Aug. 3, 1937. W. A. OBERLIN 2,089,035

PROCESS FOR TREATING COGNATE LIQUIDS OF A WELL

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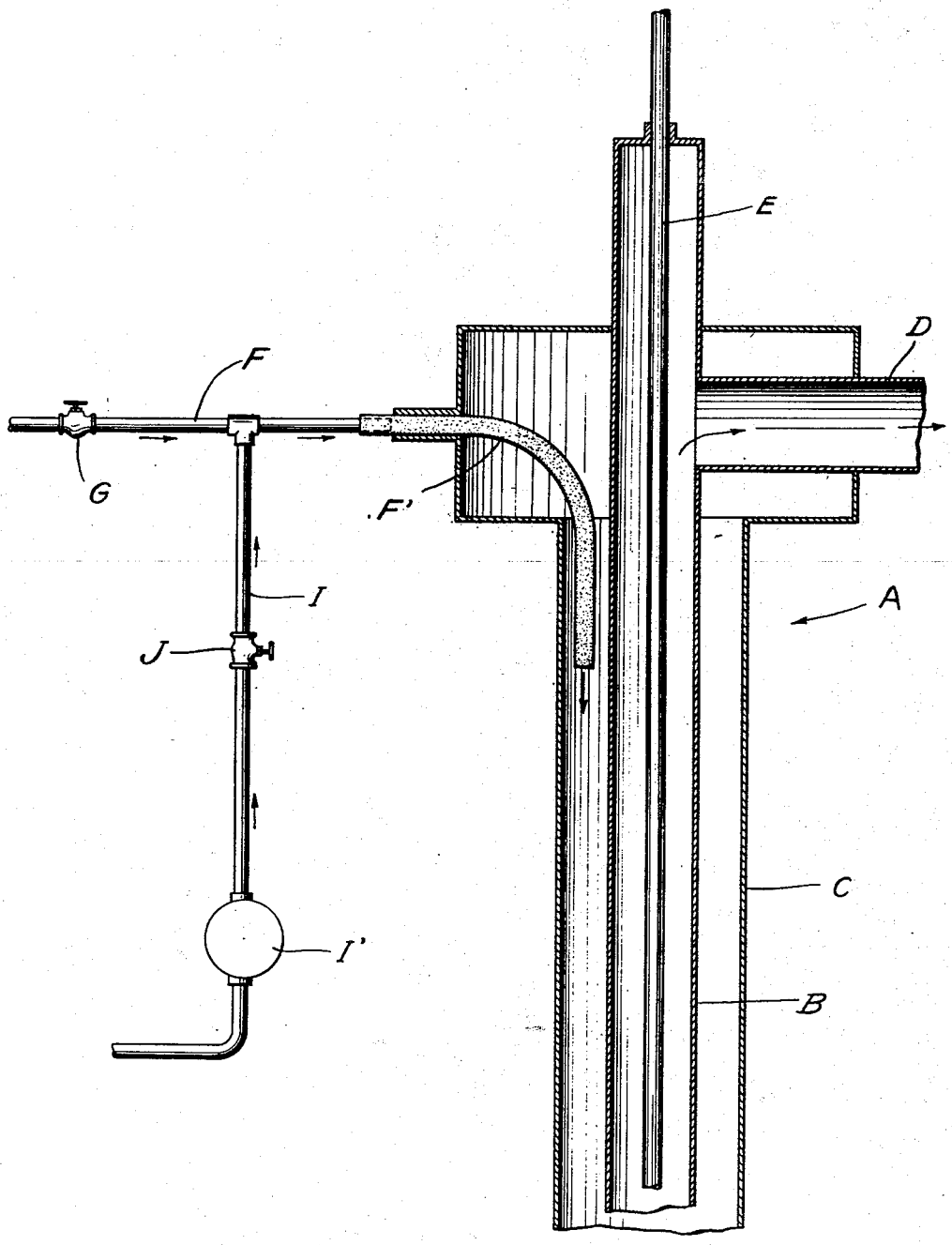

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PROCESS FOR TREATING COGNATE LIQUIDS OF A WELL

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4 Claims. (Cl. 166—21)

This invention relates to procedure that is intended to be used, either for the purpose of "breaking" a petroleum emulsion, or for preventing or tending to prevent the cognate liquids of an oil well from emulsifying while said liquids are traveling upwardly through the well in which they are produced.

