

Dec. 20, 1938.

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2,140,920

LEAD LINE SAMPLER

Filed Oct. 17, 1936

2 Sheets-Sheet 1

Fig. 1.

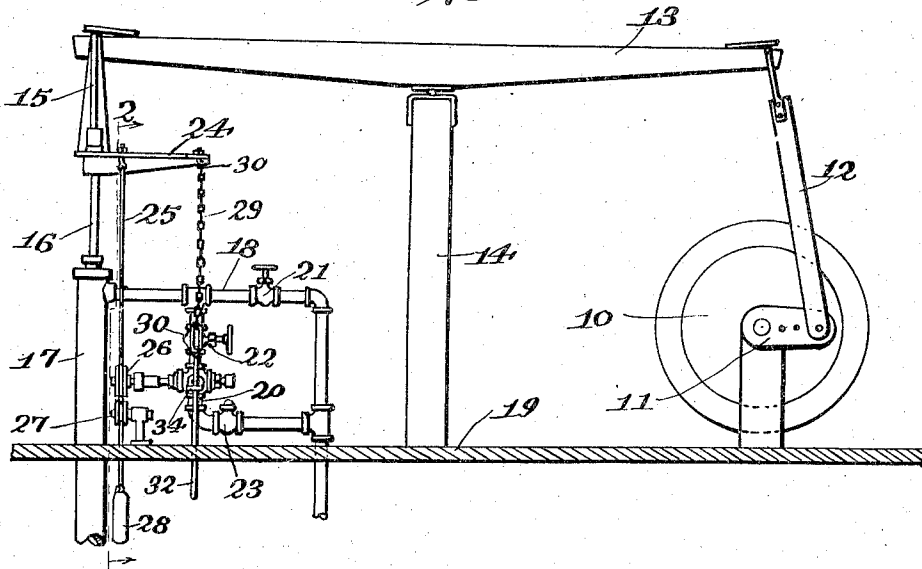
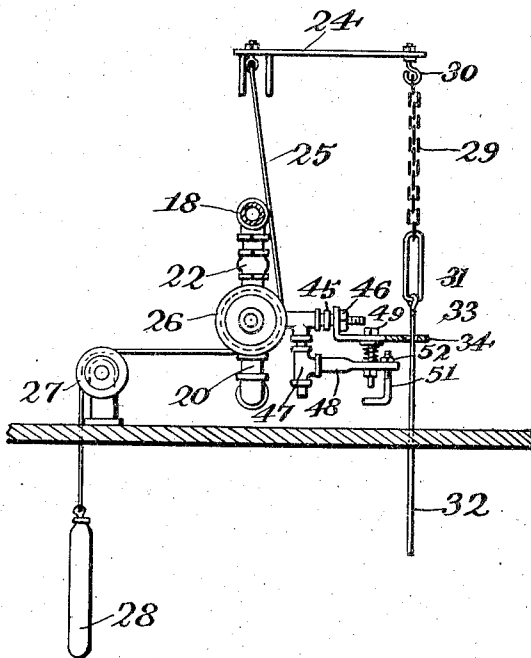


Fig. 2.



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Fig. 3.

