

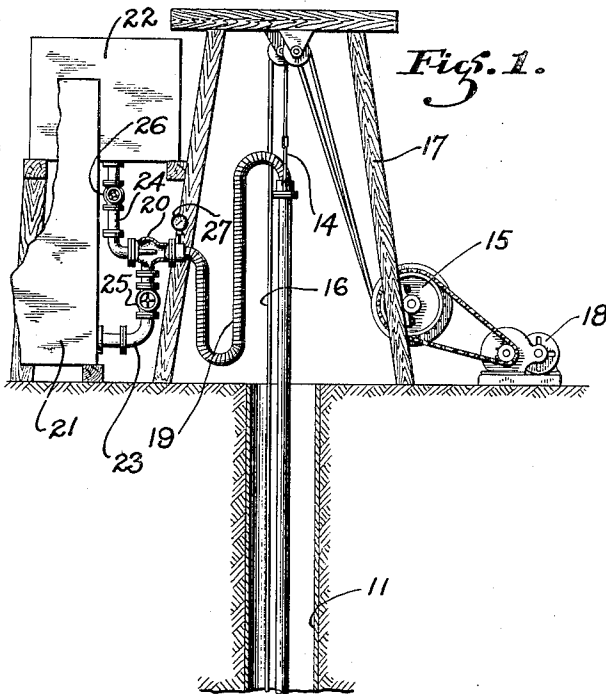
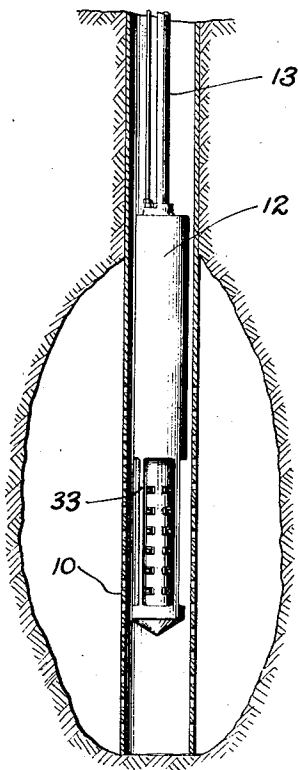
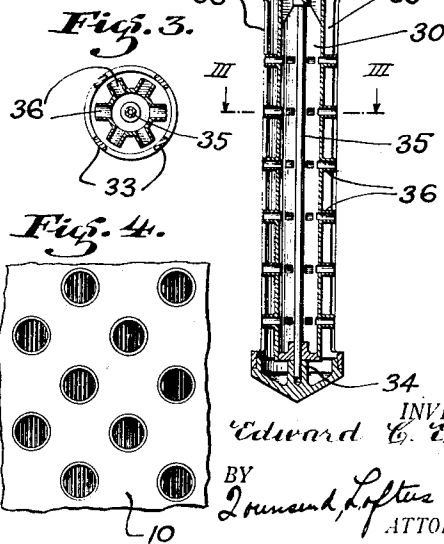
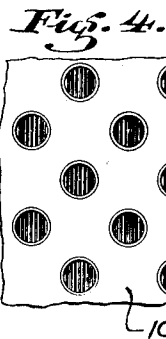
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OIL WELL CLEANER

Filed Feb. 19, 1929



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UNITED STATES PATENT OFFICE

EDWARD C. EKSTROMER, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO JAMES F. GALLAGHER, OF BERKELEY, CALIFORNIA, AND ONE-HALF TO THE EDWARD C. EKSTROMER CORPORATION, OF RENO, NEVADA, A CORPORATION OF NEVADA

OIL WELL CLEANER

Application filed February 19, 1929. Serial No. 341,259.

My present invention relates to a method and apparatus for cleaning oil wells and more particularly to the cleaning of oil well anchor screens.

The object of my invention is to provide apparatus and a method of operating same which is practical, effective, and simple in operation for the purpose of cleaning oil well anchor screens.

