March 22, 1938. A. J. MASON, JR 2,111,982

LIQUID SAMPLER

Filed July 10, 1937

Fig. 1.

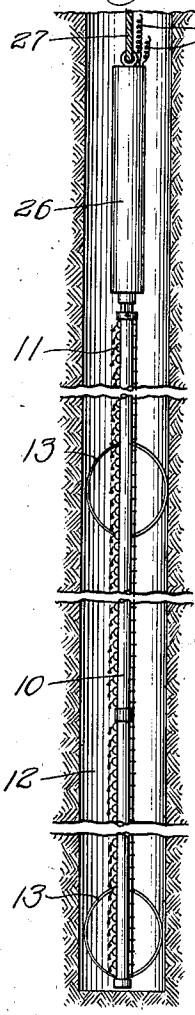


Fig. 7.

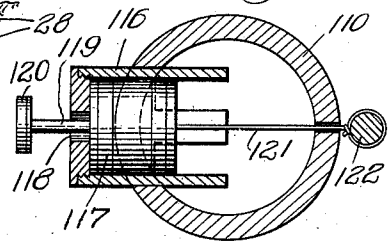


Fig. 8.

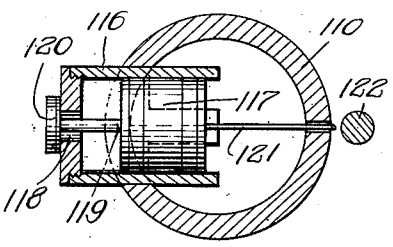


Fig. 2.

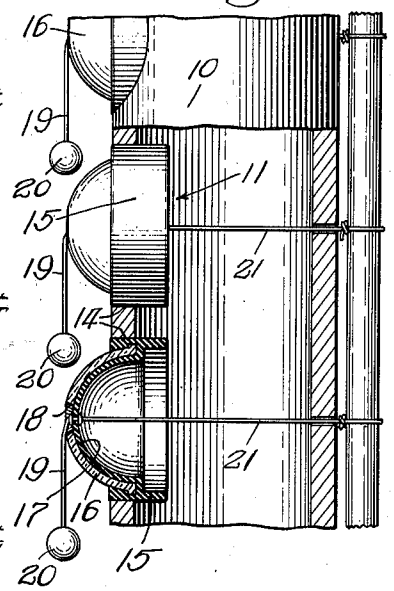


Fig. 3.

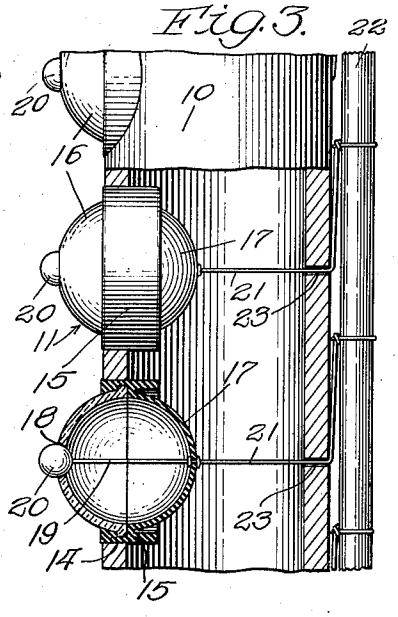


Fig. 4

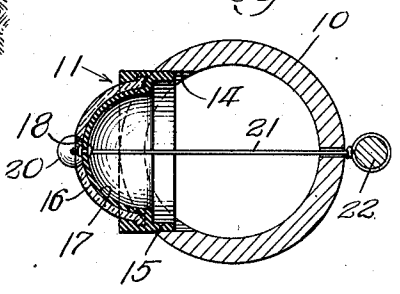


Fig. 5.