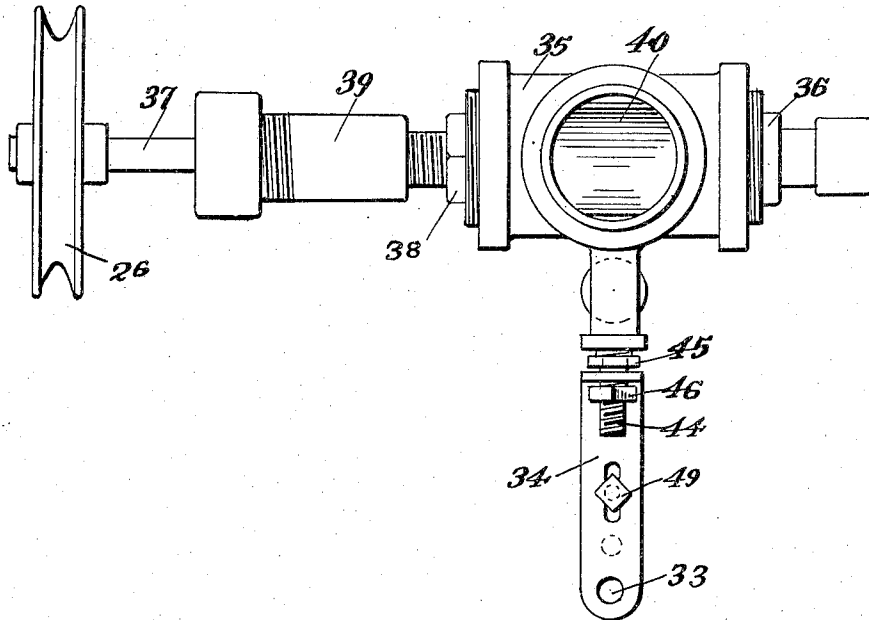
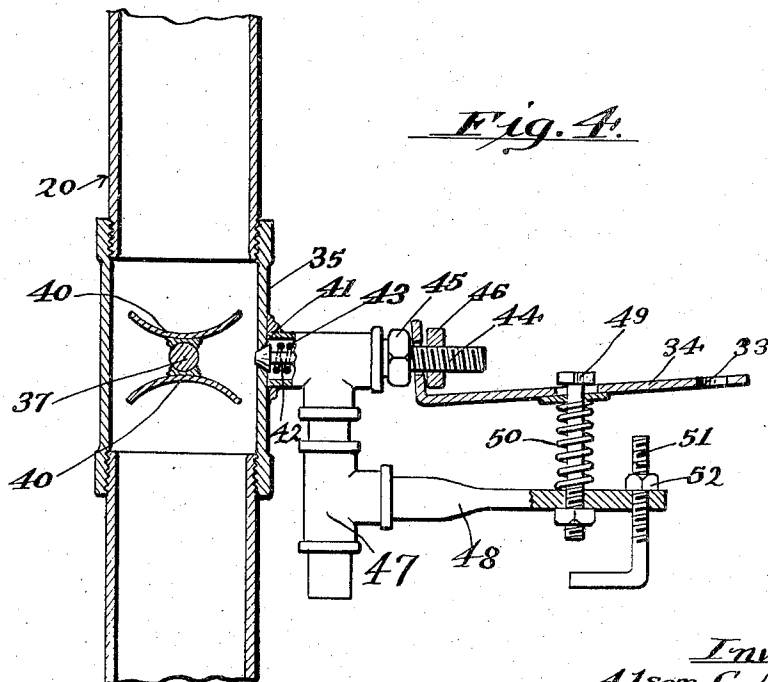


Fig. 4.



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UNITED STATES PATENT OFFICE

2,140,920

LEAD LINE SAMPLER

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Application October 17, 1936, Serial No. 106,077

13 Claims. (Cl. 73-21)

This invention relates to a lead line sampler.

An object of the invention is to provide a sampling device adapted to be inserted in a conduit which provides for agitating and mixing the fluids flowing through the conduit adjacent the point where the sample is to be taken so that a true sample of the contents of the conduit may be obtained through an outlet valve and to provide means for periodically opening the outlet valve after the contents of the conduit have been thoroughly mixed.

The present invention has been primarily designed for use in conjunction with pumping oil wells wherein the oil pumped from the well contains quantities of water or other fluids. For various reasons, such as the difference in specific gravity between water and oil, irregularities in the tubing and the like, the water content in the oil frequently tends to segregate when the oil reaches the surface so that if an attempt is made to obtain samples through the walls of the tubing the samples obtained may not be truly indicative of the relative proportions of water and oil.

By the improved lead line sampler the oil and water obtained from the well are thoroughly agitated and mixed, after which an outlet valve is opened to obtain a small sample, which is truly indicative of the relative proportions of water and oil being pumped.

Another object of the invention is to provide a lead line sampler having an agitating means and a periodically opening outlet valve wherein the agitating means and outlet valve are both operated or driven off of the pumping mechanism such as, for example, the walking beam.

Another object of the invention is to provide a lead line sampler wherein parts are so arranged as to be adequately protected against damage in the event that the sucker rod in the well should part, as sometimes occurs.

Another object of the invention is to provide an improved lead line arrangement for pumping wells enabling a sampler to be readily employed to obtain accurate samples.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Fig. 1 is a view in elevation illustrating the pumping mechanism of a well and illustrating the improved lead line arrangement in which is incorporated the lead line sampler embodying the present invention.

Fig. 2 is a view taken at substantially right angles to Fig. 1 in the direction of the arrow 2 upon Fig. 1.

Fig. 3 is a top plan view of the improved lead line sampler.

Fig. 4 is a vertical section through the improved lead line sampler.

Referring to the accompanying drawings, wherein similar reference characters designate similar parts throughout, parts of a conventional pumping apparatus of an oil well have been illustrated including the band wheel 10, crank 11, pitman 12, walking beam 13, Sampson post 14, and stirrup 15, which suspends the polish rod 16 of the sucker rod within the tubing 17. A lead line 18 leads from the tubing underneath the floor 19 of the derrick to a suitable reservoir or storage for the oil pumped. The above described construction conforms to conventional well pumping practice.

