

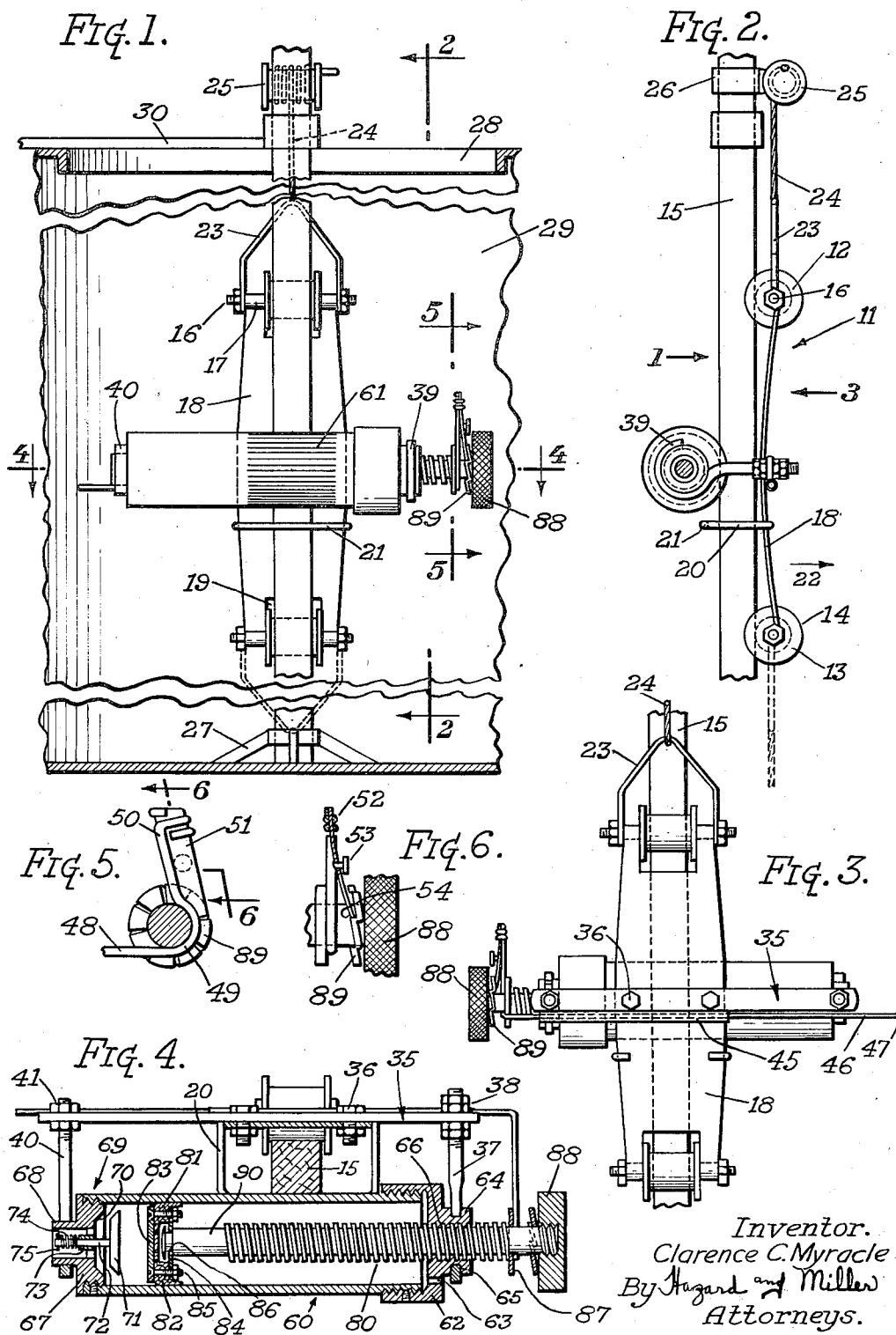
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LIQUID SAMPLER

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My invention relates to a liquid sampler and method of sampling liquids and is adapted principally for making continuous samples vertically in a tank in order to obtain a true average of the liquid in the tank.

