July 15, 1969 E. A. HOPKIN 3,455,904

DEVICE FOR SAMPLING FLUIDS

Filed March 23, 1967 2 Sheets-Sheet 1

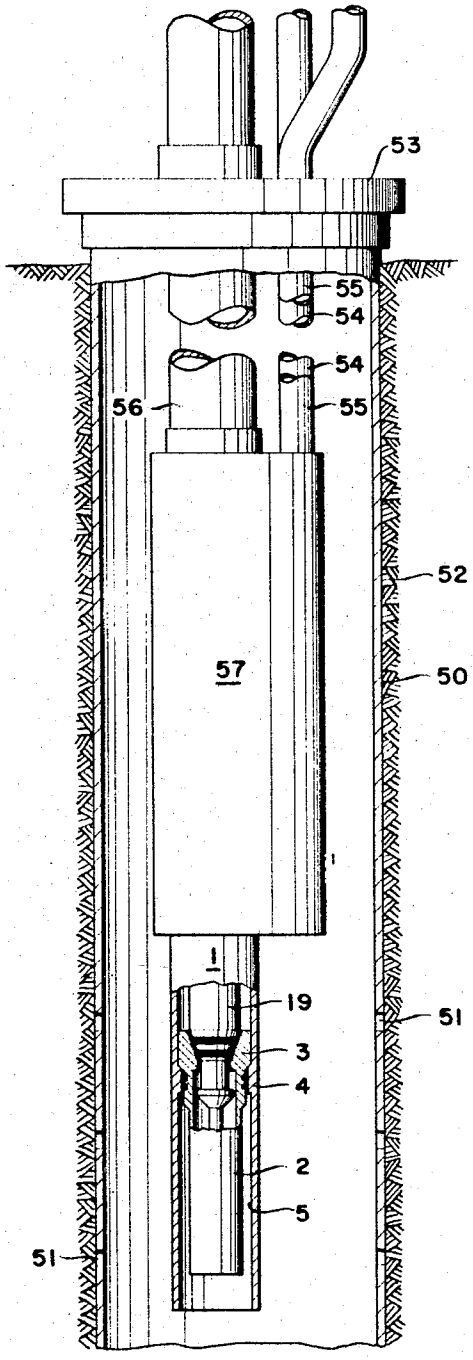


FIG. 1

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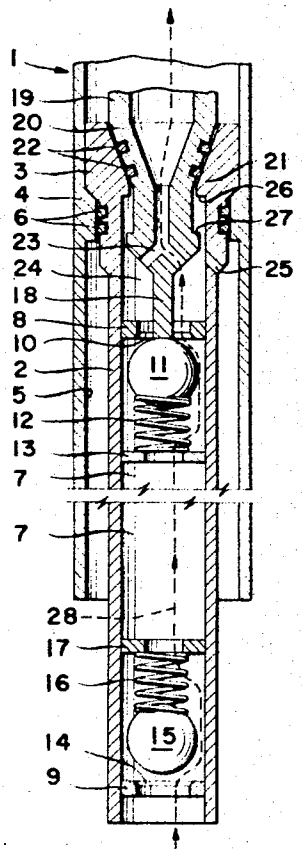