The improvement consists of a lead line sampler, the details of which are illustrated in Figs. 3 and 4, which is preferably installed in a by-pass generally indicated at 20 in the lead line. The lead line is preferably equipped with a gate valve 21 and similarly the by-pass is equipped with a gate valve 22 and a check valve 23 preventing reverse flow through the by-pass. The stirrup 15 is equipped with a laterally extending arm 24 from which is suspended a cable or section of a belt 25 which is trained over a sheave or pulley of the sampler which is indicated at 26. A second pulley or idler 27 is suitably located on or beneath the derrick floor over which the cable or belt 25 is trained and this is so arranged that when a weight 28 is suspended by the cable or belt it will cause the belt to press against the sheave or pulley 26 in driving connection therewith. The arm or bracket 24 also suspends a chain 29, the length of which is adjustable by hooking the proper link in a hook 30. This chain is connected to a link 31 on a lower rod section 32 which may be weighted if desired.

The details of the lead line sampler which is inserted in the by-pass conduit 20 are illustrated in Figs. 3 and 4. The sampler preferably comprises a suitable housing or body 35 threaded at top and bottom for connection to pipe sections forming the by-pass. In one side of the body or housing 35 there is threaded a plug 36 which forms a bearing for one end of the agitator shaft 37. The opposite side of the body is also closed by a threaded plug 38 which forms another bearing for the agitator shaft 37 and connected thereto there may be a stuffing box 39 in which

packing is disposed and compressed about the shaft to prevent leakage. Within the body 35 the agitator shaft carries agitator blades 40 which are welded or otherwise secured to the shaft and preferably present outwardly convex semi-cylindrical surfaces. These agitator blades are formed so as to sweep close to the walls of the housing or body 35 when the agitator shaft 37 is rotated by pulley 26. In one side wall of the housing or body there is disposed an outlet opening 41 which is normally closed by a spring actuated needle valve 42, the primary spring of which is illustrated at 43. This needle valve has a stem 44 which extends outwardly through the upright portion of the angular lever 34. The stem of the needle valve extends through a nut 45 and is equipped with a nut 46 on the outer side of the upright portion of angular lever 34. The housing for the needle valve has an outlet therefrom as indicated at 47 and carries an arm 48 provided with an upstanding strut or bolt 49 around which is disposed a compression spring 50 urging the angular lever 34 into its uppermost and normal position. The arm 48 also carries an adjustable stop 51 which can be locked in any adjusted position by lock nut 52 to limit downward movement of the angular lever.

The operation and advantages of the improved lead line sampler are as follows: During normal pumping operation gate valve 22 is closed and gate valve 21 is open, in which case the oil pumped from the well passes directly through the lead line 18. Whenever it is desired to obtain a sample of the oil being pumped, gate valve 21 is closed and gate valve 22 is opened, causing the oil pumped to be diverted through the sampler and through the by-pass 20. As the walking beam 13 rocks during the pumping operation the cable or belt 25 is raised and lowered, causing sheave or pulley 26 to be rotated in one direction upon a downward stroke and in the reverse direction upon the upward stroke.

Rotation of the pulley produces rotation of the agitator blades 40 in the housing so that the oil flowing through the housing 35 is thoroughly agitated and mixed. The needle valve 42 remains closed until virtually the bottom of the downward stroke is reached, at which time the inertia of link 31 encountering the angular lever 34 causes this angular lever to move downwardly against the action of springs 43 and 50. This momentarily opens the needle valve, allowing a small quantity of the agitated or mixed oil to be withdrawn and to be kept in a suitable receptacle placed beneath the outlet 47. The opening of the needle valve is of relatively short duration as the springs 43 and 50 are strong enough so that the weight of rod 32 may be supported on the lever. The inertia or momentum of the lower section 32 as it approaches the bottom of the stroke is sufficient, however, to momentarily open the needle valve to obtain this sample. Samples may thus be accumulated over a long period of time, which will be truly indicative of the relative proportions of oil and water being pumped by the well.

The chain 29 forms a type of lost motion device so that after the link 31 has struck lever 34 and caused the needle valve to momentarily open continued movement of stirrup 15 and of rod 29 to the very bottom of the stroke does not cause the lever to be pressed downwardly or the valve to remain open beyond the momentary opening.

In the event that the sucker rod should part,

causing the arm 24 to be jerked upwardly quite suddenly the weight 28 ordinarily will not be jerked in a direction so as to damage the sampler. Also rod 32, even though jerked upwardly, merely slides through the aperture 33 in the lever 34 without damaging it. The quantity of sample that is obtained at the bottom of each stroke of the pumping apparatus after the oil has been thoroughly mixed in the housing as it flows there-through can be varied by adjusting the position of stop 51 with respect to the bottom of the lever.

