

July 29, 1941.

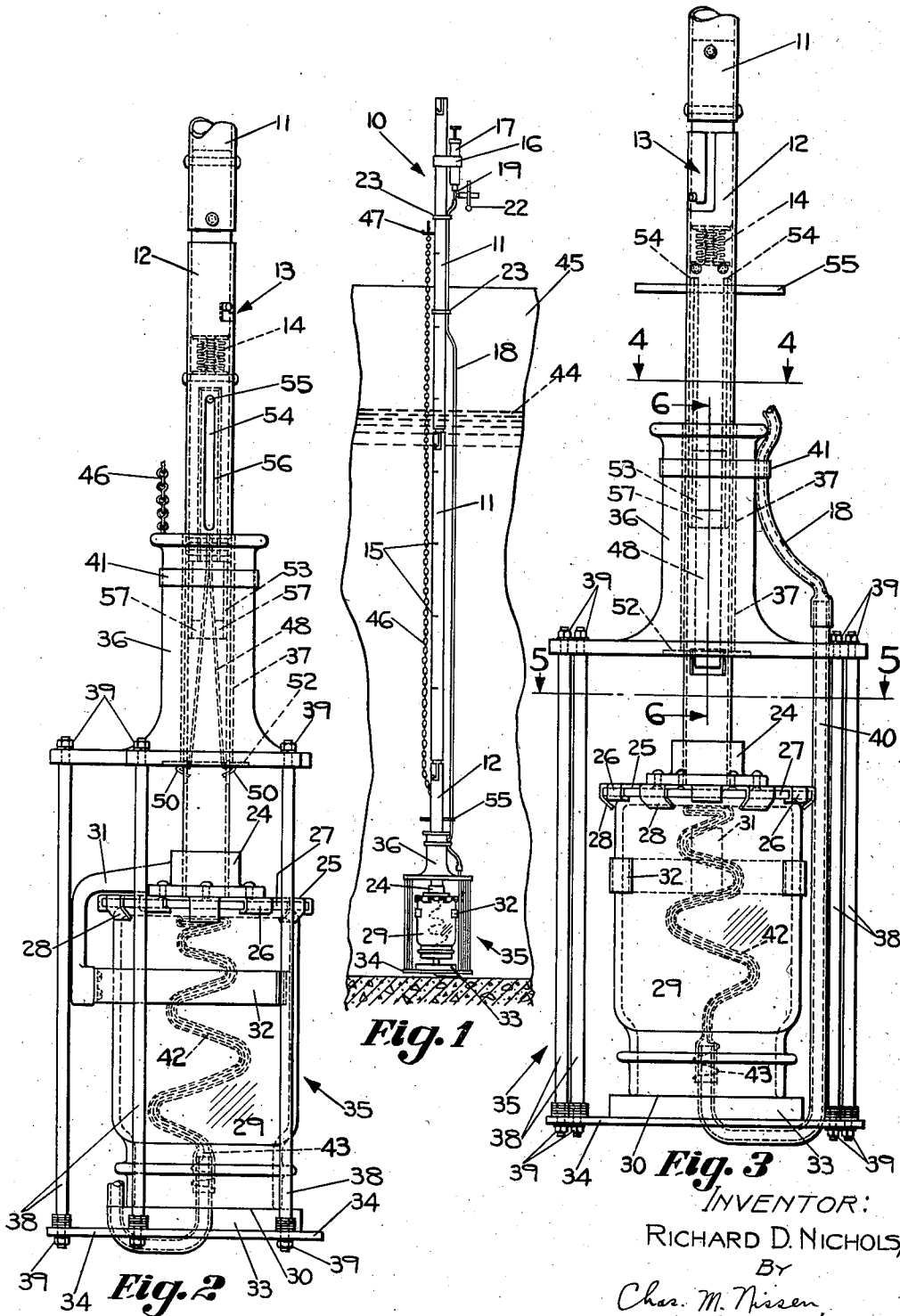
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2,250,722