FIG. 2

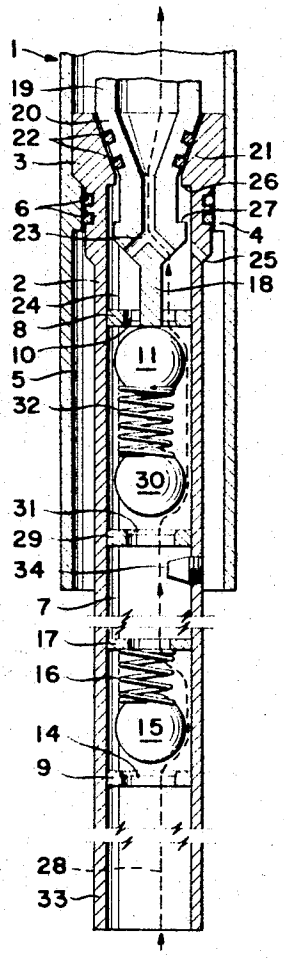


FIG. 3

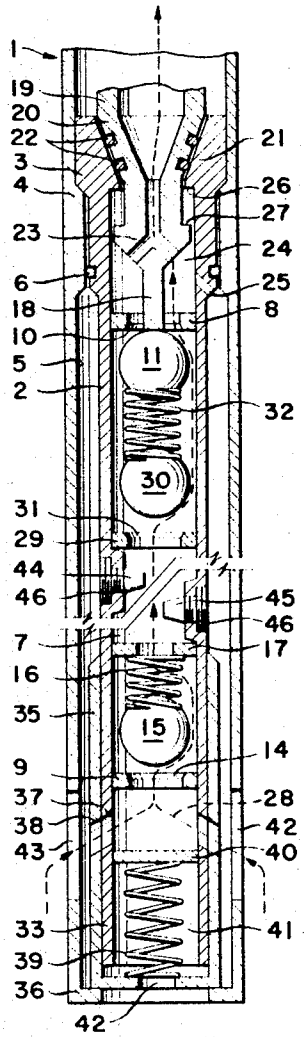


FIG. 4

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United States Patent Office 3,455,904
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DEVICE FOR SAMPLING FLUIDS

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Int. Cl. E21b *49/00;* G01n *1/10*
U.S. Cl. 166—165 6 Claims

ABSTRACT OF THE DISCLOSURE

Uncontaminated representative samples of effluent well fluid may be taken as the fluid enters a downhole free pump suction by providing a sample chamber secured to the free pump below the suction end thereof through which the well fluid is drawn. The upstream end of the sample chamber is sealed by a flow actuating check valve whereas the upstream end of the sample chamber is sealed by a check valve that is held open while the pump is operating by a stinger projecting from the lower end of the pump that holds the downstream valve movable sealing element off its seat while the pump is in operative position. A sample is taken by lifting the pump and chamber out of the well which automatically closes the respective chamber valves, thereby trapping a fluid sample therebetween.

The present invention relates to a device for sampling fluids pumped from a formation by a well pump through a vertical production tube. In particular, the present invention relates to such a device with which a sample of the fluid may be obtained which is representative of the fluid being pumped from the formation and desirably the pressure conditions under which the fluid is being pumped on its passage up said production tube.

Wire line samplers which are frequently used at the present time in oil fields do not give a true representation of the fluid being pumped in the pumping wells as the use of these wire line samplers necessitates the removal of the pump from the well before the sample is taken. The removal of the pump is a time-consuming operation and as a result separation will have taken place to some extent within the well and, as such, the sample obtained with the wire line sampler will have an increased proportion of the heavier components of the fluid. Thus, the sample taken will not be truly representative of the composition of the fluid being pumped out along the well. Further, the removal of the pump in many instances causes scale and sediment to fall to the bottom of the well which detracts from the efficient operation of the valve system in the sample. Again, the conditions of pressure within the well during sampling may differ greatly from the pressure within the well during production from the well and again the sample taken will not be representative of the actual production conditions.

The present invention provides a sampling device for obtaining a sample of the fluid being pumped from a subsurface formation by a bottom hole pump of the so-called "free" type. In free pump systems the pump structure is operatively located in the well production tubing at or near the well bottom. The pump is powered hydraulically by a separate power fluid system in a manner more completely described in U.S. Patent No. 2,952,220. The pump is positioned at the well bottom by lowering it through the tubing string from the surface at the end of a wire line. It may be removed by displacing it upwardly through the tubing string hydraulically by means of operating fluid under pressure supplied to the pump tubing string below the pump through the hydraulic power supply lines.

The sampling device of the present invention is secured

in a manner to be more fully described to the suction end of the free pump for removal from the well simultaneously therewith. Fluid samples retrieved in this manner are truly representative of the composition of the fluid being pumped during the production from the formation and desirably also the pressure conditions during said production.

