Nov. 20, 1934. E. P. WEATHERLY, JR 1,981,817

BOTTOM HOLE SAMPLING DEVICE

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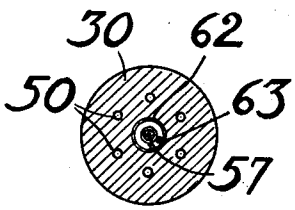


FIG.—2

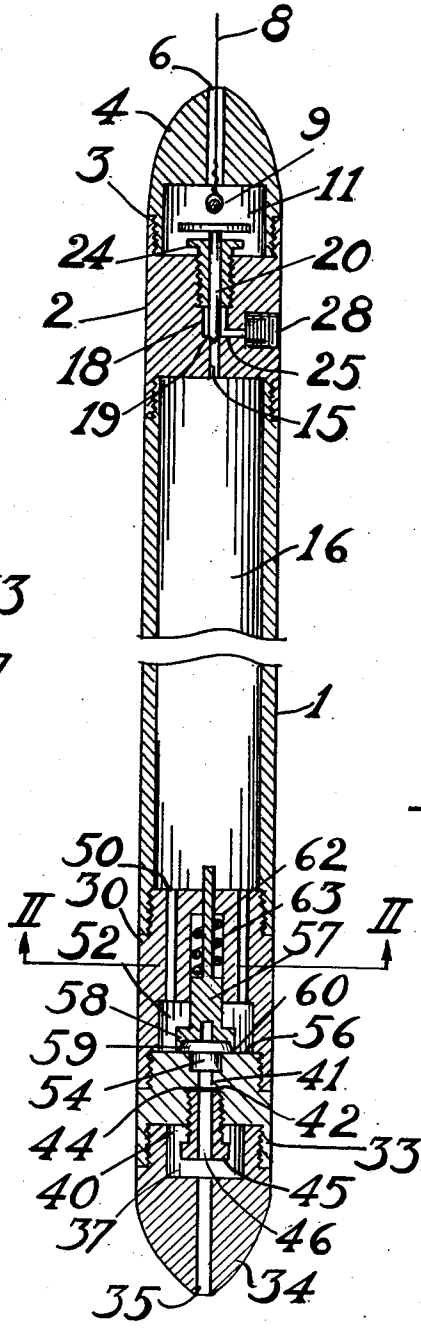


FIG.—1

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BOTTOM HOLE SAMPLING DEVICE

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6 Claims. (Cl. 137—18)

This invention relates to improvements in a sampling device for fluids, more particularly the invention relates to improvements in a device for securing samples of the liquids in different strata of a well.

The invention will be fully understood from the following description taken in connection with the accompanying drawing, in which latter.

Fig. 1 is a longitudinal sectional view through the sampling device and

Fig. 2 is a transverse sectional view taken along the line II—II.

In its preferred embodiment the sampling device includes a barrel constructed to sustain a substantial vacuum and providing means by which the liquid contents of a sand stratum may be forced into the barrel by atmospheric pressure to replace the vacuum and to hold the material in the barrel for sampling purposes.

Referring particularly to the drawing, the barrel comprises a cylindrical tube 1. The tubular member 1 is closed at one end by means of a valve housing 2 which has screw threaded engagement with the tubular member 1. The valve housing 2 in turn is connected by screw threads 3 to a cap 4. The cap 4 is provided with a bore 6 through which a suspension line 8 passes and is secured to a pin 9. The suspension line 8 functions to suspend the barrel from the surface of the ground at a suitable point within the well. The pin 9 is disposed within a chamber 11 within the cap 4. The valve housing 2 is provided with a passage 15 communicating with the chamber 16 within the tubular member 1. The passageway 15 is provided with an enlarged portion 18 forming a valve seat 19 against which a needle valve 20 is adapted to be seated. The needle valve 20 is secured in adjustable position in the enlarged portion 18 of the passageway by means of a plug 24, which has screw threaded engagement with the walls of the enlarged passageway 18. A bypassage 25 leads from the enlarged portion 18 and is provided with a screw threaded portion 28 adapted to be secured to a suitable connection not shown. The needle valve 20 is maintained closed against the valve seat 19 during the operation of obtaining a sample. The needle valve 20 can be withdrawn from the seat 19 to permit the delivery of the sample through the passageway 15 and 25.

The chamber 16 is closed at its opposite end by means of the following arrangement of parts through which a sample is adapted to be introduced into the chamber 16. A valve housing 30 is secured to the tubular member 1 by screw threads or the like. The valve housing 30 is in turn secured to a head 33 by screw threads or the like. The head 33 is secured to a cap 34. The cap 34 is provided with a port 35 for entrance of the sample from the well into the chamber 16. The port 35 is enlarged to form a compartment at 37 which opens against the adjoining end wall of the head 33.