LIQUID DEPTH SAMPLING DEVICE AND METHOD OF OBTAINING SAMPLES

Filed Jan. 12, 1939

2 Sheets-Sheet 1



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Fig. 4

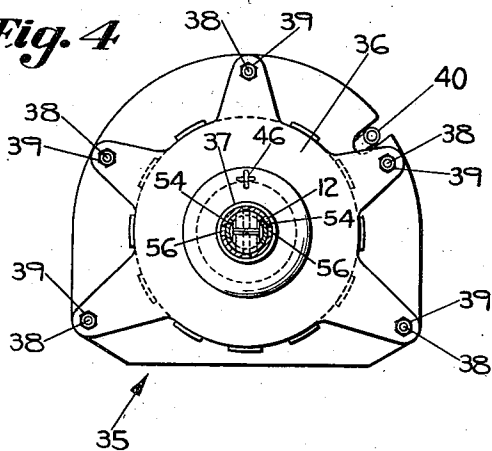


Fig. 5

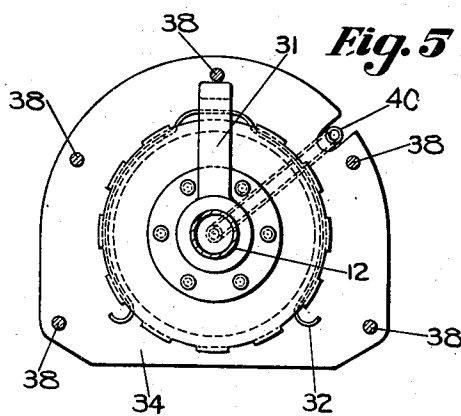


Fig. 6

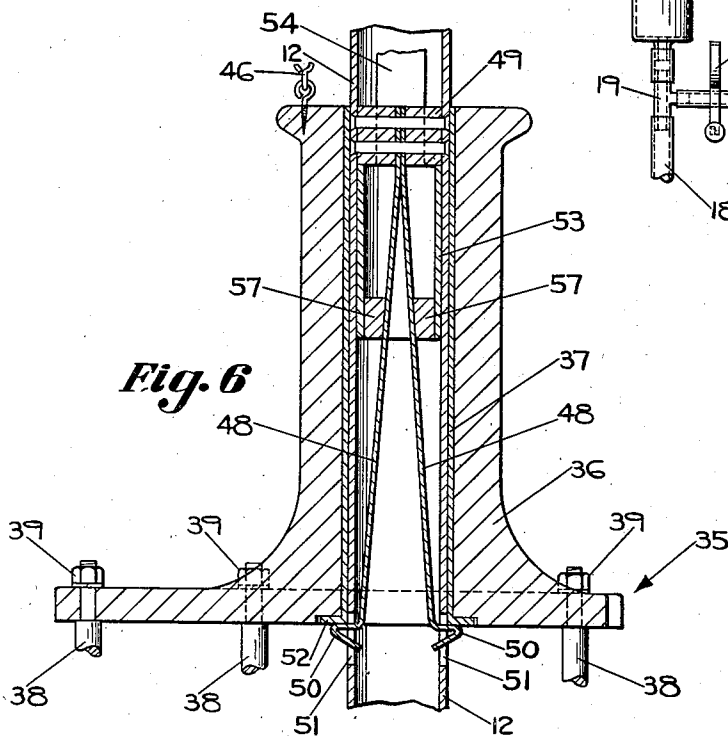
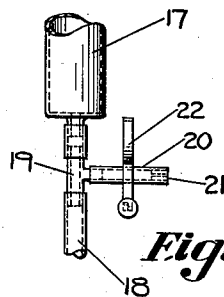


Fig. 7



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LIQUID DEPTH SAMPLING DEVICE AND
METHOD OF OBTAINING SAMPLESRichard D. Nichols, Columbus, Ohio, assignor to
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7 Claims. (Cl. 137—18)

This invention relates to a liquid depth sampling device and a method of obtaining samples of a liquid at any desired depth below the liquid surface.

