April 6, 1943. L. A. DOUGLAS 2,315,694

MEANS FOR TESTING SUBTERRANEAN STRATA FOR LIQUID AND GASEOUS CONTENT

Filed June 10, 1941

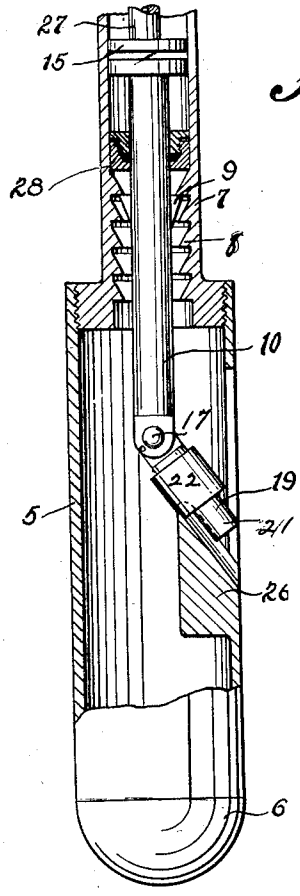


Fig. 1

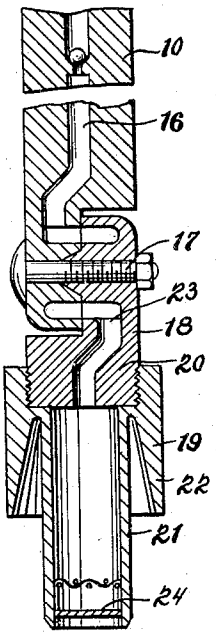


Fig. 2



Fig. 3

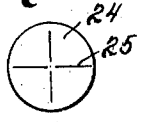


Fig. 4

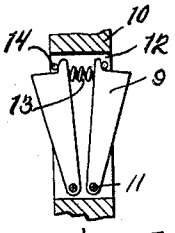


Fig. 5

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Patented Apr. 6, 1943 2,315,694

UNITED STATES PATENT OFFICE

2,315,694

MEANS FOR TESTING SUBTERRANEAN STRATA FOR LIQUID AND GASEOUS CONTENT

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Application June 10, 1941, Serial No. 397,507

6 Claims. (Cl. 255—1.4)

In my co-pending application, Serial No. 397,505, filed on the 10th day of June, 1941, I have illustrated and described a tool adapted to penetrate subterranean strata and having associated therewith a vacuum chamber into which the oil or other liquid or gaseous content of the strata is drawn under the action of the vacuum.

The present invention provides means for penetrating subterranean strata for the purpose of withdrawing the liquid or gaseous pore content of the strata, but relies upon the existent external pressure to force said pore content into a chamber which may be drawn to the surface of the earth for purposes of analysis or other test.

Further objects and advantages of the invention will be set forth in the detailed description which follows.

In the accompanying drawing:

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

Fig. 2 is a sectional view through a transmitting joint, hereinafter described;

Fig. 3 is a view of the screen which I may employ, and

Fig. 4 is a detail view of a frangible disc hereinafter described;

Fig. 5 is a detail sectional view, showing the pawls hereinafter described.

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

The device of the invention comprises a pipe section 5 having a bull plug 6 at its lower end and suspended at its upper end from a string of pipe 7. The lower section of this pipe carries a plurality of beveled rings 8 adapted to be engaged by pawls 9 in the downward movement of a rod 10. These pawls (see Fig. 5) are pivotally mounted at 11 in a transverse slot 12 of rod 10, are urged outwardly by spring 13 and are limited in their outward movement by stops 14. A piston 15 upon the upper end of the rod has fluid-tight engagement with the wall of the lower pipe section 7. A port 16 extends through the length of rod 10 and through the piston, said port having an upwardly opening check valve 10a in its length. The lower end of rod 10 has pivotal connection by means of bolt 17 with an ear 18 of tool 19. This tool comprises a head 20 of which the ear 18 is a part, a barrel 21 and an apron 22. A port 23 formed in the head and the ear is in constant communication with port 16 throughout all positions of angularity of the tool with respect to rod 10. The function of the apron 19 is to impact the mud in the area around the tool as it is forced into the strata to thereby prevent as far as possible the flow of mud into the pipe 21. I may, if desired, provide a relatively coarse screen to span the pipe 21. A weakened disc 24 provided with the scored weakening lines 25 is fixed in the mouth of the pipe and prevents the entry of mud into said pipe in the initial movement of the tool into the strata. A guide abutment 26 carried by the pipe section 5 constitutes a support for the tool during the time that the whole structure is being lowered into a bore hole or well and until the strata that it is desired to test is reached. Any suitable means may be employed for imparting initial downward movement to rod 10 with respect to pipe section 5. For example, a heavy weight indicated at 27 may be dropped upon the piston 15 or air pressure from the surface of the ground may be delivered into the pipe string above the piston 15. In either case the initial downward movement of rod 10 rocks the tool more toward the horizontal than in Fig. 1, and consequently projects the outer end of said tool into engagement with the wall of the well. During this movement the pawls 9 pass the ratchet 8 and engage there-beneath. By then lowering the whole structure in the well the tool will be moved still more toward the horizontal, and consequently will be caused to firmly engage its outer end in the strata to be tested. It will be understood that in this continued downward movement of the whole structure the abutment 26 moves away from the tool because the preliminary engagement of the outer end of the tool with the wall of the well prevents bodily downward movement of the tool.

