Aug. 20, 1963 S. SPITZ 3,101,116

BOTTOM HOLE JET HEATER

Filed April 4, 1961

Fig. 1.

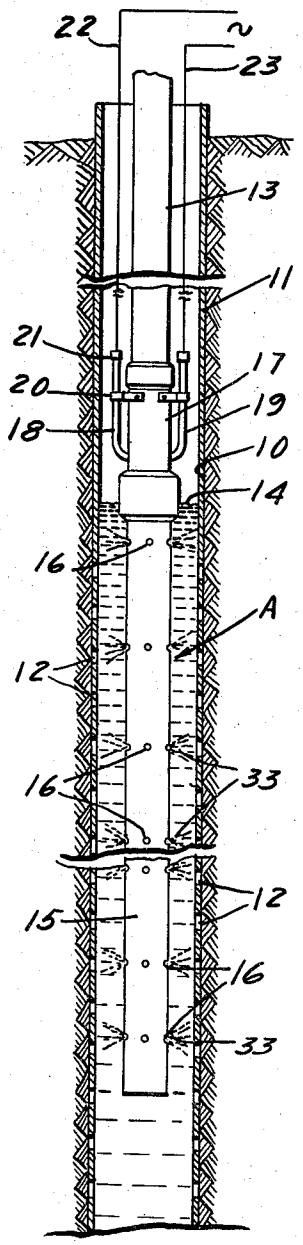
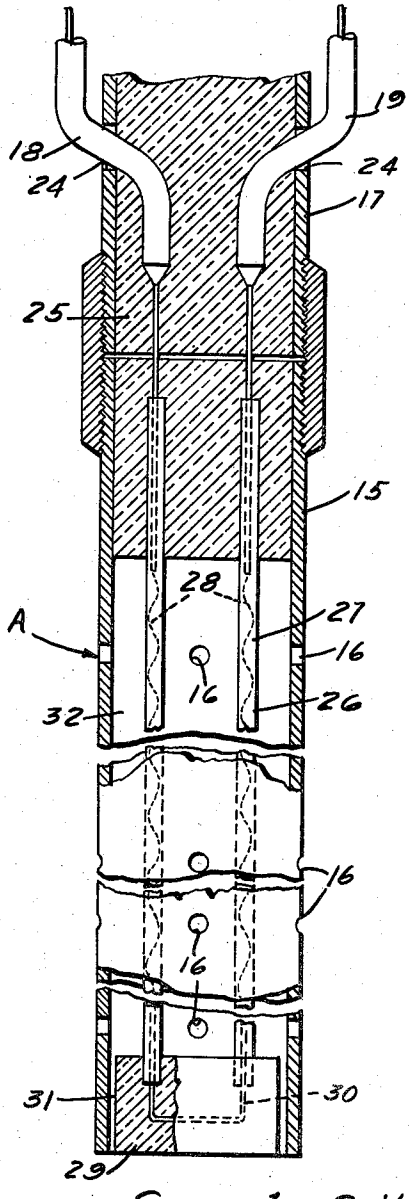


Fig. 2.



Samuel Spitz,
INVENTOR.

WHANN & McMANIGAL
Attorneys for Applicant

by

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BOTTOM HOLE JET HEATER

Samuel Spitz, Los Angeles, Calif., assignor to Electronic Oil Well Heater, Inc., Los Angeles, Calif., a corporation of Nevada

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The present invention relates generally to heating apparatus, and is more particularly concerned with means for the application of heat to a subterraneous passage, such as to the bottom hole portion of a drilled oil well.

It has been long realized that the flow in oil wells may be materially restricted by paraffin and asphalt which may have congealed in the walls of the well and in the openings of slotted casings. Moreover, it has also been known to utilize various and sundry types of heating devices for removing the paraffin and asphalt, whereby the flow may be augmented to the end that the oil well fluid flow may be restored to an economical paying basis.

Various heater arrangements have been utilized which vary as to complexity and efficiency. Steam has been conducted to the occluded portions of the well and utilized for heating the fluid. In other arrangements it has been known to utilize electrical heaters. Regardless of the medium for raising the temperature of the fluid, the conventional devices have depended in the most part upon heating the fluid and circulating the heated fluid simply by convection currents.

Having in mind the conventional arrangements, the present invention seeks to provide an improved bottom hole heater wherein effective use is made of pressurized heated fluid so as to not only heat the adjacent wall formations of the well, but also to subject the formations to pressurized jet streams which will be effective in augmenting the removal of the occluding paraffin and asphalt as well as other materials.

A further object of the invention is to provide an oil well heater, wherein provision is made for heating and pressurizing the fluid in the well hole at the location to be treated, thus permitting the heated fluid to be forcibly applied directly through jet streams at the treated location.

Another object of the invention is to provide as an article of manufacture, an oil well heating unit which is simple of construction, reliable and efficient in operation, and which may be utilized with standard tubings such as normally installed in an oil well with a minimum of change.