According to the present invention, therefore, there is provided a device for sampling a fluid pumped from a formation through a vertical production tube by a free pump, which device comprises a sampler tube adapted to be connected to said pump. The outer walls of the sampler tube are adapted to cooperate with the inside wall of the production tube with a fluid-tight seal so as to suspend the sampler tube vertically in said production tube. The sampler tube also includes a chamber formed by transverse walls across the internal bore of the tube, each wall being provided with a non-return valve such that on suspension of the sampler tube in said production tube, the non-return valve in the lower transverse wall is adapted to open under the action of external fluid pressure to allow fluid drawn up said production tube by the pump to pass therethrough. The non-return valve in the upper transverse wall is adapted to be opened only when the sampler tube is suspended in said production tube whereby on stopping the pump at least the non-return valve in the lower transverse wall is closed and on removal of the pump and the sampler tube from said production tube, both said non-return valves are closed to provide a sample of said fluid passing up said production tube in said chamber.

In a preferred embodiment of the present invention, the valve in the upper transverse wall is arranged to be actuated by a pump shoe attached to a free pump which is slidably mounted in the upper end of said sampler tube. The sampler tube is axially movable relative to the pump shoe between a retracted position in which it opens the upper transverse wall valve and an extended position in which the valve is closed. Additionally, the pump shoe is arranged to support the sampler tube whereby on pulling the pump up on the production tube, the valve in the upper transverse wall closes and the sampler tube is pulled out of the well with the pump via the shoe. The outer wall of the sampler tube is adapted to cooperate with the inside wall of the production tube so as to provide a fluid seal therebetween and also vertically support the sampler tube in operative position relative to the pump shoe.

When the free pump and sampler tube is lowered into operative position in the production string, the outer periphery of the sampler tube is sealed relative to the inner bore of the production tube, thereby requiring the well fluid drawn into the pump suction to pass axially through the sampler tube and the chamber therein. The distance between the supporting shoulders on the inside wall of the production tube for the pump and the sampler tube respectively is such as to require the sampler tube to be telescoped upwardly relative to the pump, thereby causing the moving valve element in the upper transverse chamber wall to engage a stringer extension on the pump shoe and be held off its seat.

When a sample of the well fluid is desired, the free pump is lifted off its supporting shoulder and moved axially up the production tube by hydraulic pressure. This motion allows the sampler tube to extend telescopically relative to the pump and its shoe, thereby causing the moving valve element in the upper transverse chamber wall to disengage from the stringer on the pump shoe and close to seal the upper end of the sample chamber. The lower end of the sample chamber is closed automatically when the pump stops drawing fluid therethrough. Consequently, a truly representative sample of the well fluid under pumping conditions is trapped in the sample chamber between the two valves.

It will be readily realized that the non-return valve in the upper transverse wall being adapted to be opened by external pressure can be opened inadvertently due to a higher pressure that may exist between the sample chamber and the pump during the pulling of the pump from the production tube shoe. In order to take account of this, the sampler tube, in a second embodiment of the invention, is desirably provided with an intermediate transverse wall containing a non-return valve arranged to open in the opposite direction to the non-return valve in the upper transverse wall and, as such, open in the same direction as the non-return valve in the lower transverse wall. Thus, while the size of the chamber may be reduced by this intermediate transverse wall, the non-return valve in this wall cannot be opened by external pressure and therefore it is possible to ensure that no fluid enters the chamber through this wall subsequent to the stopping of the pump.

Similarly, it will be readily realized that the non-return valve in the lower transverse wall is also susceptible to being open by external fluid pressure and again this valve may be inadvertently opened due to the pressure conditions in the production tube after the pump has been stopped and during the pulling of the pump from the well. In a third modification of the invention, the sampler tube extends substantially below the lower transverse wall to provide a tail portion. The provision of this tail portion is to provide a partially closed volume which contains a fluid that is substantially the same composition as that in the chamber when the pump is stopped such that if an external pressure is applied to the bottom of the sampler tube, then the only liquid which will enter the chamber is of the same composition as that in the chamber.