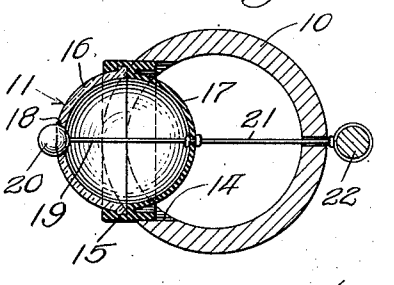
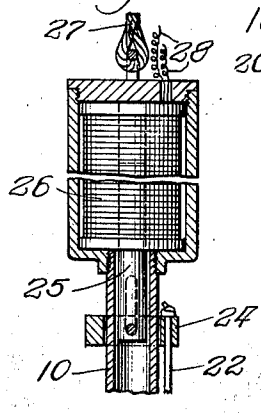


Fig. 6.



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LIQUID SAMPLER

Arthur J. Mason, Jr., Bakersfield, Calif.

Application July 10, 1937, Serial No. 153,041

4 Claims. (Cl. 137—18)

This invention relates to a liquid sampler for use in connection with oil wells to obtain samples of liquid in the well at various levels, so that encroaching water which is diluting the oil, can be detected.

My improved device is so made that it can be adapted for use in collecting simultaneously, fluid samples over a range of depth when a well is flowing.

By the use of my invention samples can be captured and sealed at various depths and brought up to the surface in closed receptacles for examination at the surface.

My improved device can be easily and cheaply made and will be found to be simple and efficient in operation.

Other features and advantages will appear more fully as I proceed with my specification.

In those forms of device embodying the features of my invention shown in the accompanying drawing—Fig. 1 is a view in side elevation of a well showing the apparatus in use; Fig. 2 is a view on an enlarged scale of a portion of the sampler partly in side elevation and partly in section showing the receptacles before being filled with samples; Fig. 3 is a similar view showing the receptacles filled with fluid samples and closed; Fig. 4 is a horizontal sectional view showing one of the samplers before filling; Fig. 5 is a similar view after filling; Fig. 6 is a vertical sectional view of a portion of the device; and Figs. 7 and 8 are similar to Figs. 4 and 5 showing a modified form of device.

In actual use, the device will preferably include a plurality of samplers adapted for simultaneous use. For example, there may be provided a series of samplers extending over a vertical distance of seventy-five (75) feet or more. The apparatus is designed to be lowered to a predetermined depth in a well and all the samplers loaded or charged simultaneously. The apparatus is then brought to the surface and the various samples analyzed to show the liquid entering the well at various depths.

Any suitable means may be employed for supporting a vertical series of the samplers for lowering them into a well. For example, as here shown, I have provided a pipe 10 carrying a vertical series of samplers indicated in general by 11. For the purpose of centering the pipe 10 in the well 12 I provide any suitable means as, for example, the conventional guide members 13.

The pipe 10 is provided with a vertical series of holes 14 in one side, spaced, for example, about one and one-half (1½) inches apart, each hole adapted to accommodate one of the samplers. Since the construction and operation of the samplers are the same I need to describe in detail but one.

In general, it may be stated that each sampler is in the form of a chamber or receptacle with an inlet opening and a wall portion adapted to be moved to increase the capacity of the chamber. Means are provided for moving the wall portion to increase the capacity of the chamber after the sampler has been lowered into a well so that a sample of liquid in the well is drawn into the chamber somewhat similar to a bellows drawing in air. I preferably also provide means operated by the movable wall portion for closing the inlet opening as the movable wall portion reaches the limit of its movement. Such closure means may be dispensed with if the inlet is made small enough. If the inlet is small enough there will be very little loss or spillage out of it even if it is not closed.

Fastened in the hole 14 is a collar 15 carrying a hemispherical member 16 preferably made of glass. 17 indicates a hemispherical diaphragm made of rubber or similar material adapted to be sprung to one side or the other of the plane of its edge that is attached to the collar 15. As shown in Fig. 4 this diaphragm 17 may lie just inside and against the glass wall 16 or it may be snapped out as shown in Fig. 5 to form a substantially spherical receptacle with the glass member 16. That is, the two members 16 and 17 together form a chamber of which the diaphragm 17 is a movable wall portion adapted to be moved away from the member 16 to increase the capacity of said chamber.

