Dec. 15, 1925. 1,565,574

C. LARSEN

WELL CLEANING PROCESS

Filed June 27, 1924

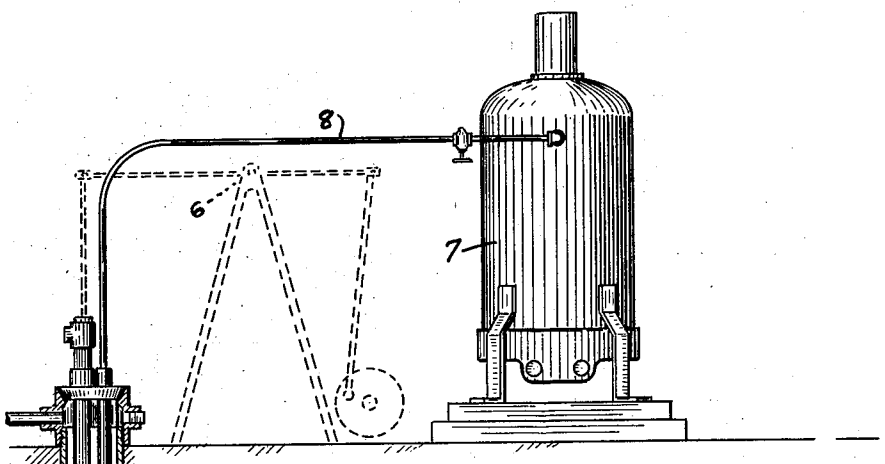
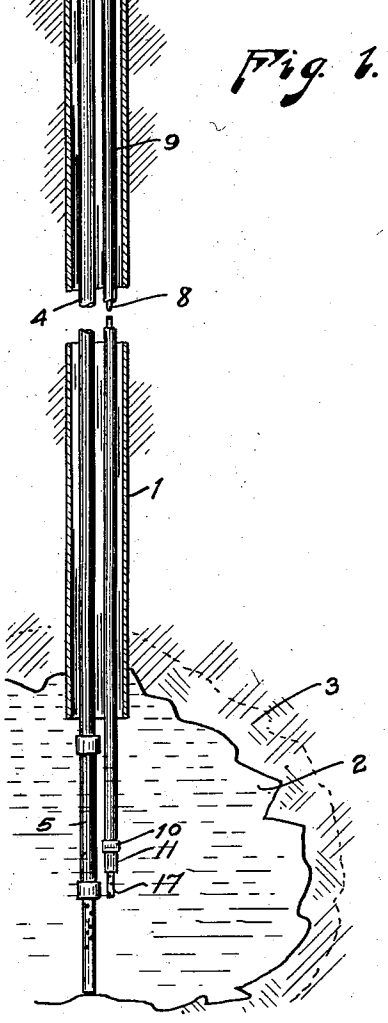


Fig. 1.



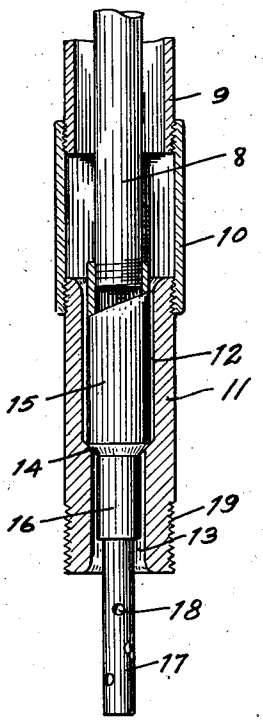


Fig. 2.

Inventor

Charles Larsen.

By A. J. O'Brien

Attorney

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UNITED STATES PATENT OFFICE.

CHARLES LARSEN, OF DENVER, COLORADO.

WELL-CLEANING PROCESS.

Application filed June 27, 1924. Serial No. 722,818.

To all whom it may concern:

Be it known that I, CHARLES LARSEN, a citizen of the United States, residing at Denver, the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Well-Cleaning Processes; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to a method and an apparatus for cleaning oil wells.

It is well known that oil wells yielding oil, with a heavy paraffine base, has a tendency to gum up and choke, thereby greatly decreasing the amount of their production. This is one of the most serious problems confronting the producing end of the industry and many experiments have been made for the purpose of producing some satisfactory method of cleaning the well and of restoring it to production. It is not alone paraffine that causes the sealing or choking of the well, but salt also adds to the difficulty.

In the past deparaffining has been attempted in many different ways, some of which have been partially successful, but none of which have been generally adopted.