With the possibility of the valves opening subsequent to the pump being stopped, it is not possible to obtain a sample in which the pressure conditions within the production tube during the pumping of the fluid therethrough are truly representative. In order to obtain this condition, it is necessary that both the valves in the intermediate and lower transverse walls remain closed during the pulling of the pump and the sampler tube from the well. In order to achieve this, according to a further modification of the present invention, the aforesaid tail portion is provided with a sleeve closing the interior of the tail portion from the production tube, said sleeve being slidably mounted on said tail portion and arranged to move between a retracted position and an extended position to which it is biased. The tail portion and the sleeve are provided with valve means connecting the interior of said tail portion and said production tube, said valve means being open only in the retracted position of said sleeve whereby on suspending said sampler tube in said production tube, the sleeve is arranged to be forced by said production tube into the retracted position. On removal of said sampler tube from said production tube, the sleeve returns to the extended position. Preferably, the sleeve is spring-biased into the extended position.

Although the sampling device of the present invention is described herein with specific reference to a free pump system, it should be understood that with appropriate modifications it may be adapted to other pump systems such as rod pumps.

The present invention will be further described with reference to the drawings wherein:

FIGURE 1 is a cross-sectional elevation view of a well bore having a free pump production system incorporating the present invention suspended therein;

FIGURE 2 is a vertical section taken through a sampling device according to the basic embodiment of the invention located in the lower end of the production tube;

FIGURE 3 is a vertical section of the invention similar to FIGURE 1 but incorporating certain modifications; and

FIGURE 4 is a vertical section of the invention similar to FIGURE 2 but incorporating further modifications.

With reference to FIGURE 1 of the drawings, the present invention is illustrated therein as incorporated in a closed, fluid operated, free pump system installed in a well which is provided with a casing **50** having perforations **51** through which well fluid may flow from a surrounding productive formation **52**. At the upper end of the casing **50** is a casing head **53** from which supply, return and production tubing strings **54**, **55** and **56**, respectively, are suspended. The supply string **54** is adapted to conduct pump operating fluid under pressure downwardly into the well while the return string **55** is adapted to convey spent operating fluid upwardly to the surface, production fluid pumped from the well being conveyed upwardly to the surface through the production string **56**.

The supply, return and production strings **54**, **55** and **56** are connected at their lower ends to a pump control unit **57**. A free pump unit, not shown, such as that described in U.S. Patent No. 2,952,220, is positioned within the control unit **57** for operation.

A production tube extension **1** projects below the pump control unit **57** to conduct well fluid into the pump suction. An extension shoe **19** from the suction end of the pump projects into the production tube **1** and carries the sampler tube or barrel **2**.

With reference to FIGURE 2, the outer wall of the sampler tube **2** has a shoulder **3** which cooperates with a supporting member or ring **4** formed as part of the inside wall **5** of the production tube **1** so as to suspend the sampler tube **2** vertically in the production tube **1**. A fluid-tight seal is formed between the production tube **1** and the sampler tube **2** by sealing members **6**, such as O-rings, which are arranged on the outer part of the sampler tube **2** just below the shoulder **3**. The sampler tube **2** includes a chamber **7** formed by an upper transverse wall **8** and a lower transverse wall **9**, each of these transverse walls **8** and **9** being provided with a non-return valve of the ball and seat type. Thus, the upper transverse wall **8** contains a valve seat **10** defining an outlet means which cooperates with a ball **11** urged into the closed position by a spring **12** which is supported by a ring member **13** connected to inner wall of the sampler tube **2**. Similarly, the lower transverse wall **9** contains a valve seat **14** defining an inlet means which cooperates with a ball **15** urged into the closed position by a spring **16** which is supported by a ring member **17** connected to the inner wall of the sampler tube **2**.

In the preferred embodiment of the present invention illustrated in FIGURE 2 the valve in the upper transverse wall **8** is arranged to be actuated by a stinger **18** which forms part of the inner end of the pump shoe **19**, adapted to be attached to the pump (not shown in the drawing), which is slidably mounted in the upper end of the sampler tube **2**. In the position shown in FIGURE 2, the ball **11** of the upper valve is held in the open position against the action of the spring **12** by the stinger **18**. The pump shoe **19** is provided with a conical first shoulder **20** which is supported a corresponding conically shaped support **21** at the top of the sampler tube **2**. In the particular embodiment shown, fluid seals **22** (for example, O-rings) are arranged between the shoulder **20** and the support **21**.