My invention is especially designed for obtaining samples of oil in storage or similar tanks in which the oil in the tank is apt to have different characteristics at different elevations, the portions of the oil of lighter specific gravity being uppermost and those of the heavier specific gravity lowermost in the tank, that is, where the oil has had a chance to separate. Also different viscosities of the oil would affect a lack of uniformity of oil in the tank. An object and feature of my invention is to take a continuous sample between different specified elevations in a tank. This need not necessarily be from the bottom of the tank to the top, but if it is known that there is water in the tank or sediment, the taking of the sample may be started above the tank bottom. With my invention I cause in effect a suction of the liquid in a continuous manner while the sampling receptacle is being moved either from a low to a high position in the tank or vice versa and this is done at a proportionate rate so that the amount of liquid sucked in at any series of equal vertical distances would be the same. Thus my invention avoids a difficulty of a larger sample being taken at one zone than at another zone.

A further object and feature of my invention relates to having the receptacle for the liquid in the form of a rotatable barrel with a check valve intake and a movable piston or plunger therein. At the initial stage of the operation the piston is located in proximity to the check valve. The barrel is caused to rotate while it is either being moved upwardly through the liquid or downwardly and during the rotation the piston is gradually drawn or moved towards the head of the barrel opposite the intake and check valve. The rate of movement of the piston longitudinally of the barrel is proportionate to the number of turns the barrel rotates. Therefore no matter whether the barrel is moved upwardly or downwardly quickly or slowly, it will rotate a number of turns which may be calculated depending on the travel and the piston will be moved inwardly of the barrel proportionately to the number of rotations of the barrel and thereby obtain an even rate of flow of liquid through the check valve into the barrel where the sampling receptacle is the portion between the piston and the intake barrel head.

Another object and feature of my invention is in mounting the sampling barrel on a carriage structure, this being slidable on a sampling rod which may be inserted through a manhole or the like in a tank and either have legs or weights at the bottom to hold the rod upright or be retained by a bracket or spider at the man-hole. The carriage may thus ride vertically on the rod being lowered by the action of gravity and raised by a pull-cord and on this carriage I mount the barrel for rotation.

Another feature of my invention relates to the mounting of the barrel on the carriage whereby a removable connection is provided using preferably hooks which engage both heads of the barrel. Another feature resides in the hooks forming the journal mounting for the rotating barrel, the barrel having a knurled periphery in contact with the rod and retained in frictional relationship to the rod by a resilient spring structure of the carriage.

Another feature of my invention relates to the manner of withdrawing the piston. This consists of having a screw threaded stem or shank threaded through one head of a barrel and having the piston or plungers secured to the inner end of the screw with a swivelling connection so that while the screw is retained from rotation by a pawl and ratchet device attached to the carriage, the rotation of the barrel causes the movement of the piston and hence a filling of the sampling receptacle with the liquid.

My invention is illustrated in connection with the accompanying drawing in which:

Fig. 1 is a front elevation of my invention taken in the direction of the arrow 1 of Fig. 2 showing the assembly in a tank.

Fig. 2 is a vertical section on the line 2—2 of Fig. 1 in the direction of the arrows showing the manner of mounting the rotatable barrel on the carriage at one end thereof.

Fig. 3 is an elevation opposite to that of Fig. 1 and taken in the direction of the arrow 3 of Fig. 2.

Fig. 4 is a horizontal section on the line 4—4 of Fig. 1 in the direction of the arrows.

Fig. 5 is a detail vertical section on the line 5—5 of Fig. 1 in the direction of the arrows showing the pawl and ratchet construction.

Fig. 6 is a partial section on the line 6—6 of Fig. 5 taken in the direction of the arrows.

The carriage assembly, designated by the numeral 11 employs an upper roller 12 and a lower roller 13. These each have flanges 14 to confine the rollers for operation on a vertical rod 15 or

the like which rod may be made of wood. The rollers have each an axle 16 mounted in journal ends 17 of a spring plate 18, the plate having cut-outs 19 at each end to accommodate the rollers. This plate has a wire band 20 connected thereto in which a cross member 21 is located on the opposite side of the rod from the spring plate 18. This spring plate is tensioned to exert a resilient action or movement in the direction of the arrow 22 of Fig. 2 and thus tends to bring the cross member 21 into contact with the rod 15 and when the barrel is removed from the carriage, holds the carriage stationary. At one end of the carriage there is a bail 23 from which an operating cord 24 extends to a reel 25, this being attached to a collar 26 which is adjustable on the rod. It will be obvious that if desired, a bail may be placed at the lower end of the carriage and the pull-cord operated over a pulley at the bottom of the rod in order to positively pull the carriage with the barrel downwardly. If desired the rod may be provided with legs 27 at the bottom to rest on the bottom of the tank and is designed to extend through a man-hole 28, a portion of the tank being indicated by the numeral 29 and there may be a centering arm or brace 30 at the man-hole for holding the rod in correct position.