The head 33 is provided with a passageway which is closed by a frangible closure adapted to be ruptured under continued application of difference in pressure on opposite sides of the closure. The passage comprises an enlarged portion 40 which is constricted at 41 to form a shoulder 42 against which a frangible disc 44 is seated closing the passage. The frangible disc 44 is held in position transversely across the passageway and against the shoulder 42 by means of a plug 45 which has screw threaded engagement with the wall of the enlarged portion 40 of the passageway. The plug 45 is provided with a passageway 46 which communicates at one end with the compartment 37, and at its opposite end opens against the disc 44. The passageway 46 is preferably of substantially the same diameter as the passageways 35 and 41.

The frangible disc 44 is preferably formed of tin or other similar metal which has the property to fatigue or creep under differences in pressure on opposite sides of the disc. The metal disc has a lower tensile strength when subjected to stress for some time than it has when not under continued stress. Therefore, the disc withstands higher pressures for a short period of time but soon ruptures under continued application of the same pressure. By varying the thickness of the disc it can be used to secure samples in a well under any given pressure. If desired, a plurality of discs can be substituted for the single disc 44 and some of the advantages of the invention will be retained.

Upon rupture of the frangible disc by differences in pressure on opposite sides of the disc, the fluid entering through passage 35 is permitted to flow into the chamber 16 through the following arrangement of parts. The valve housing 30 is provided with a plurality of annularly disposed ports 50 which extend longitudinally of the valve housing and open at one end into the chamber 16. The ports 50 open at their opposite end into an enlarged portion constituting a valve chamber 52. The valve chamber 52 opens against the adjoining end of the head 33 and communicates with the passageway 41, which latter is enlarged at 54. A one way check valve 57 is mounted for longitudinal reciprocating movement

in the valve chamber 52 to and from the adjoining end 56 of the head 33. The end 56 functions as a valve seat. The one way check valve comprises a valve head 58 recessed at 59 to form an annular rim 60 adapted to be seated against the end wall 56 and around the enlarged passageway 54. The valve 57 is mounted for reciprocation in a recess 62 and is normally maintained seated by a helical spring 63.

In the preferred use of the device, after its assembly, the closed metal chamber 16 is evacuated through the ports 15 and 25 and sealed. The device can then be lowered by means of the suspension line 8 into the well from which a sample is desired. The fluids in the well are normally under greater than atmospheric pressure. The difference in pressure between the fluids in the evacuated chamber 16 causes the disc 44 to give way after a certain length of time, admitting a sample of the fluid through the check valve 57 into the chamber 16. Upon raising the sampling device the check valve 57 causes the sample to be retained in the chamber 16, under pressure without loss of any fluid.

In a modified form of the device the recess 59 in the valve head 58 and the passageway 41 with its enlarged portion 54 are used as a reservoir for mercury or the like. The disc 44 is made of tin or other metal adapted to amalgamate with the mercury. The sampling device is lowered into the well and retained in the well until the mercury has had time to amalgamate with the tin sufficiently long to weaken the tin to such an extent that the difference in pressure within the chamber 16 and exterially of the sampling device is sufficient to cause the tin disc to be ruptured. The fluid under pressure can therefore flow into the chamber 16.

Various changes may be made within the scope of the appended claims, in which it is desired to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. In a sampling device for fluids subjected to pressure, a chamber the interior of which is under less pressure than the fluid, the chamber having an inlet passage, a frangible closure closing the passage and adapted to be ruptured under continued application of the pressure to admit the fluid into the chamber, and a one-way valve in the passage between the closure and the chamber actuated by the pressure of the fluid to permit flow of the fluid into the chamber until the pressure inside and out of the chamber is substantially equalized, and to then close the passage to prevent discharge of the fluid from the chamber.

2. A sampling device for fluid according to claim 1 in which the frangible closure is a soft metal disc of sufficient strength to withstand the difference in fluid pressure for a short time only.

3. A sampling device for fluid according to claim 1 in which the frangible closure is a series of soft metal discs of sufficient strength to withstand the difference in fluid pressure for a short time only.

4. A sampling device for fluid according to claim 1 in which the frangible closure is made of tin of a thickness to have sufficient strength to withstand the difference in fluid pressure for a short time only.

5. In a sampling device for fluids subjected to pressure, an evacuated chamber having an inlet passage, a frangible closure sealing the passage and constructed of material of a size adapted to be ruptured under continued application of the pressure to admit the fluid into the chamber, and a one-way valve in the passage between the closure and the chamber actuated by the pressure of the fluid to permit flow of the fluid into the chamber until the pressure inside and out of the chamber is substantially equalized, and to then close the passage to maintain the sample of fluid within the chamber under the pressure.

6. In a sampling device for fluids subjected to pressure, a chamber the interior of which is under less pressure than the fluid, the chamber having an inlet passage, a tin closure closing the passage, the passage being enlarged between the closure and the chamber to form a reservoir, mercury disposed in the reservoir adapted to amalgamate with the tin closure to weaken the closure, whereby the closure ruptures under continued application of the pressure to admit the fluid into the chamber, and a one-way valve in the passage between the closure and the chamber actuated by the pressure of the fluid to permit flow of the liquid into the chamber until the pressure inside and out of the chamber is substantially equalized, and to then close the passage to prevent discharge of the fluid from the chamber.

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