The pump shoe **19** contains a channel **23** through it to communicate between the space **24** above the upper valve seat **10** and the suction entrance of the pump (not shown in the drawing) to which the pump shoe **19** is connected. A vent bore **25** is provided in the sampler tube **2** to allow easy lifting of the pump shoe **19** with respect to the sampler tube **2**. In order to raise and lower the sampler tube **2**, support **21** forms at the bottom thereof a circular collar **26** suitable to cooperate with a second shoulder **27** at the lower end of the pump shoe **19**. Thus, by lifting the pump shoe **19**, the sampler tube **2** and its contents may be lifted.

The operation of the sampling device as shown in FIGURE 2 is as follows:

The pump shoe **19** is connected to the lower end of a well pump (not shown) and is lowered into the production tubing **1** of a well. The sampler tube **2** is carried by the pump shoe **19** by cooperation of the shoulder **27** and the circular collar **26**. When it reaches the lower end of the production tubing **1**, the shoulder **3** at the upper end of the sampler tube **2** comes to rest on the supporting ring **4** in the inside of the production tubing **1**, a seal being formed between the inside of the production tubing **1** and the sampler tubing **2** by the sealing members **6**.

Further downward movement of the pump continues until the shoulder **20** of the pump shoe **19** comes to rest on the conical support **21** at the top of the sampler tube **2** and causes the opening of the upper valve by separation of the ball **11** from its valve seat **10** by the stinger **18**.

Actuation of the well pump causes fluid being produced by the formation in which the well penetrates to flow in upward direction as indicated in FIGURE 1 with the wide broken line **28** through the sampler tube **2** by lifting the ball **15** from its valve seat **14** against the action of spring **16** by fluid pressure to open the lower valve.

By pulling the pump upwards, the pump shoe **19** is also pulled upward, the flow of fluid is interrupted and the lower valve is closed by action of the spring **16**. By raising the pump shoe **19** the stinger **18** is also raised with respect to the sampler tube **2** and the upper valve is closed by the action of the spring **12** pressing the ball **11** into its valve seat **10**. On further lifting of the pump, the shoulder **27** of the pump shoe **19** comes into contact with the collar **26** of the sampler tube **2** the latter is lifted from the supporting ring **4** of the production tube **1**. The vent bore **25** equalizes the pressures inside and outside the space **24** during the first part of the upward movement of the pump shoe **19**.

The fluid present in the chamber **7** during the lifting of the pump is trapped therein under the production pressure by the closing of the upper (ball **11** and valve seat **10**) and lower valves (ball **15** and valve seat **14**). Thus, the fluid sample which is lifted to the surface within the sampling chamber **7** can be studied at the surface under the exact conditions at which it is being produced from the formation.

The sampling apparatus according to FIGURE 2 can be unloaded by lifting the ball **15** off the valve seat **14** to open the lower valve by mechanical means such as a stinger (not shown). The sampled fluid can be displaced from the sampling chamber **7** via the ring member **13** and via the valve seat **14** by injecting an inert fluid via the space **24** into the top of the sampling chamber **7**. If the pump shoe **19** with stinger **18** is removed beforehand, which can be done, for example, by unscrewing screw threads, not shown, in that part of the sampler tube **2** which is located above the valve seat **10**, the upper valve will be opened by the action of the fluid injected into space **24**, whereafter this fluid will enter via valve seat **10** and the opening in the ring member **13** into the sampling chamber **7**. Preferably, the lower valve is not opened until the lower end of the sampling apparatus communicates via a fluid-tight passage with a container suitable for receiving the sample.

FIGURE 3 illustrates a modified form of the apparatus shown in FIGURE 2 in which the sampler tube **2** is provided with an intermediate transverse wall **29** containing a non-return valve formed from a ball **30** and a valve seat **31** urged into the closed position by the spring **32** which in FIGURE 3 is shown as a common spring between the ball **11** and the ball **30**. In addition, the sampler tube **2** extends substantially beyond the lower transverse wall **9** to provide a tail portion **33**. Otherwise, the arrangement of the parts is substantially identical in FIGURES 2 and 3.