When the outer end of the tool has been firmly embedded in the strata the external pressure usually existent in gas or oil wells causes the liquid or gaseous pore content of the strata to flow into the tool, through the ports or conduits 23 and 16 and past the check valve to that portion of the pipe section 7 which lies above the piston 15. Here said pore content is trapped for removal to the surface of the earth when the whole structure is drawn out of the wall. When the tool, in its entry into the strata, contacts solid material, such as sand or shale, the weakened disc 24 will give way to permit the entry of the liquid or gaseous pore content of the strata into the tool. To aid in relieving the under side of the piston, of the well pressure I may provide a stuffing or packing box 28 in the lower pipe section 7, said stuffing box also aiding in guiding the rod 10.

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 spirit of the appended claims.

Having described my invention, what I claim is:

1. A device of the character described comprising a pipe section having a side wall opening formed therein, a tubular member from which said pipe section is suspended, a piston movable in said tubular member, a rod projecting from said piston, pawl and ratchet connections between said rod and tubular member, a strata-penetrating tool pivotally connected to the end of said rod, said tool having a port formed therein, the joint between said tool and rod permitting swinging movement of the tool with respect to said rod and permitting flow of gas or liquid from the tool past said joint, a port in the rod, and a collecting chamber to which said port leads.

2. A structure as recited in claim 1, in combination with a guide abutment upon the pipe section upon which said tool rests during the initial operation of the device.

3. A structure as recited in claim 1, in combination with a packing box surrounding said rod below said piston.

4. A device of the character described comprising a cylindrical section having a bull plug in its lower end, a pipe string from which said cylindrical section is suspended, a piston fitted in the lowermost section of said pipe string, a rod projecting from said piston into the cylindrical section, a strata-penetrating tool pivotally connected with the lower end of said rod through the medium of a fluid-conducting joint, means for conducting the liquid or gaseous pore content of strata to said joint, means for conducting said liquid or gaseous content from said joint to a point above the piston, and means for preventing return flow of said liquid or gaseous substance.

5. A device of the character described, comprising a pipe section having a side wall opening formed therein, a tubular member from which said pipe section is suspended, a piston movable in said tubular member, a rod projecting from said piston, a tubular strata penetrating tool pivotally connected to the end of said rod, the joint between said tool and rod permitting swinging movement of the tool with respect to said rod and permitting flow of gas or liquid from the tubular tool past said joint, a port in the rod, a collecting chamber to which said port leads, and inter-engaging members between the rod and tubular member which permit limited initial downward movement of the rod and piston with respect to the tubular member and which thereafter cause the rod and tubular member to move together under the bodily downward movement of said tubular member, said tool being provided with a seal for preventing the entry of material thereinto until said seal is ruptured.

6. A device of the character described, comprising a pipe section having a side wall opening formed therein, a tubular member from which said pipe section is suspended, a piston movable in said tubular member, a rod projecting from said piston, a tubular strata penetrating tool pivotally connected to the end of said rod, the joint between said tool and rod permitting swinging movement of the tool with respect to said rod and permitting flow of gas or liquid from the tubular tool past said joint, a port in the rod, a collecting chamber to which said port leads, and inter-engaging members between the rod and tubular member which permit limited initial downward movement of the rod and piston with respect to the tubular member and which thereafter cause the rod and tubular member to move together under the bodily downward movement of said tubular member, said tool being initially closed by a weakened disc which prevents entry of material into the tool until said disc is ruptured by contact with material of a determined degree of hardness.

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