Still another object is to provide an improved method for treating an oil well which permits the application of heated fluid in situ by means of heated pressurized fluid jets.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is a sectional view diagrammatically illustrating an oil well with a heater therein embodying the features of the present invention; and

FIG. 2 is an enlarged fragmentary longitudinal section through the heater, and showing the operative relationship of the various components thereof.

Referring now more specifically to the drawings, for illustrative purposes, there is shown in FIG. 1 a typical oil well of conventional construction including a subterraneous passage or bore 10 in which a conventional casing 11 is placed with its upper end terminating at the surface, while the lower end portion may or may not contain a section of slotted or otherwise perforated casing with openings 12 therein.

Conventional tubing 13 is shown as extending from the surface into the well, where its lowermost end is positioned below an oil level, as indicated by the numeral 14, of oil or a mixture of oil and water.

Heating apparatus according to the present invention, as indicated generally at A is shown as comprising a separate unitary structure secured to the tubing 13 so as to be positioned at the bottom of the well or other desired location in the well which is to be treated. In the present instance, the heating unit is located adjacent a section of the casing containing the openings 12, and which may have become occluded by paraffin and/or asphalt so that the oil flow has been diminished and reduced. In the heating unit of the present invention, the oil or oil and water mixture in the well bore will be heated to a relatively high temperature which decreases the viscosity of the fluid. The heated fluid is then ejected in high pressure jet streams against the perforated casing so as to open the flow perforations therein, after which the jets may be operative through the openings into the adjacent wall formation.

The specific details of the oil well heater A will now be described by reference to FIG. 2. It will be realized, of course, that the basic concept of the present invention may be embodied in various physical structures. For purposes of illustration herein, the heater is disclosed as comprising an elongate section of tubing 15 which is provided substantially throughout its length with a plurality of circumferentially spaced longitudinally extending rows of wall openings 16.

The tubing 15 is connected at its uppermost end with a coupling extension 17 of bronze or other suitable material, this coupling extension being arranged for connection with the tubing string 13 in conventional manner. The coupling extension is further arranged to provide for terminal connections of the heater elements, as will subsequently be described.

Lead-in conductors 18 and 19 are shown as being supported on opposite sides of the extension 17 as by a suitable bracket 20 in each case. The uppermost ends of the lead-in conductors are fitted with appropriate connectors 21 which permit the lead-ins to be connected through supply conductors 22 and 23 with a suitable source of electric power located at the surface.

As most clearly shown in FIG. 2, the other ends of the lead-in conductors 18 and 19 are respectively carried through a slot or opening 24 in the wall of the coupling extension 17, and internally thereof as well as in the upper end of the tubing 15 are insulatingly anchored and supported within an insulating filler 25 of suitable material such as porcelain.

The insulating filler 25 also provides a support for a U-shaped heater 26 arranged to extend longitudinally within the tubing 15.

The heater 26 comprises elongate supporting rods 27 which contain therein the heating element 28. The uppermost ends of the rods 27 are embedded in the porcelain filler 25, while the lowermost ends of the rods are anchored in a disc-like porcelain block 29 at the lowermost end of the tubing 15. The upper ends of the heating elements 28 are respectively conductively connected with the lead-in conductors 18 and 19. At their lowermost ends, the heating elements are interconnected through a conducting element 30 within the block 29. The rods 27 thus provide a support for the block 29. The block 29 is of such size that its outer periphery is spaced from the adjacent wall of the tubing 15 so as to cooperatively form therewith an annular inlet 31 for fluid flow from the exterior to a chamber 32 thus formed within the tubing 15, this chamber containing the heating unit and having fluid outlets through the openings 16 in the wall thereof.

As thus arranged, the heating unit will raise the tem-

perature of the oil or mixture of oil and water in the chamber **32** and thus increase its pressure to such an extent that the heated pressurized fluid will be ejected through the openings **16** as fluid jets **33** outwardly against the adjacent wall of the well bore where it will act upon the paraffin and asphalt materials which occlude the flow of oil.

It will be appreciated that the inlet area and outlet areas of the openings **16** will have to be relatively proportioned in order that the heated fluid will be properly ejected through the openings **16**.

From the foregoing description it is believed that the method of treating the oil well sections will be readily apparent.

From the foregoing description, it will be realized that other modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to the specific form or forms shown or uses mentioned, except to the extent indicated in the appended claim.

I claim:

As an article of manufacture, a heater for an oil well comprising: a tubular member having a plurality of circumferentially spaced longitudinally extending rows of openings in its wall and defining an elongate heating chamber; a closure of insulating material at the uppermost end of said tubular member; a U-shaped heater extending through said chamber with its ends supported in said closure, and its bridging portion positioned adjacent the lowermost end of said chamber; means of insulating material supported by said heater bridging portion cooperating with the adjacent wall of the tubular member at this end to define a restricted inlet opening to the interior of said chamber; and lead-in electric conductors at the uppermost end of said tubular member connected with the ends of said heater, said wall openings and inlet opening being so proportioned as to effective total areas as to cause, upon energization of said heater, relatively cool oil well fluid to be drawn through said inlet opening and ejected as hot jet streams through the wall openings.

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