In the modified apparatus illustrated in FIGURE 3, the action of the pump raises a flow of fluid in the direction indicated by the broken line **28**, and will open the valve in the intermediate transverse wall **29** as well as the valve in the lower transverse wall **9** as shown in the drawing by lifting the balls **15** and **30** from the respective valve seats **14** and **31**. On raising the pump, the valves in the intermediate transverse wall **29** and the lower transverse wall will close simultaneously, thereby trapping a representative sample within the sampling chamber **7** of the fluid which is being produced from the formation by the pump.

In FIGURE 3, near the upper part of the sampling space **7**, there is provided in the wall of the sampler tube **2**, a check valve **34** which may be in the form as is used for a grease nipple. This valve **34** closes towards the exterior of the sampling chamber **7** and can be opened to allow the passage of fluid for displacing the sample from the sampling chamber **7** by injecting this fluid from the exterior of the sampling apparatus into the check valve **34**. Before injecting this unloading fluid, the lower end of the wall of the sampling tube **2** is brought into communication with a container suitable for receiving the sample, whereafter the ball **15** of the valve in the lower transverse wall **9** is lifted from its valve seat **14** by mechancial means such as a stinger.

The sampling apparatus as shown in FIGURE 3 is particularly useful when the hydrostatic pressure prevailing in the space around the pump shoe **19** is high when compared with the pressure in the sampling chamber **7**. Contamination of the contents of the sampling chamber **7** is then prevented, since the high pressure fluid cannot enter the chamber **7** as the difference between the high hydrostatic pressure and the pressure within the chamber **7** keeps the valve in the intermediate transverse wall **29** in the closed position, during the upward movement of the pump shoe **19** with respect to the sampler tube **2** and during the subsequent lifting of the sampling apparatus to the surface. During this latter lifting procedure, the hydrostatic pressure comes to act on the ball **15** and since the pressure inside the chamber **7** is lower than this hydrostatic pressure outside an equalization of pressures may take place if a weak spring **16** is used. In order to prevent contamination of the content of the sampling chamber **7** by fluid entering this chamber past the ball **15** during this equalization of pressure, the wall of the sampler tube **2** is extended in downward direction so as to form a tail portion **33**. Thus, the fluid entering the sampling chamber **7** during pressure equalization will be the same as the sample fluid. It will be obvious to those skilled in the art that the sampling apparatus as shown in FIGURE 3 will only give a representative sample of the composition of the fluid as produced during the action of the pump and not of the pressure conditions thereof if operated in an oil production tubing in which high hydrostatic pressures prevail around the pump shoe **19**. The pressure within the well during production will then be measured by means of a suitable pressure gauge (not shown) arranged below the tail portion **33** of the lower sampler tube **2**.

To obtain a fluid sample under the pressure conditions as prevailing in the well during the pumping operation even if a very high hydrostatic pressure prevails around the pump shoe **19**, use may be made of the sampling apparatus as illustrated in FIGURE 4.

Basically, the apparatus shown in FIGURE 4 is very similar to that shown in FIGURE 3, but the apparatus is further modified by the tail portion **33** being provided with a tubular sleeve **35** slidably mounted on the tail portion **33** which cooperates with a shoulder **36** at the lower end of the production tube **1**. Both the wall of the sampler tube **2** and the tubular sleeve **35** are provided with openings **37** and **38** respectively which cooperate with one another when the sleeve **35** is forced into the retracted position against the action of the spring **39** which is arranged to act between the base of the sleeve **35** and a separation wall **40**. In the position of the apparatus as shown in FIGURE 4, the tubular sleeve **35** is urged into the retracted position with respect to the wall of the sampler tube **2** against the action of the spring **39**. In this position, the

lower part of the tubular sleeve **35** is in contact with the shoulder **36** at the lower end of the production tube **1**. Venting of the space **41** is effected via opening **42** in the tubular sleeve **35** and the passage past the shoulder **36** at the lower end of the production tube **1**. Further openings **43** are arranged in the wall of the production tube **1**, thus providing a passage for the flow of fluid out of the formation through the sampling chamber **7** and to the pump, which flow is indicated by the broken line **28**.

