to the lower end of plunger 21. A shear pin 22 holds the tool at about the angle shown in Fig. 1 with respect to the plunger until the time of use arrives. The pipe section 8 carries a guide abutment 23 upon which the tool of Fig. 2 has an initial seating.

The plunger 21 is provided with a head 24 and this head and the plunger may be thrust forcibly downward by the dropping of a weight 25 thereon or by the creation of mud pressure thereon, by a pump, from the surface of the ground.

By referring to Fig. 5, it will be seen that plunger 21 is provided with one or more ratchets or dogs 26. These dogs are pivoted at 27 in a transverse slot of the plunger and their upper ends are thrust outwardly by spring 28. Their outward movement is limited by pins 29. When the plunger is thrust downwardly, these dogs yield and pass through the beveled rings 30. These rings act, in substance, as ratchet teeth. They permit downward movement of the plunger but resist upward movement of the same.

The wall of the well being tested lies in close contact with the body of the tool constituted by pipe section 8, vacuum chamber 5, etc. The initial downward movement of plunger 21 shears off pin 22 and begins to rock the tool 11 more to the horizontal. A very short movement of this

tool causes its end 12 to engage the wall of the well. Then, the whole tool is lowered by means of the pipe section 31. This causes the guide abutment 23 to move away from tool 11 and since the tool itself is engaged with the wall, it follows that the tool will move more and more toward the horizontal and be thrust farther and farther into the strata. The interior of the tool is in communication through port 32 and flexible tube 33 with the vacuum chamber. Consequently, when the disc is ruptured, the gaseous and fluid pore content of the strata may pass through this tube to the interior of the vacuum chamber, and there be trapped for removal to the surface for analysis or other test.

It is to be understood that the invention is not limited to the precise construction set forth, but that it includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. A tool of the character described, comprising a vacuum chamber, a pipe string, means for supporting the vacuum chamber from the pipe string to be lowered into a well, a plunger vertically movable in the pipe string, pawl and ratchet connections between the plunger and the pipe string, a strata penetrating tool pivotally connected to the lower end of the plunger, means for initially holding said tool at an angle to the plunger and means for connecting said tool to the vacuum chamber, said tool being adapted to move to a position of greater angularity with respect to the plunger and to thereby penetrate the strata to be tested, under the action of the bodily lowering of the plunger and associated parts, after the tool has engaged the side wall of the well.

2. A device of the character described comprising a tubular pipe section, a vacuum chamber secured to the lower end of the pipe section, a bull plug secured to the lower end of the vacuum chamber, a pipe string engaged with the upper end of the pipe section, a plunger vertically movable in the lower end of the pipe string, means for applying pressure to said plunger from the surface of the ground, pawl and ratchet connections between said plunger and the pipe string, a tool pivotally connected to the lower end of said plunger and inclined outwardly, said tool comprising a tubular body portion and a frangible closure disc and a flexible connection between the tool and the vacuum chamber.

3. A structure as recited in claim 2, wherein said tool is provided with a surrounding apron.

4. A structure as recited in claim 2 wherein said pipe section is provided with a guide abutment upon which the tool initially rests.

5. A structure as recited in claim 2, in combination with a shear pin for initially holding the tool at an angle with respect to the plunger.

6. A tool of the character described, comprising a vacuum chamber, means for supporting the same in a well, a vertically movable plunger, means for actuating said plunger from the surface of the ground, a strata penetrating tool pivotally connected to the lower end of the plunger, a flexible connection between said tool and the vacuum chamber, and pawl and ratchet connections between the plunger and the supporting means, arranged to permit initial downward movement of the plunger with respect to the vacuum chamber, and for causing said plunger to move bodily downward with the supporting means after such initial movement.

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