It is now common practice in the oil producing industry to introduce a chemical treating agent directly into a well that is producing "cut oil", "roily oil', "emulsified oil" or "wet oil", so as to cause the treating agent to contact the cognate liquids of the well before said liquids travel upwardly through the well. Such procedure is commonly referred to as "down the hole treatment", and in many instances, is more effective than chemical treatment above the ground, i. e., treatment after the emulsified or partially emulsified oil has been discharged from the well, due to the fact that in the "down the hole treatment" the chemical treating agent comes in contact with the cognate liquids immediately as they come from the strata, or immediately after the emulsion has formed or starts to form.

The treatment by "the down the hole method" of wells producing cut oil is almost limited to the use of a water-soluble or water-miscible treating agent. The general procedure is to conduct a water solution to the bottom of the well, usually by passing it down between the tubing and casing. In instances where the otherwise most effective reagent is a water-insoluble reagent, this method cannot be employed. By means of my invention, such water-insoluble reagents may be effectively used in the down the hole process.

As is well-known the water-insoluble type of treating agent, such as oxidized castor oil, phthalated castor oil, etc., gives more effective treatment on certain emulsions than is obtainable by any other agent. It has previously been appreciated that if there were a practical method for introducing such reagents into the bottom of the well, increased advantages would be obtained by using them, over and above the advantages obtained by using them at the well-head in preference to other agents. This advantage is the advantage frequently demonstrated by "the down the hole treatment" over the various methods of surface treatment.

I have devised a new underground process for treating the cognate liquids of a well, that is an improvement upon the conventional "down the hole treatment", in that it contemplates the use of water-insoluble treating agents, which, in many instances, are more effective than water-soluble treating agents. Briefly described, my process consists in subjecting the cognate liquids of a so-called "cutting well" to the action of a water-insoluble treating agent that is conveyed or conducted down into the well by means of a stream of water, the procedure involving feeding the stream of water down into the well, and adding to or injecting into said stream the water insoluble treating agent which is drawn from a source of supply separate and distinct from the source of supply of the stream of water. Herein, the term "cutting well" is used to mean a well that produces cognate liquids or petroleum emulsion which requires some kind of treatment to convert it into merchantable oil commonly referred to as clean pipe line oil. The reagent as employed in my process is not dissolved or dispersed in water in the sense that soap may be said to be dissolved or dispersed. Similarly, the reagent employed in my process is not dispersed or emulsified in water in the manner characteristic of an emulsifiable mixture of a water-insoluble reagent and a suitable emulsifying agent. On the contrary, the reagent employed in my process is present in the water or suspended in the water in the form of macroscopic droplets. The treating agents that I prefer to use are water-insoluble demulsifying agents of the modified fatty acid type, or of the blown oil type, or of the sulfonic acid type. Modified fatty acids have been disclosed and claimed for use in the treatment of petroleum emulsions by Barnickel, U. S. Patent #1,467,831.

The figure of the drawing illustrates more or less diagrammatically an apparatus that may be used in practising my process.

In the drawing the reference character A designates the well head of a conventional oil producing well, B designates the well tubing, and C designates the well casing. The liquids produced in the well are ejected from the well through a pipe D by means of a pump (not shown) that is actuated by a sucker rod E. The reference character F designates a supply line leading from a source of supply of water and provided with a terminal portion F', formed preferably by a piece of flexible tubing, that enters the well head and projects downwardly into the space between the well tubing and the well casing, as shown in the drawing, said supply line F being adapted to be used for feeding into the well a stream of water into which is injected an insoluble chemical treating agent. Usually, the supply line F will be provided with a valve G for

regulating the flow of water through said line. It is immaterial how the chemical treating agent is admitted to or introduced into the stream of water supplied by the line F so long as said treating agent is drawn from a separate source of supply and injected into a flowing stream of water that is traveling to the producing strata or zone of the well. In the apparatus illustrated in the drawing the reference character I designates a chemical line leading from a source of supply of a suitable water insoluble treating agent and equipped with a pump or any other suitable means I' that feeds the treating agent into the supply line F, where it is picked up by the stream of water in said line and conducted to the tubing F', from which it is discharged downwardly into the space between the well tubing and well casing. The pump I' may be actuated by any suitable source of power, and the rate of flow of the chemical treating agent through the chemical line I into the water supply line F may be controlled by regulating the speed of the pump, or by adjusting a valve J in the chemical line I.