Secured to the spring plate 18 I have a cross plate 35 secured to the spring plate by bolts 36 and thus the cross plate forms part of the carriage. At one end there is a swivel rod 37 secured in place by nuts and lock nuts 38. This has a hook 39 at its free end, this hook being for the purpose of engaging the barrel as hereinafter detailed. The opposite end of the cross plate is provided with a second hook 40 secured by nuts and clamp nuts 41. Connected to the cross plate 35 and to the spring 18 there is a tube or sleeve 45 in which there is a slidably mounted rod 46. This rod has an end 47 preferably extending beyond the end of the plate 35 and at the other end has a right angularly bent section 48 with a spring latch portion 49 and a free end 50 to which is attached a spring pawl 51, this pawl being firmly secured by loops and soldering at 52 to the end portion of the rod and having a push button 53 for displacing the end 54 of the pawl from a ratchet hereinafter detailed.

The sampler device proper includes a barrel structure 60, this being cylindrical and having a knurled surface 61 for engaging the rod 15. This barrel has what may be termed an inner head 62 secured by a threaded connection, such head having a perforation 63 for the outflow of air. The head has a neck 64 with an annular groove 65. This groove is engaged by the hook 39 on the swivel rod 37. The head is internally threaded preferably with square threads as indicated at 66.

The outer head 67 is threaded to the other end of the barrel, this being shown as having an internal thread and has a cylindrical neck 68 which is engaged by the hook 40. This neck is tubular and has a check valve assembly 69 mounted therein, this being by providing a valve seat 70 on the head, a plug 71 on a stem 72 slidable in the spider 73 and a coil spring 74 engaging the spider and a cotter-pin or the like 75 on the end of the stem thus tending to keep the check valve seated.

An operating screw 80 is threaded in the head 62 and has the piston 81 on its inner end. The piston is constructed with a cupped leather 82 having a plate 83 on one side and a split ring 84 on the other side secured by bolts 85. The inner end of the screw has an annular groove 86

with the split ring 84 fitting therein. This allows the screw 80 to rotate or swivel in the piston so that the piston is withdrawn during the rotation of the screw or threaded inwardly.

At the end of the screw there is a disc 87, this being spaced from the knurled head 88 having the ratchet disc 89 thereon. This space accommodates the latch portion 49 of the bent wire 48 which as above mentioned, is part of the rod 46. The pawl 51 is therefore in a position to engage the ratchet 89. There is an unthreaded section 90 on the screw adjacent the piston to limit the stroke.

In the operation of my invention, presuming it is desired to obtain a sample of liquid starting at or adjacent the bottom of a tank, the screw is threaded inwardly by the hand grip head 88 thus positioning the piston at the outer end of its stroke adjacent the check valve. After the rod 15 is positioned in a tank, being inserted through a man-hole, the carriage with the barrel 60 is lowered by gravity on the rod. The barrel may readily be attached or detached from the hooks 40 and 37 having the hook end 39, as the rod 37 may be rotated on its axis and thus swing the outer reduced cylindrical neck 68 of the outer head away from its hook 40 and then the barrel may be lifted off of the hook 39. The fitting of the barrel is by a reverse step. In this downward roll of the barrel with the carriage, the pawl rides freely over the ratchet. A tension is maintained by the spring 18 so that the barrel is in good frictional contact with the rod 15. Then when it is desired to take the sample, the cord 24 is pulled upwardly such as being wound on the reel 25 and this elevates the carriage, causing a rotation of the barrel. However as the rod 46, slidably mounted in the sleeve 45, is prevented from rotation and has a clamp grip with the spring latch portion 49 on the end of the stem, the pawl 51 engages the ratchet and holds the screw 80 from rotation. Thus as the barrel rotates and the screw does not rotate, the screw is threaded outwardly through the head 62. Thus as the piston is drawn outwardly the check valve 69 is open and the liquid, such as oil, is drawn in the barrel to fill the space between the piston and the head having the check valve. Any air or liquid which is in the barrel on the side having the screw is forced outwardly through the perforation 63 or around the screw threads. When the unthreaded portion 90 engages in the head 62, manifestly there can be no further outward movement of the piston and therefore this stops the movement of the piston and ends the sampling. The check valve closes and holds the liquid trapped in the barrel between the check valve and the piston. It will be noted that in the sampling, that a small amount of liquid such as oil enters through the check valve which provides only a small opening and thus the sample is gradually added to the barrel. Due to the rotation of the barrel there is a continuous mixing of the liquid between the piston and the check valve so that as soon as the sample is forced out of the barrel, by threading the piston inwardly substantially, a proper mixture is already obtained.