In a process of this type it is necessary to dissolve the salt as well as to melt the paraffine and to remove the salt and paraffine while they are in a fluid state, and this can only be accomplished when the pump line and pumping apparatus is in place. I have found that if superheated steam at a pressure of substantially one thousand pounds is conducted to the bottom of the well and there liberated, the heat transferred and liberated will soon raise the temperature of the walls of the well to such an extent that the paraffine will melt and flow out into the sump where it is removed by the pump. The water which is formed from the condensed steam is a good solvent of salt and will cause the latter to go into solution, whereby it, as well as the paraffine, will be removed by the pump. Actual experiments have shown that wells which have been treated for less than twenty-four hours, have had their production increased approximately eighty-five per cent.

The steam is introduced into the well and conducted to the bottom by means of a small pipe located within a larger pipe, from the walls of which it is spaced so as to be entirely surrounded by an air space that serves as a heat insulator. A special fitting is provided at the lower end of the larger pipe, which forms a seal between it and the smaller pipe, whereby liquid is prevented from entering the air space between the pipes.

In order to carry out my process successfully, I employ an apparatus which I will now describe in detail, reference for this purpose being had to the accompanying drawing in which the apparatus is shown in a general way, and in which:

Fig. 1 is a vertical section through a well and shows the location of the pump line, the steam line and the boiler; and

Fig. 2 is a section through the lower end of the steam line and shows the special fitting.

Numeral 1 represents an oil well whose bottom has been enlarged by "shooting" into a chamber 2, which varies in size, but which is usually about twenty feet in diameter. After a well has been in operation for some time, the paraffine will gum or clog the pores in the sand, producing a stratum 3 which is practically impervious and which therefore prevents oil from the surrounding sand to flow into the well. This "sealing" action is further aggravated by the presence of salt, which precipitates and forms a crust on the inner surface. The ultimate result of this sealing action is to render the well entirely nonproductive.

The pump line 4, with its working barrel 5 and pumping jack 6 is of ordinary construction, and is not interfered with or altered in the least. For the purpose of generating the steam I have provided a boiler 7 which, together with the remaining parts of the apparatus, is specially built of bronze and Monel steel so as to enable it to withstand the terrific heat and pressure. The heat is derived from an oil blast which is produced by means of well known apparatus. The steam is conducted by means of a three-quarter inch (¾″) pipe 8 (from the boiler), which extends downwardly within the two inch (2″) pipe 9. The lower end of pipe 9 is provided with an ordinary hydraulic coupling 10, to which is threadedly connected a special fitting 11. This fitting has an axial opening 12 approximately one

and one-half inches (1½") in diameter, extending substantially one-half the length thereof. Another opening 13 co-axial with opening 12, but of a smaller diameter (about one inch) extends the remainder of the length of the fitting. The shoulder 14, which joins the inner surfaces of the two openings, is inclined at 45 degrees and forms a seat for the cooperating fitting 15, which is attached to the lower end of pipe 8. The fitting 15 has a portion 16 of smaller diameter than the main body portion thereof and extends into opening 13. The weight of pipe 8 is supported, in part at least, on the shoulder 14. The two fittings 12 and 15, therefore, form a valve which prevents water or other liquid from entering the space between the pipes and at the same time permits the withdrawal of pipe 8. Secured to the part 16 is a nozzle 17 which is provided with perforations 18. The lower end of the fitting 11 is threaded, as indicated by numeral 19, for connection of an anchor in case this should be necessary.

When the parts are in place in the manner shown and described, steam is generated in the boiler 7 and raised to a pressure of about 1000 pounds per square inch and superheated to eleven hundred degrees Fahrenheit. This intensely hot, high pressure steam is permitted to flow through pipe 8 and enters the well through the openings 18 in the nozzle 17. The pump is kept in constant operation while the process is carried out and serves to remove the molten paraffine from the walls.

By means of the process outlined above, it will become possible to restore to production a large percentage of the many thousand wells that have become partially or entirely choked by paraffine or salt and thereby make available a large amount of oil that at present is unattainable.

This application is a continuation in part of my co-pending application, Serial No. 664,130, filed September 21, 1923.

Having now described my invention, what I claim as new is:

1. A method of cleaning oil wells, which consists in generating steam at a pressure of substantially one thousand pounds per square inch and conducting the same to the bottom of a well where it is permitted to expand and liberate its heat whereby the walls of the well become heated sufficiently to melt any solidified paraffine, and whereby the water of condensation will cause soluble matter to enter into solution, and simultaneously removing the liquids from the well.

2. A method of cleaning oil wells, which consists in generating steam at a pressure of substantially one thousand pounds per square inch and superheated to eleven hundred degrees Fahrenheit and conducting the same to the bottom of a well where it is permitted to expand and liberate its heat whereby the walls of the well become heated sufficiently to melt any solidified paraffine, and whereby the water of condensation will cause soluble matter to enter into solution, and simultaneously removing the liquids from the well.

In testimony whereof I affix my signature.

CHARLES LARSEN.