An object of the invention therefore is to provide an improved type of liquid depth sampling device and particularly such a device by which samples of a liquid having flocs in suspension therein are obtained, particularly without destroying or reducing the size of the flocs.

Another object of the invention is to provide an improved method of obtaining samples of a liquid, and particularly a liquid having flocs in suspension therein without destroying or reducing the size of the formed flocs.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a diagrammatic view showing the device of my invention in elevation and in obtaining a sample of liquid in a tank;

Fig. 2 is an enlarged elevational view of the lower portion of the device;

Fig. 3 is a view similar to Fig. 2 but taken at right angles with respect to Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3 looking in the direction of the arrows;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3 looking in the direction of the arrows;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 3 looking in the direction of the arrows; and

Fig. 7 is an enlarged view showing a feature of the device.

One of the principal problems encountered in obtaining samples, particularly of liquids having flocs in suspension, is that in obtaining the sample the flocs are altered from their original state as found in the liquid, particularly in that the flocs are either destroyed or appreciably reduced when received by the sampling mechanism. I have provided an improved type of sampling device and method of operation by which this difficulty is overcome.

Referring to the accompanying drawings, it will be seen that I have provided a device comprising a handle 10 made up of a plurality of removably connected sections 11 and a head section 12. The sections 11 and 12 are provided with cooperating bayonet slot attaching means 13 including a retaining spring mechanism 14 which operates in an obvious manner to main-

tain the sections 11 and 12 removably connected while at the same time providing for their ready disconnection. The sections 11 are preferably provided with scale means 15 to indicate the depth at which the sample is obtained, the head section 12 having a known length, as does the receptacle.

Carried by the topmost section 11 by a removable clamping bracket 16 is a hand pump 17 which is connected to a flexible rubber hose or conduit 18 by a T-connection 19 which provides a pinch-cock vent by means of a short rubber tube 20 (see Fig. 7) having a restricted outlet orifice 21, with which tube 20 there is provided a pinching spring 22 which may be operated manually to open or close the valve formed thereby. The hose 18 is preferably supported from the top section 11 by a pair of bands 23, 23.

Adjacent its bottom the head section 12 is provided with a rigidly attached bushing 24 to which is riveted plate 25 having a plurality of fingers or clips of which those numbered 26 are bent over to retain a disc 27 of rubber in contact with the plate 25 and of which those numbered 28 act to center the sampling receptacle or collector preferably in the form of an inverted glass jar 29 which, in the operating position is, of course, provided with a bottom opening 30 which is normally the top of the jar. To retain the jar 29 on the rubber disc 27 the bushing 24 is provided with an integral arm 31 to which is attached a spring clip 32 which, at least in part, surrounds the glass jar 29 and removably holds it against both vertical and lateral movement. It is thus evident that the jar 29 is removably attached to the handle 10 at the bottom thereof and will move upwardly and downwardly therewith.

To close the opening 30 in the bottom of the jar 29 to seal in a sample of liquid I provide a closure or stopper 33 preferably in the form of a soft rubber disc which is rigidly attached to the bottom plate 34 of a cage 35. In addition to the bottom plate 34 the cage 35 comprises a top casting 36 in the form of a sleeve which is provided with a journal bearing 37 slidable along the head section 12 of the handle 10.

Interconnecting the top casting 36 and the bottom plate 34 is a plurality of rods 38 which are attached to each by appropriate nuts 39. As best seen by reference to Fig. 4 of the drawings, the top casting 36 is in the form of a spider, the legs of which extend out to receive the above mentioned rods 38. Also, as seen by reference particularly to Figs. 3 and 4 of the drawings, on

one side of the cage 35 the rods 38 are so spaced as to provide an opening or door which permits ready insertion and removal of the glass jar 29.