In carrying out my invention, I propose to provide an oil throwing apparatus which may be inserted into the well and which will, when in operation, throw oil either in globules or in a continuous stream against the interior of the oil well screen so as to dislodge any foreign matter which might be embedded in the openings thereof. In order to facilitate a throwing of the oil in this manner, I propose to introduce oil into the well either in measured quantities or in the form of a mixture with an inert gas. When gas is used in accordance with this latter aspect of my invention, I find that a spitting effect is produced in the discharge of the oil through the outlets of the oil throwing apparatus which, under some conditions, greatly improves the operation thereof.

For a better understanding of my invention, reference should be had to the accompanying drawing, wherein I have shown by way of illustration and not of limitation, a preferred arrangement and apparatus for carrying out the purposes thereof.

In this drawing—

Fig. 1 is a view in elevation, partly in section, showing one form of apparatus as it is assembled in cleaning a well,

Fig. 2 is a sectional view of a preferred form of oil throwing apparatus such as I propose to lower into the well,

Fig. 3 is a sectional view taken along the line III—III of Fig. 2, and

Fig. 4 is a fragmentary developed view of one form of anchor screen showing the arrangement of the perforated buttons.

In Fig. 1 of the accompanying drawing, 10 designates an oil well anchor screen, this anchor screen being formed upon the end of the oil well casing 11 as is the customary practice. Located within the well at the an-

chor screen 10 there is also shown a motive power unit and oil throwing device 12. This device 12 will be described in more detail in connection with Fig. 2 of the drawing. It will be sufficient at this point to say that this device 12 is secured upon the end of suitable piping 13 by means of which it is lowered into the well, the piping 13 being equipped at its upper end with a suitable bail 14 which connects with a hoisting and lowering rig 15. In addition to the pipe 13, there is also shown extending downwardly into the well a power cable 16 which is adapted to furnish the electromotive power for driving the device 12. This cable 16 passes over a suitable sheave and is paid out and recoiled as the device is lowered and raised. For the purpose of supporting the device 12 within the well, I have shown a simple form of derrick 17 and the hoisting rig 15 is illustrated as driven by means of an electric motor 18. It will be understood that as the device 12 is being lowered into the well, sections of the piping 13 will be added in a manner similar to that employed when a pump is lowered into the well and that when the device is being removed from the well, the pipe section will be disconnected.

Connected to the upper end of the pipe 13 I show a flexible hose or conduit 19 which communicates with a suitable chamber 20 through which gas and/or oil may be introduced through the pipe 13 and into the oil throwing device 12, as will appear more fully in the description of the operation of my device. Arranged adjacent the mixing chamber 20, I show an oil tank 21 and a gas tank 22, each of which communicates respectively with the chamber 20 by means of pipes 23 and 24, these pipes 23 and 24 being provided with suitable valves 25 and 26. On the discharge side of the mixing chamber 20 there is also shown a pressure or vacuum gauge 27 by means of which the relative proportions of gas and oil may be determined, as will also appear hereinafter.

By referring now to Fig. 2, it will be seen that the motive power and oil throwing device 12 consists essentially of a casing 28 in which there is arranged a plurality of mo-

tor units 29 and an exposed rotatable member 30 located at the lower end thereof which is adapted to be rotated by the motors 29.

Inasmuch as the design and arrangement of the motor units 29 forms no part of my present invention, it is not thought that a description thereof is necessary. For a fuller understanding of this feature of my device, reference should be had to my copending application Serial Number 266,471, filed April 2, 1929, wherein I have fully described a motive power unit which is well suited to this particular use.