Where it is desired to obtain a sample through a comparatively short vertical distance in a tank, the carriage may be raised and lowered through the specific distance and on the movement in one direction will draw the liquid into the barrel. This action may be repeated until the screw 80 is drawn completely to one end of the

barrel to bring the unthreaded portion 90 into engagement with the head 62 and thus after this operation through a specific distance, the carriage may be drawn to the top of the tank and the specific sample removed from the barrel.

When it is desired to take a sample when the barrel is moving downwardly, the carriage should be reversed so that the ratchet and pawl operate in a reverse direction.

Various changes may be made in the details of the construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A liquid sampler comprising in combination a receptacle for the liquid having an inlet for the sample, a movable suction device in the receptacle, a connecting means to said device extending outwardly through the receptacle, means to bodily move the receptacle with the said connecting means in the liquid, means to develop a relative rotation between the receptacle and the said connecting means and an operative engagement of the receptacle and the connecting means to move the suction device longitudinally of the receptacle to draw liquid into such receptacle.

2. A liquid sampler as claimed in claim 1, the means to develop the relative rotation between the receptacle and the connecting means comprising a track-like structure on which the receptacle may roll and means to prevent the connecting means from rotation during one direction of movement of the receptacle but to permit rotation thereof during the other direction of movement of the receptacle.

3. A liquid sampler comprising in combination a liquid receptacle having an opening at one end for an intake of the liquid sample, a suction piston in the receptacle, a shaftlike device connected to the piston and extending through the other end of the receptacle, means to immerse the receptacle in a liquid to be sampled with means for reciprocating the receptacle, means to hold the shaftlike device from rotation while the receptacle is rotated in one direction and to permit rotation of the shaftlike device when the receptacle is rotated in a reverse direction and thus rotates with the receptacle and means to move the shaftlike device with the piston outwardly while there is a differential rotation between the receptacle and the shaftlike device.

4. A liquid sampler as claimed in claim 3, a carriage structure, means to mount the receptacle on the carriage structure for rotation, a track structure engaged by the carriage and the exterior of the receptacle and means mounted on the carriage for preventing and permitting rotation of the shaft like device.

5. A liquid sampler comprising in combination a hollow receptacle having a cylindrical inside surface with an intake opening for a sample at one end, a threaded head on the other end, a screw extending through said end, a suction piston connected to the screw, means to immerse the receptacle in a liquid, means to rotate the receptacle on its axis, means to prevent rotation of the screw during the rotation of the receptacle whereby the screw is threaded outwardly through the receptacle and thus causes the piston to suck liquid into the receptacle.

6. A liquid sampler as claimed in claim 5, means for rotating the receptacle in opposite directions, the means to prevent the screw from

rotation also having means to allow the screw to rotate with the receptacle when the receptacle turns in a reverse direction.

7. A liquid sampler comprising in combination a receptacle forming structure cylindrical on its inside surface and having a head at one end with an intake opening and a threaded head at the opposite end, a screw extending through the threaded end and having a suction piston mounted thereon, a pawl and ratchet connected to the screw, means to immerse the receptacle in a liquid including means to move the receptacle with a movement of translation and means to develop a relative rotation of the receptacle and the screw including the pawl and ratchet whereby when the receptacle is moved in one direction the screw is threaded outwardly and thus draws the piston towards the threaded head and sucks a sample through the sample intake at the opposite head.