Extending along one side of the cage 36 is a pipe 40 the lower end of which is bent in the shape of a U and extends through a central hole in the closure or stopper 33, thus projecting into the glass jar 29, as clearly illustrated in Figs. 2 and 3 of the drawings. The upper end of the pipe 40 is attached to the aforementioned hose 18 which hose 18 is attached by a clip 41 to the top of the casting 36. The lower end of the pipe 40 which, as above set forth, extends into the jar 29, is provided with a flexible hose 42 the upper end of which is open and which is held against the top, or what is normally the bottom, of the jar 29 by an internal helical wire spring 43 having less diameter than the internal diameter of hose 42 to allow a free flow of air therethrough. The lower end of the spring 43 is wrapped about and securely attached to the upwardly extending lower end of the pipe 40. It is, of course, evident that the top casting 36 and the cage 35, which is rigidly attached thereto and forms a part of it, may slide along the head section 12 to move the stopper or closure 33 into and out of closing position with respect to the jar 29.

To provide for the movement of the cage 35, thereby to move the closure or stopper 33 to its closing position, while below the surface of the liquid 44 in the tank 45, as illustrated in Fig. 1 of the drawings, a chain 46 is provided, the lower end of which is attached to the casting 36 (Fig. 6) and the top of which is provided with an appropriate ring and received by a hook 47 on the upper section 11 of handle 10 (Fig. 1).

To provide a latch to lock the cage 35 in stoppered closing position, I provide a latch mechanism which operates automatically whenever said stopper or closure 33 is moved to such position, which latch is illustrated in Fig. 6 of the drawings. Said latch comprises a pair of leaf springs 48 which are rigidly attached to a head 49 which, in turn, is rigidly attached to the head section 12. The leaf springs 48 are provided with latching hooks 50 which extend through opposed slots 51 in the head section 12 and are adapted to hook over a circumferential flange 52 formed integral with the journal bearing 37. In other words, the leaf springs 48 are biased to move outwardly, as viewed in Fig. 6 of the drawings, and consequently, when the relative movement between the cage 35 and the head section 12 is such as to move the stopper or closure 33 to jar closing position the hooks 50 will move outwardly and hook over the flange 52, thereby locking the stopper or closure 33 in its closing position.

To provide for the release of this latch an operating cylinder 53 is provided which moves freely in the head section 12 and which is provided with a pair of spaced integral upwardly extending arms 54 to which is attached an operating handle 55 having free but limited vertical motion in elongated slots 56 formed in opposite sides of the head section 12, one of which is clearly illustrated in Fig. 2 of the drawings. The lower end of the cylinder 53 carries a pair of sliding abutments 57 adapted to contact and slide over the leaf springs 48.

It is manifest that with the handle 55 in its uppermost position, as illustrated in Figs. 2 and 3 of the drawings, the cylinder 53 and slide

blocks 57 will be in their uppermost positions. Upon moving the cylinder 53 downwardly by moving handle 55 downwardly slide blocks 57 will bring the lower ends of the leaf springs 48 closer together sufficient to release the latch between the hooks 50 thereof and the flange 52 of the journal bearing 37. This operation will be effected as hereinafter described after the sample has been removed from the liquid 44.

In the operation of the device comprising my invention with the consequent realization of the method of my invention, the parts will first be assembled as illustrated in Fig. 1 of the drawings, after which the lower end of the device will be lowered into the liquid 44 a desired amount which may be anywhere between the surface of the liquid 44 and the bottom of the tank 45 at a depth which will be determined by the scale 15. During this lowering operation the jar 29 will be in the position illustrated in Fig. 1 of the drawings and it is probable that some of the liquid 44 will flow into the jar 29. When the desired position of the jar 29 is reached the operator will operate the pump 17 which will force air into the top of the jar 29 by way of the hose 18, pipe 40 and hose 42, the top of which is retained in the top of the jar 29 by the coil spring 43 thereby insuring that all the liquid will be driven out of the jar 29 by compressed air whenever the operator has operated pump 17 the necessary amount which will be indicated by bubbles coming to the surface of the liquid 44. Under these conditions it is, of course, evident that the jar 29 is substantially evacuated or empty insofar as the liquid is concerned and that all of the liquid has been removed therefrom and the device is substantially full of compressed air.