The casing 28 of the device 12 is provided with a cored out head 31 and axially extending passageways 32 which communicate therewith so that when oil is introduced through the pipe 13 it will pass downwardly through the conduits 32 and be discharged from the lower ends thereof into the rotatable member 30. The casing 28 is also shown as provided with downwardly projecting arms or supports 33 which carry a step bearing 34 for supporting the outer end of the rotatable member 30, a shaft 35 being shown as extending from the lowermost motor unit 29 through the member 30 and journaled at its lower end in the step bearing 34. The rotatable member 30 may be said to consist of a cylindrical body portion projecting from the sides of which there are a number of radially extending nozzles or outlets 36, these outlets 36 being arranged in spaced relation axially along and radially about the member 30 so as to throw a multiplicity of jets of oil outwardly in response to centrifugal force as the member 30 is rotated. At the upper end of the rotatable member 30 where the shaft 35 enters, it will be seen that I have provided a spider 37 for holding the member 30 concentric with the shaft. The arms of this spider 37 are arranged at an angle so that as the member 30 is rotated, they will serve more or less as an impeller in directing the fluid discharged from the conduits 32 downwardly into the body of the member 30.

By referring now to Fig. 3, it will be seen that there are four downwardly extending arms or supports 33 and that by reason of their arrangement they form what might be called a protecting cage within which the rotatable member 30 rotates. This arrangement insures against the ends of the nozzles or discharge outlets 36 coming in contact with the interior of the anchor screen or well casing and being damaged.

The operation of this apparatus in carrying out my improved method of cleaning oil wells will be substantially as follows: It will be assumed that the well has been in operation and that, as a result of the flow of oil through the anchor screen, there has accumulated upon and adjacent the outer surface thereof certain foreign matter which is interfering with the free pumping of oil from

the well. Under these conditions, it will be readily seen that if a sufficient back pressure can be created within the well through the oil well screen and against this accumulation of foreign matter that it will be dislodged and thus render the anchor screen again operative to permit a free flow of oil therethrough. This accumulation of material and its consequent stopping up of the anchor screen is generally evidenced by a reduction in the amount of oil which it is possible to pump from the well and when, under these conditions, the well is not supplying its supposed normal out-put, I withdraw the pump and lower therein to its stead my improved oil throwing device 12, the device 12 being lowered into the well upon the end of a suitable length of piping 13. This piping is then connected at its upper end to suitable supplies of oil and inert gas, the gas preferably being ordinary oil well gas.

When the device 12 is lowered to a point adjacent the interior of the anchor screen 10, I may proceed in two ways, either of which will produce the results sought. I may, after setting the rotatable element 30 in rotation by energizing the motors 29, introduce a quantity of oil into the pipe 13 and allow it to flow downwardly therethrough and be discharged centrifugally as will be understood from the description of the apparatus. This operation may be repeated periodically allowing a quantity of oil to flow down the pipe 13, this operation being carried out so that there might be said to be traveling down the pipe 13 a glob of oil followed by a space, which space may contain a quantity of the gas previously referred to and then another glob of oil and a space or quantity of gas, this being repeated while the apparatus is in operation. Under these conditions, the glob of oil when it reaches the rotatable element 30 will be thrown outwardly and then the quantity of gas there-following will be forced down and into the well by reason of the next following globs of oil so that there will be created within the well a condition which will permit of a throwing of the oil. During this operation, it is also contemplated that the device may be raised and lowered so that the oil throwing action will be directed against the total length of the anchor screen. The other method of operation differs from the above only in that instead of introducing the oil into the pipe 13 in globs, as previously stated, I introduce the oil in a more or less steady stream and mix with it at the time of introduction a certain quantity of gas from the tank 22 so that under these conditions the oil which is flowing downwardly into the device 12 is what might be termed a mixture of oil and gas. When this mixture is finally discharged into the rotatable member 30, the oil portions thereof will be acted upon by centrifugal force and be thrown outwardly,

whereas the gas will not be so affected and, as a result, this method of operation also makes possible the throwing of the oil.