8. A liquid sampler comprising in combination a rod forming a track, a carriage with means for moving the carriage longitudinally of the track, a sampling barrel having an intake head at one end and a threaded head at the opposite end, means to mount the barrel on the carriage for rotation, the periphery of the barrel being in contact with the rod, a screw extending through the threaded head and having a suction piston thereon, a pawl and ratchet structure operative between the carriage and the screw whereby when the barrel rotates in one direction the screw is held from rotation and threaded outwardly through the threaded head and when the barrel rotates in the opposite direction the screw rotates with the barrel retaining the piston from longitudinal movement whereby on reciprocation of the carriage on the rod, the screw may be moved outwardly in the barrel to draw the suction piston from the head having the inlet for the sample to the threaded head.

9. A liquid sampler comprising in combination a rod forming a track adapted to be inserted in a tank from the top, a carriage mounted on the track for longitudinal movement thereon, said carriage having a resilient member, a sampling barrel mounted on the resilient member and adapted to have its outside periphery brought in contact with the rod, said barrel having an intake head at one end, a threaded head at the other end, a screw threaded therethrough having a piston connected to the inner end of the screw, the inside of the barrel being cylindrical, a collar on the screw, a ratchet disc secured to the screw adjacent the collar, the carriage having a guide sleeve, a rod slidably mounted in said sleeve, an arm connected to the rod and engaging the screw adjacent the collar, the rod having a pawl to engage the ratchet, means for bodily moving the carriage longitudinally of the track formed by the rod, the pawl and ratchet being adapted to retain the screw from rotation while the barrel rotates in one direction and thus thread the screw outwardly and thereby moves the piston for intake of a sample, the screw being adapted to rotate with the barrel when the barrel rotates in a reverse direction and hence develop no movement of the piston in the barrel during such latter movement.

10. A liquid sampler as claimed in claim 9, the screw having an unthreaded portion adapted to engage in the threaded head and thus limit the longitudinal movement of the screw and hence of the piston in the barrel.

11. A liquid sampler as claimed in claim 9, the means for connecting the barrel to the resilient member comprising a pair of hooks engaging the barrel adjacent opposite ends, one end being readily disconnectable from one hook, the other hook being rotatable on the resilient member whereby the barrel may be turned on the axis of the latter hook to disengage the barrel from the rod and thereby permit removal of the barrel from said latter hook.

12. A liquid sampler comprising in combination a rigid track structure adapted for immersion in a liquid in a tank from the top of such liquid, a carriage movable longitudinally on the track, a sampling receptacle having an inlet opening at one end, a movable piston and means to move said piston towards the end of the receptacle remote from the inlet and means interacting between the track and the carriage to operate the piston moving means to move the piston on movement of the carriage on the track to draw a sample of the liquid through the inlet to fill the receptacle between the inlet and the piston.

13. A liquid sampler as claimed in claim 12, means to cause the movement of the piston when the carriage is moved in one direction on the track but to retain the piston from movement when the carriage moves in the opposite direction on the track.

14. A liquid sampler comprising in combination an elongated rigid track structure adapted

for insertion in a top of a tank to have a portion thereof immersed in the liquid to be sampled, a carriage mounted on the track with means for moving the carriage longitudinally thereof, a sampling receptacle detachably connected to the carriage, said receptacle having a barrel with an inlet head at one end, a threaded head at the opposite end, a piston mounted therein, a screw connected to the piston and extending through the threaded head, the detachable connection of the receptacle causing one portion of the receptacle to engage the track whereby on longitudinal movement of the carriage, a relative rotation is developed between the barrel and the screw thus causing the piston to move away from the inlet head and draw a sample of the liquid into the receptacle.

15. A liquid sampler as claimed in claim 14, the screw having a ratchet connected thereto, the carriage having a pawl supported thereon and movable with the screw whereby as the screw moves outwardly through the threaded head the pawl maintains contact with the ratchet, the pawl and ratchet being adapted to cause the relative rotation of the receptacle and the screw when the carriage moves in one direction on the track but to retain the screw from rotation as to the receptacle during the opposite direction of movement of the carriage.

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