One of the principal problems in obtaining samples of liquid, particularly those samples which have flocs therein, for example as obtained by flocculation of turbid water, industrial wastes or sewage, is that the water is flowing into the container, such as the container 29, flows in at such a high velocity as to destroy or appreciably alter the flocs from what they were in the liquid 44. As a consequence, a true indication of the condition of the flocs in the liquid 44 has not previously been obtained. To prevent this undesirable action the air is released from the glass jar or container 29 at a very low rate in that the air is allowed to leak out of said jar 29 by way of the pinch-cock illustrated in detail in Fig. 7 of the drawings. That is, the spring 22 is released to allow the air to flow through the short rubber tube 20 and through the restricted orifice 21 which requires the flow of the liquid having the flocs in suspension into the container 29 to be at a low rate.

It should be understood that before the inverted jar 29 is projected to a predetermined level in the tank 45, the handle 55 is moved down to release the latches 50, 50 of Fig. 6 whereupon the top casting 36 of the cage 35 may be let down by releasing the chain 46 from the hook 47 and again suspending the chain from the hook after the closure 33 occupies a position spaced below the open mouth of the jar 29. Then by moving the handle 55 back to its upper position, the latches 50, 50 will be in position to operate automatically, although while the closure 33 is spaced below the jar opening the latches 50, 50 rest against the inner wall of the head section 12.

As stated above, some liquid will enter the jar 29 through its open mouth 30 when the operator

lowers the structure to the position shown in Fig. 1. Some of this liquid may be from any level in the tank 45, whereas the sample to be taken is to be from a level predetermined by means of the scale 15 on the rod 10. In Fig. 1 there is illustrated the taking of a sample of liquid from the bottom level.

When the jar is located at a predetermined level the pump 17 is operated to force out from the jar 29 all water that may be therein. The exclusion of all water in the jar 29 is indicated by bubbles of air rising from the open mouth of the jar to the surface of the liquid in the tank 45.

After the liquid at the predetermined depth or level becomes quiescent, the spring 22 is released to allow air in the jar 29 to slowly escape from the restricted orifice 21 (Figs. 1 and 7) and as this occurs, water slowly enters the open mouth 30 of the jar 29 until no more air escapes from the orifice 21 which indicates to the operator that the jar is filled with the desired sample of the liquid at the desired depth. The filling of the jar 29 thus takes place with a minimum of disturbance, and this is particularly important in water purification systems and in sewage disposal systems where in certain steps flocs are in suspension and in taking samples it is highly desirable not to destroy or reduce the size of the formed flocs.

After the jar 29 has been filled with liquid while in the position shown in Fig. 1, an upward pull on the chain 36 will lift the cage 35 relatively to the jar 29 so as to lift the closure 33 against the open mouth 30 of the jar. The latch mechanism 50, 51 will be operated automatically when the closure of the bottom opening of the jar takes place and consequently the sample of liquid at the desired depth is locked in the jar while the latter is being lifted to and above the surface 44 of the liquid in the tank 45.

After the sample has been taken and removed from the tank the head section 12 may be removed at the bayonet joint 13 from the next adjacent section 11. By inverting the cage 35 and releasing the latches 50, 51, the jar may be released after opening the closure 33. With the jar in upright position resting on the rubber disc 27 it may easily be lifted from the positioning clips 28 and then swung around with the arm 31 and spring clip 32, through the largest lateral opening of the cage 35 and finally lifted out from between the arms of the spring clip 32. The removal of a filled jar and the replacement thereof with an empty jar may readily be effected by reason of the flexibility of the hose extension 42.