The glass wall 16 is provided with a small inlet opening 18 through which extends a cord 19 with its inner end attached to the diaphragm 17 and its outer end carrying the spherical stopper 20. The cord is of such a length that when the diaphragm 17 is moved to the limit of its travel, the stopper 20 will be pulled against the inlet opening 18 to close the same.

Means are provided for moving the diaphragm 17 after the device has been lowered into a well. Such means includes a cord 21 attached to the diaphragm at one end with its other end attached to an operating cable 22 which lies just outside of the tube 10. The various operating cords 21 for the samplers extend through holes 23 in the pipe 10 and have their outer ends attached to the operating cable 22.

The upper end of the cable 22 is attached to a collar 24 carried by the lower end of an armature

25 adapted to be operated by solenoid 26 at the upper end of the pipe 10.

The entire apparatus is supported at a predetermined depth in the well 12 by means of a conventional wire line with electric wire core 27. 28, 28 indicate the electrical conductors extending to the surface inside the wire line, adapted to carry the current to operate the solenoid 26 to cause simultaneous tripping of all the samplers.

In Figs. 7 and 8 I have shown a modified form of sampler. Here the pipe 10 is indicated by 110. The receptacle includes a cylinder 116 in which the piston 117 is a movable wall portion. In Fig. 7 the receptacle is shown empty and in Fig. 8 it is shown filled. The piston 117 is adapted to be moved by a cord 121 corresponding to the cord 21. 118 indicates an inlet opening into the cylinder. The piston 117 carries a bar 119 with the stopper 120 at the end. The piston is forward as shown in Fig. 7 until the sampler is lowered to the desired depth. The cord 121 is then pulled to draw the piston inwardly to the position shown in Fig. 8. This fills the cylinder and seals the opening 118. The cylinder 116 may be made of glass if desired so that the liquid contained can be examined by visual inspection.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as permissible, in view of the prior art. For instance the spirit and scope of this invention would not be changed if, instead of a solenoid, other mechanical means common in oil well tools are used to actuate the cable 22, such as a spring.

What I claim as new, and desire to secure by Letters Patent, is:

1. A liquid sampling device including: a rigid substantially hemispherical member having an inlet opening therein; a flexible diaphragm forming a receptacle with said substantially hemispherical member, said diaphragm adapted to be moved to increase the capacity of said receptacle; means for supporting said receptacle in a well; and means for moving said diaphragm to a position to increase the capacity of said receptacle after the same is positioned in a well, whereby a sample of liquid in the well is drawn into said receptacle.

2. A liquid sampling device including: a receptacle with an inlet opening and a wall portion adapted to be moved to increase the capacity of said receptacle; means for supporting said receptacle in a well; means for moving said wall portion to increase the capacity of said receptacle after the same is supported in a well, whereby a sample of liquid in the well is drawn into said receptacle; and means operated by the movable wall portion for closing the inlet opening as the movable wall portion reaches the limit of its movement.

3. Liquid sampling apparatus, including: a vertical tube having a plurality of vertically aligned openings in one wall thereof; sampling devices carried in said openings, each including a collar supporting a rigid hemispherical wall portion with an inlet opening therein, and a movable wall portion, forming a receptacle with the rigid wall portion, said movable wall portion adapted to be moved to a position to increase the capacity of said receptacle; means for simultaneously moving the movable wall portions of said sampling devices; and means included with each sampling device for closing the inlet opening as the movable wall portion is moved to a position to increase the capacity of the receptacle.

4. A liquid sampling device including: a rigid substantially cup-shaped member having an inlet opening therein; a flexible diaphragm forming a receptacle with said substantially cup-shaped member, said diaphragm adapted to be moved to increase the capacity of said receptacle; means for supporting said receptacle in a well; and means for moving said diaphragm to a position to increase the capacity of said receptacle after the same is positioned in a well, whereby a sample of liquid in the well is drawn into said receptacle.

ARTHUR J. MASON, JR.