From the above described construction it will be appreciated that the improved lead line sampler is automatic in operation in the sense that it is driven off of the conventional pumping apparatus of the well. The fluids passing through the by-pass are thoroughly mixed and agitated as they flow through the housing so that when the needle valve is opened a truly representative sample is obtained.

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

I claim:

1. A line sampler comprising means providing a housing adapted to be inserted in a conduit, agitating means in the housing for agitating and mixing the fluids flowing therethrough, means for operating the agitating means, an outlet valve from the housing independent of the agitator, and means for periodically opening the outlet valve.

2. A line sampler comprising means providing a housing adapted to be inserted in a conduit, rotary agitating means in the housing for agitating and mixing the fluids flowing through the housing, means for rotating the agitating means, an outlet valve from the housing independent of the agitator, and means for periodically opening the outlet valve.

3. In combination with a well pumping apparatus, means for obtaining a sample comprising a housing in the conduit through which fluids pumped from the well are caused to flow, agitating means in the housing, an outlet valve from the housing, means driven off of the pumping apparatus of the well for periodically opening the outlet valve, and means driven off of the pumping apparatus for causing the agitating means to agitate and mix the fluids as they flow through the housing.

4. In combination with the pumping apparatus of a well, means for obtaining a sample of the fluid pumped comprising a housing, rotary agitating means in the housing, means operable by the pumping apparatus for rotating the agitating means, an outlet valve from the housing, and means for momentarily opening the outlet valve near the end of a stroke of a pumping apparatus, said means being operable by the pumping apparatus.

5. A line sampler comprising a housing adapted to be inserted in a conduit, an agitator shaft extending therethrough, agitator blades on the agitator shaft, a pulley on the agitator shaft by which the agitator shaft may be rotated, an outlet valve in a wall of the housing, spring means urging the outlet valve to be normally closed, and means whereby the outlet valve is opened momentarily against the action of the spring means.

6. In combination with a well pumping apparatus, a by-pass in the lead line from the well,

valves for optionally diverting fluids flowing from the well through the lead line or the by-pass, and a sampler in the by-pass, said sampler comprising a housing inserted in the by-pass, an agitator shaft rotatably mounted in the housing, agitator blades carried by the agitator shaft and disposed within the housing, a pulley on the agitator shaft, means forming a driving connection between the pulley and the pumping apparatus for causing the agitator shaft to rotate, an outlet valve from the housing, and means operable by the pumping apparatus for momentarily opening the outlet valve.

7. A line sampler comprising means providing a housing adapted to be inserted in a conduit, agitating means in the housing for agitating and mixing fluid flowing therethrough, means operable externally of the housing for operating the agitating means, there being an outlet from the housing adjacent and independent of said agitating means, and means for periodically opening said outlet.

8. A line sampler comprising means providing a housing adapted to be inserted in a conduit, rotary agitating means in the housing, means for rotating the agitating means independently of the forces acting thereon by fluids flowing through the housing so as to agitate and mix the fluids flowing therethrough, there being an outlet from the housing adjacent and independent of the agitating means, and means for periodically opening and closing the outlet.

9. A line sampler comprising means providing a housing adapted to be inserted in a conduit, agitating means in the housing, means for operating the agitating means independently of forces acting thereon by fluids flowing through the housing so as to agitate and mix the fluids flowing therethrough, there being an outlet from the housing adjacent and independent of the agitating means, and means for periodically opening and closing the outlet.

10. In combination with a well pumping apparatus, means for obtaining a sample of the fluid pumped comprising a housing through which fluids pumped are caused to flow, agitating means in the housing, means operable by the pumping apparatus for operating the agitating means to agitate and mix the fluids therein, there being an outlet from the housing located adjacent the agitating means, and means for periodically opening and closing the outlet.

11. In combination with a well pumping apparatus, means for obtaining a sample of the fluids pumped comprising a housing through which the fluids pumped are caused to flow, agitating means in the housing, means for operating the agitating means to agitate and mix the fluids flowing through the housing, there being an outlet from the housing located adjacent the agitating means, and means operable by the pumping apparatus for periodically opening and closing the outlet.

12. In combination with a well pumping apparatus, means for obtaining a sample of the fluids pumped comprising a housing through which the fluids pumped are caused to flow, agitating means in the housing, means for operating the agitating means to agitate and mix the fluids flowing through the housing, there being an outlet from the housing located adjacent the agitating means, and means operable by the pumping apparatus for periodically opening and closing the outlet near the end of a stroke of the pumping apparatus.

13. A line sampler comprising a housing adapted to be inserted in a conduit conveying fluids, there being an outlet in the side of the housing, an agitator shaft extending transversely of the housing, agitator blades on the shaft disposed opposite the outlet, said agitator means being independent of said outlet, means by which the shaft may be rotated, and means for periodically opening and closing the outlet.

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