In order to control the quantity of oil and/or gas introduced into the device 12 in accordance with the above methods of procedure, I resort to the gauge 27, previously referred to as located adjacent the chamber 20, and when proceeding in accordance with the first method outlined above, the gauge 27 functions, as follows: It will be assumed that the gauge is at zero when the oil is introduced into the top of the pipe 13 and that the valve 25 leading from the oil tank has been closed. Under these conditions, as the glob of oil flows downwardly in the pipe 13, it will create a suction or vacuum in the zone of the gauge 27, the value of which will be registered thereupon, and when a predetermined gauge reading has been established, I open the valve 26 to permit an amount of gas to enter sufficient to reduce this vacuum either to zero or to some predetermined value. I then close the valve 26 and open the valve 25 to permit a second glob of oil to be introduced into the pipe, which second glob of oil will repeat the above action on the gauge 27 and the additional quantities of gas and oil will be introduced. When proceeding in accordance with the second method outlined above, I will open the oil valve 25 and the gas valve 26 to such a degree that the oil and gas mixture as it flows down the pipe 13 will maintain a certain reading upon the gauge 27, this reading being determined by the relative proportions of oil and gas, it being understood that where the proportion of oil predominates the reading will be higher than would be the case where the proportion of gas predominates, this being, it is believed, because of the fact that the oil column in the pipe 13 will vary in weight, depending upon the amount of oil therein, the gas being considered as having substantially no weight which would tend to create a vacuum or reduced pressure upon the gauge 27.

While I have shown the preferred form of my invention as now known to me, it is to be understood that various changes may be made in its construction without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. An oil well cleaner and agitator comprising a rotary element having axially and radially spaced liquid discharge outlets adapted to be lowered into the well, means for alternately introducing a liquid and a gas into said rotary element, a motor for driving said rotary element at a relatively high speed, whereby the liquid introduced thereinto will be thrown outwardly through its discharge outlets in jets against the oil well screen to

thereby clean the same, and means for controlling the flow of liquid and gas to produce alternately a discharge of liquid and then a discharge of gas into the well through the rotary element.

2. An oil well cleaner and agitator comprising a rotary element having axially and radially spaced liquid discharge outlets adapted to be secured upon a well tubing and lowered into the well, means at the top of the well for alternately introducing a liquid and a gas into said rotary element through said tubing, a motor also mounted upon said tubing for driving said rotary element at a relatively high speed, whereby the liquid introduced thereinto will be thrown outwardly periodically through its discharge outlets in jets against the oil well screen to thereby clean the same.

3. An apparatus for cleaning and agitating oil wells comprising the combination of a motive power unit adapted to be lowered into the well upon the end of a tubing and drive a rotary liquid throwing element, said liquid throwing element being mounted upon the lower end of said motive power unit and directly connected to the motor, a source of liquid and a source of gas at the top of the well connected to the other end of said tubing, and means to alternately control the introduction of a liquid and a gas under pressure through said tubing and into said rotary element, whereby the liquid will be discharged into the well with a spitting action.

4. An apparatus for cleaning and agitating oil wells comprising the combination of a motive power unit adapted to be lowered into the well upon the end of a tubing and drive a rotary liquid throwing element, a liquid throwing element mounted upon the lower end of said motive power unit and directly connected to the motor, means at the top of the well connected to the other end of said tubing adapted to alternately introduce a liquid and a gas through said tubing and into said rotary element, and means for regulating the proportions of liquid and gas, whereby sufficient gas to counteract the back pressure of the well will be introduced during the well cleaning operation.

5. In oil well cleaning apparatus, the combination of a motor enclosing housing adapted to be secured to the end of a tubing and lowered into the well, a motor within said enclosing housing, an annular fluid conduit communicating with said tubing and extending completely around said motor forming a free passageway to a discharge outlet at the lower end of said housing, and a rotatable cylindrical element supported upon the lower end of said housing and directly connected to said motor, said cylindrical element being adapted to receive the liquid introduced through the tubing and discharge it by centrifugal

force against the oil well screen in jets to thereby clean the same.

6. The method of cleaning an oil well anchor screen which comprises introducing a liquid and an inert gas alternately into the well and discharging the liquid centrifugally against the inside of the anchor screen, while a liquid free cavity is formed about the discharging device by the gas.

7. The method of cleaning an oil well anchor screen which comprises discharging oil by means of centrifugal force against the inside of the anchor screen while counteracting the back pressure in the well by introducing an inert gas under pressure.

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