Suitable sealing members (not shown) may be provided between the inner wall of the sleeve **35** and the outer wall of the sampler tube **2** so as to prevent any leakage between these members when the openings **37** and **38** are not in communication. Further, a stop member (not shown), such as a pin arranged on sampler tube **2** and a slit arranged in the sleeve **35**, may be provided for restricting the relative displacement between the sleeve **35** and the sampler tube **2** between a desired retracted position and a desired extended position of the telescopic assembly formed by the sleeve **35** and the sampler tube **2**.

In FIGURE 4, near the upper part of the sample chamber **7**, there is provided in the wall of the sampler tube **2** a check valve **44** which may be of the type used for a grease nipple. A second check valve **45** of the same type as **44** is arranged in the sample chamber **7** just above the ring member **17** on which spring **16** is supported. The entrances to each of the valves **44** and **45** are closed in a fluid-tight manner by suitable plugging members **46** which are screwed into the wall of the sampler tube **2**. When unloading the sample chamber **7** after the sampling apparatus has been retrieved from the well, the plugging members **46** are screwed out of the wall of the sample tube **2** and suitable conduits (not shown) are screwed with their ends into the screw threads in which the plugging members **46** were located. The conduit communicating with the check valve **45** is provided with means which open valve **45** when screwing this conduit into the wall of the sampler tube **2**. By injecting fluid under pressure via the conduit communicating with the check valve **44**, this valve will open and allow the passage of this fluid into the sampling chamber **7**, thereby displacing the sampled fluid via the valve **45** and the conduit communicating therewith. A container suitable for receiving the sampled fluid is arranged at the other end of this last-mentioned conduit.

The operation of the sampling apparatus as shown in FIGURE 4 is as follows:

The pump shoe **19** is connected to a well pump (not shown in the drawing) which is run into the oil production tube **1** of a well penetrating into a formation of which the fluid is to be pumped and sampled. On arriving at the bottom of the production tube **1**, the telescopic assembly formed by the sampler tube **2** and the sleeve **35** is urged into the retracted position due to the downward force from the pump, and in this retracted position the openings **37** and **38** slide into communication. Relative movement betwen the sleeve **35** and the sampler tube **2** is stopped when the latter rests with its shoulder **3** on the supporting ring **4** of the production tube **1**. On further downward movement of the pump, the telescopic assembly formed by the pump shoe **19** and the conical support **21** at the upper end of the sampler tube **2** is retracted until the conical shoulder **20** of the pump shoe is supported by the conical support **21**. The valve in the upper transverse wall **8** is opened by the downward movement of the stinger **18** of the pump shoe **19** separating the ball **11** from its valve seat **10**. In the position as shown in FIGURE 4, the pump (not shown) is held in its place by friction or by any other suitable means during the pump action which is subsequently started. On starting the pump, the pressure reduction created by the pumping action within the channel **23** of the pump shoe **19** opens the valves in the lower and intermediate transverse walls **9** and **29** and a flow of fluid is set up in the direction indicated by the broken line **28**.

If a sample is to be taken, the pump is stopped and then pulled upward. Stopping the pumping action in this way results in the valves in the lower and transverse walls **9** and **29** closing. Further upward movement of the pump causes the telescopic assembly forced by the conical shoulder **20**, pump shoe **19** and the conical support **19** of the sampler tube **2** to expand whereby the stinger **18** is retracted and the valve in the upper transverse wall **8** closes. Upon contact of the shoulder **26** at the upper end of the sampler tube **2** with the circular collar **27** at the lower end of the pump shoe **19**, the sampling apparatus is lifted from its supporting ring **4**. Consequently, the telescopic assembly formed by the lower end of the sampler tube **2** and the sleeve **35** is expanded by the action of the spring **39** which results in breaking the communication between the openings **37** and **38** in the sampler tube **2** and the sleeve **35**, respectively, and trapping the fluid in the tail portion **33** of the sampler **2** and the separation wall **40**. After this position has been reached, further lifting of the pump will lift the sealing members **6** out of contact with the supporting ring **4** at the upper end of the sampler tube **2**. A high pressure prevailing within the space above the conical support **21** at the upper end of the sampler tube **2** will thus not affect the conditions in the sampling chamber **7**, since the sleeve **35** is already in the retracted position before seal provided by the sealing members **6** is broken. The valve in the intermediate transverse wall **29** will prevent this high pressure from influencing the conditions within the sampling chamber **7** at the upper end of this chamber.