In practising my process I have found that the most effective chemical treating agents are oxidized oils (such as oxidized castor oil, or oxidized rape seed oil), and highly polymerized oil, obtained by sulfation of reactive fatty oils like castor oil, or their fatty acids, such as oleic acid, followed first by hydrolysis to eliminate the sulfur-containing radicals, and then, in turn, followed by polymerization or condensation with the elimination of water. Other effective treating agents that may be employed in my process are petroleum sulfonic acids of such high molecular weight that they exhibit substantially no water-solubility; certain organic demulsifying agents whose alkali salts are water-soluble, i. e., bodies having carboxylic or sulfonic or sulfuric hydrogen present, after combination of such bodies with a high molecular weight amine, such as triamylamine; various materials obtained by sulfation of castor oil and various alkylated naphthalene sulfonic acids when neutralized with triamylamine; petroleum sulfonic acids of the type which are themselves ordinarily water and oil-soluble, when neutralized with high molecular weight amines, such as triamylamine; and phthalated castor oil, oxalated castor oil and maleated castor oil.

The amount of chemical treating agent employed depends upon the effectiveness of said treating agent. Generally speaking, it is desirable to first determine the minimum quantity of treating agent that will effect resolution of the emulsion being produced by the well, by subjecting the emulsion to tests above the surface of the ground, and thereafter practice the procedure that constitutes my present invention, i. e., convey the treating agent down into the well by means of a flowing stream of water into which is injected the treating agent, the said treating agent being drawn from a separate source of supply and added in a ratio of approximately one half to one-third of the quantity that was found to be effective in the test made above the surface of the ground. I have found that some emulsions which are not susceptible to treatment above the ground when subjected to the action of a relatively large quantity of water-insoluble treating agent, yield to treatment under the ground when the procedure above described is followed or practised. The amount of water required to convey or conduct the treating agent to the producing zone of the well need only be sufficient to carry the treating agent along with it. Since there is practically no expense attached to introducing the water, it is immaterial whether a little more or a little less is used, and since the amount of water introduced is usually small, as compared with the amount of liquids being produced by the well, such introduction of water does not materially affect the cost of lifting or raising the well liquids. Generally speaking, if the terminal portion F' of the water supply line F is approximately one-fourth of an inch in diameter, or possibly one-half or even three-fourths of an inch, and if water be employed at such a rate that a substantially full and continuous stream passes through the terminal portion F' of the supply line, sufficient water will pass into the well to carry the unemulsified water insoluble treating agent down to the bottom of the well, where it comes in contact with the cognate liquids of the well.

As is plain from the description above, the term "water" is intended to include brine, which would ordinarily be available and which might be employed. In some instances, fresh water is practically unobtainable in an oil field at any reasonable cost; and it may, in fact, be more valuable than the oil produced. In such circumstances, my process may be employed using brine, provided only that the reagent is insoluble in such brine and does not react with it in an undesirable manner.

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

1. An underground process for treating the cognate liquids of a well, which consists in feeding into a well a flowing stream of water, and adding to or injecting into said flowing stream a water-insoluble treating agent of the modified fatty acid type, whereby said treating agent will be conveyed in the form of unemulsified macroscopic droplets by said stream to the producing zone of the well.

2. An underground process for treating the cognate liquids of a well, which consists in feeding into a well a flowing stream of water, and adding to or injecting into said flowing stream a water-insoluble treating agent of the blown oil type, whereby said treating agent will be conveyed in the form of unemulsified macroscopic droplets by said stream to the producing zone of the well.

3. An underground process for treating the cognate liquids of a well, which consists in feeding into a well a flowing stream of water, and adding to or injecting into said flowing stream a water-insoluble treating agent of the sulfonic acid type, whereby said treating agent will be conveyed in the form of unemulsified macroscopic droplets by said stream to the producing zone of the well.

4. An underground process for treating the cognate liquids of a well, which consists in discharging a flowing stream of water into the space between the tubing and casing of the well, and injecting into said stream before it discharges into the well, a water-insoluble treating agent drawn from a separate source of supply, whereby said treating agent will be conveyed in the form of unemulsified macroscopic droplets by said stream to the producing zone of the well.

WILLIAM A. OBERLIN.

CERTIFICATE OF CORRECTION.

:t No. 2,089,035. August 3, 1937.

WILLIAM A. OBERLIN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 53, for "an" read a water; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day October, A. D. 1937.

Henry Van Arsdale

Seal)

Acting Commissioner of Patents.

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