After the container 29 is filled, or at any intermediate time in its operation, the former of which is indicated by the fact that no air flows from the pinch-cock, the chain 46 is pulled upwardly thereby moving the cage 35 upwardly which carries the closure or stopper 33 into position to close the bottom opening 30 of the glass jar 29 where it is automatically latched by the aforescribed latch mechanism. Under these conditions, a sample of liquid having flocs in suspension therein is entrapped in the jar or closure 29 and the jar may, of course, be withdrawn from the liquid 44 by lifting the handle 10.

After the jar is withdrawn as aforesaid, the lower section 11 is disconnected from the head section 12 and the latter is turned over so that the jar 29 has its opening 30 at the top. After this is effected the aforementioned latch is re-

leased by operating the handle 55, moving it upwardly, under the conditions described, whereupon the cage 35 may be moved upwardly to permit free removal of the glass jar 29 from the head section 12.

While the above mentioned method and operation of the apparatus has been described in connection with the obtaining of samples of liquids having flocs in suspension it is, of course, evident that the sampling device may be employed with other liquids, but it is particularly useful where the inflow of liquid should be at a restricted rate to reduce to a minimum disturbance of the constituency of the liquid or particles suspended therein. It is thus manifest that I have produced a simple but efficient device for obtaining accurate samples of liquid and particularly a liquid having flocs in suspension therein and have produced a novel method of obtaining such samples while insuring that the sample is truly representative of the liquid at the position where the sample is taken.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a liquid sampling device, the combination with an elongated handle, of a liquid container open at its bottom carried thereby, pump means to pump air into said container while it is submerged including a hose extending through said open bottom and terminating at the top of the inside of the container, means to allow air to flow from said container at a gradual rate, and means to close said open bottom of said container.

2. In a liquid sampling device, the combination with an elongated handle, of a liquid container open at its bottom carried thereby, pump means to pump air into said container while it is submerged, means including a hose extending through said open bottom of said container to allow air to flow from said container at a gradual rate, and means including a flexible material closure adapted to close said open bottom of said container.

3. In a liquid sampling device, the combination with an elongated handle carrying at its bottom an open container, a pump near the top of said handle, a hose extending from said pump into the opening of said container whereby air under pressure may be pumped into said container, and a valve near said pump connected with said hose to control the flow of air from said container.

4. A sampling device comprising an inverted glass jar, mechanism for removably supporting said jar in inverted position comprising a base having jar centering fingers and a spring clip frictionally attaching said jar thereto, a flexible material closure for said jar, and mechanism for operating said closure including latch means to latch it in closed position.

5. In a sampling device, the combination with a container having a bottom opening, mechanism for suspending said container, a closure for said bottom opening, and mechanism for operating said closure from open position spaced below said bottom opening to closed position against said

bottom opening, said last-named mechanism including a bottom member spaced below said container and a top member spaced above the container connected by rods to a cage with the rods spaced to provide removal of the container laterally from the cage.

6. In a sampling device, the combination with a container having a bottom opening, of means for suspending said container with its opening at its underside, a closure for said opening, and mechanism guided along said suspending means above the container and comprising a cage about said container connected to a support for said closure spaced below the bottom opening of said container, said cage having a side opening to provide for ready removal of the container.

7. A sampling device comprising an inverted container having an open bottom, a support, a disc of resilient material, means for connecting said disc to said support, spaced clips connected to the support in position to be engaged by the upper end portion of said container to center the same relative to said support, suspension means connected to said support, an L-shaped arm extending radially from said support and downwardly alongside said container, and a spring clip comprising arms mounted on said L-shaped arm in position to frictionally embrace said container to support the same with its upper end against said resilient disc while centered by said spaced clips relative to said support.

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