It will be obvious that various modifications may be made in the construction of the specific forms of the sampling apparatus illustrated in FIGURE 2, 3 or 4 without departing from the spirit of this invention. The specific details as described in the foregoing specification with reference to the drawings are therefore merely intended to be illustrative and not to limit the scope of the invention in any way.

Thus, the balls **11** and **30** forming part of the valves in the upper and intermediate transverse walls **8** and **29**, respectively, need not be equipped with a common spring **32** but may each be provided with a separate spring. Moreover, the valves as shown in the drawings are only illustrative of one particular type and valves of another type may be used if suitable for the purpose.

The sealing means shown in the drawing is one that uses O-seals. Other sealing means than that using O-seals may alternatively be employed.

Furthermore, the shoulder **20** of the pump shoe **19** provided with the fluid seals **22** need not be of the conical type. If desired, the pump shoe **19** may have a cylindrical portion sliding in a cylindrical opening at the upper end of the sampler tube **2**, sealing means being provided therebetween which seal the passage between the cylindrical portion of the pump shoe **19** and the cylindrical opening of the upper end of the sampler tube **2** irrespective of the position of the telescopic assembly formed by the pump shoe **19** and the upper end of the sampler tube **2**. A shoulder suitable to contact with the horizontal upper plane of the upper end of the sampler tube **2** may be provided on the pump shoe **19** for supporting the pump shoe **19** in the retracted position of the said telescopic assembly.

I claim:

1. Apparatus for sampling well production fluid under pumping conditions, said apparatus comprising:

a pump shoe attached to the lower end of a pump which is movable to pass freely up and down a well tubing string;

said shoe including a stinger on the lower end thereof;

a sampler tube carried by said pump and defining a sample chamber, said sampler tube operatively associated with said shoe and axially relatively movable with respect to said shoe and said tubing string;

means limiting axial relative movement between said sampler tube and said shoe so that free reciprocation

of said shoe relative to said sampler tube is allowed with said shoe movable between a first position and a second position;

said means limiting axial relative movement between said sampler tube and said shoe including a first shoulder and a second shoulder on said shoe and engageable with a support member on said sampler tube;

said chamber having inlet and outlet means;

first standing valve means at the lower end of said sampler tube for controlling fluid flow through said inlet means; and

second valve means in said sampler tube biased to close said outlet means;

said stinger adapted to open said second valve means when said first shoulder of said shoe engages said sampler tube support member and adapted to allow said second valve means to close when said second shoulder of said shoe engages said sampler tube support member.

2. Apparatus for sampling well production fluid under pumping conditions as described by claim **1** additionally comprising:

first partition means in said sampler tube dividing said sample chamber into upper and lower portions;

port means in said partition means; and

third valve means for closing said port means to fluid flow from said upper portion to said lower portion.

3. Apparatus for sampling well production fluid under pumping conditions as described by claim **2** additionally comprising:

valved conduit means through said sampler tube adjacent said first partition means adapted to admit pressurized gas into said lower portion.

4. Apparatus for sampling well production fluid under pumping conditions as described by claim **2** wherein said sampler tube includes a shoulder adapted to cooperate with a support member comprising a portion of said tubing string to support said pump and sampler tube.

5. Apparatus as described in claim **2** wherein said sampler tube extends substantially below said first valve means, thereby forming a tail portion, the end of said sampler tube below said first valve means being open to said well.

6. Apparatus as described in claim **5** having fluid-tight second partition means disposed transversely across said tail portion between said first valve means and said sampler tube open end;

first aperture means through the side wall of said sampler tube between said first valve means and said partition;

sleeve means telescopically disposed around said tail portion of said sampler tube, the lower end of said sleeve means being resiliently biased axially away from said sampler tube open end;

second aperture means in the side walls of said sleeve means; and

abutment means on said well tubing string whereby said sleeve means is telescopically moved with respect to said tail portion so as to bring said first and second aperture means in fluid communicating alignment when said sleeve means engages said abutment means and said stinger opens said second valve means.

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