March 13, 1956 H. D. BOWMAN 2,738,409

HEATING APPARATUS

Filed Aug. 26, 1953

Fig. 1

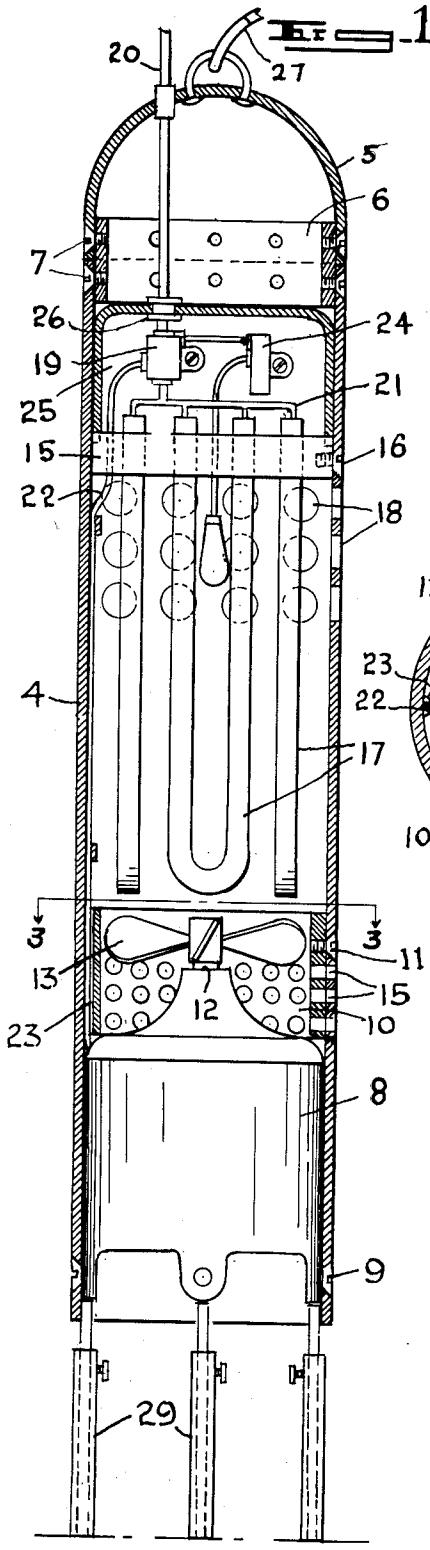


Fig. 3

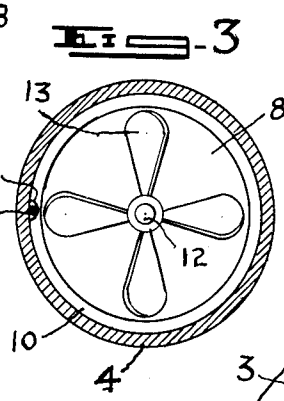
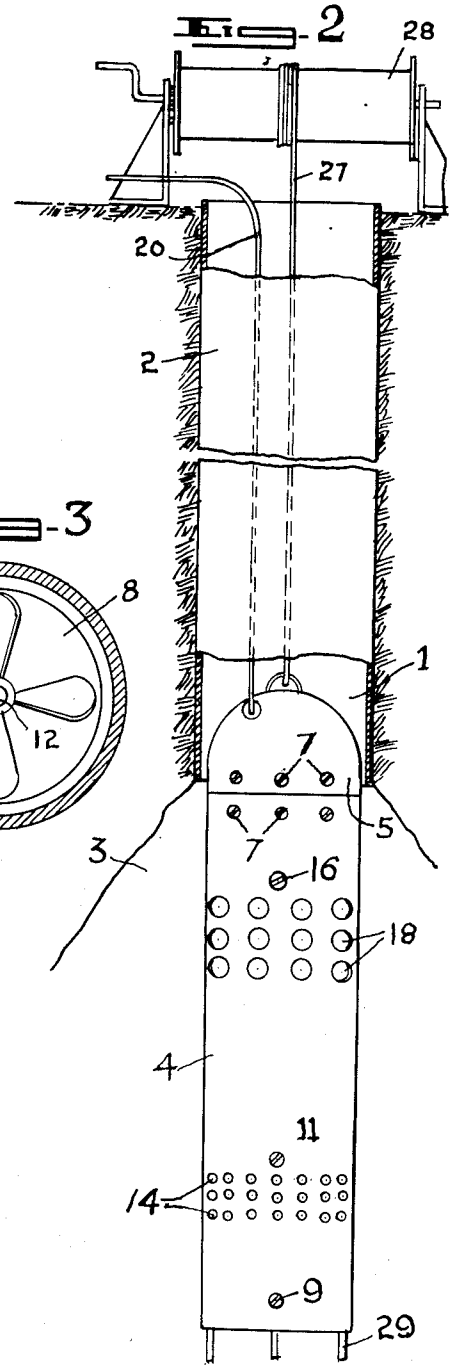


Fig. 2



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United States Patent Office 2,738,409 Patented Mar. 13, 1956

2,738,409

HEATING APPARATUS

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Application August 26, 1953, Serial No. 376,627

1 Claim. (Cl. 219—33)

This invention relates to a heating apparatus, and while primarily designed and intended for clearing oil wells of congealed constituents of petroleum that may have accumulated around the bottom of the well to such an extent as to partially or entirely stop the flow of oil to the pumping apparatus of the well, it will be obvious that the device may be employed for any other purposes wherein it is found to be applicable.

Important objects and advantages of the invention are to provide an apparatus of the character described, which is effectively operable to quickly liquify any congealed petroleum constituents that may have accumulated around the bottom of the well and thereby restore normal oil production, which embodies a circulator member operable for expediting the process of reducing the congealed mass to a liquid state over a considerable area surrounding the bottom of the well, which is simple in its construction and arrangement, durable and efficient in its use, and comparatively economical in its manufacture, operation, and maintenance.

To the accomplishment of these and such other objects as may hereinafter appear, the invention resides in the novel construction, combination and arrangement of parts herein specifically described and illustrated in the accompanying drawing, but it is to be understood that changes in the form, proportions and details of construction may be resorted to that come within the scope of the claim hereunto appended.

In the drawing wherein like numerals of reference designate corresponding parts throughout the several views:

Figure 1 is a vertical cross sectional view of the shell of the heating apparatus, and showing the various parts of the latter housed within the shell.

Figure 2 is an elevational view illustrating the application of the apparatus in connection with a well.

Figure 3 is a transverse sectional view taken on line 3—3, Figure 1.

Referring in detail to the drawing 1 represents a well lined with a casing 2 in the usual manner. At the bottom of the well is the sump 3 in which congealed constituents of petroleum frequently accumulate to retard or stop the normal production.

The improved heating apparatus comprises an elongated, vertically disposed, cylindrical shell 4 having an open lower end. The shell includes a reduced preferably dome-shaped top cover 5. The top cover is removably attached to the shell by an inwardly disposed collar 6, which overlaps the adjacent edges of the shell and top cover, and which is secured in position by means of screws 7.

A vertical electric motor 8 is mounted in the lower end portion of the shell 1 and is removable from the latter. The motor is secured in the shell by screws 9 engaging the lower end thereof, and by means of a reinforcing sleeve 10 secured against the inner face of the shell by screws 11 and seating on the upper end of the motor frame.

The motor 8 includes a shaft 12, which carries a fluid circulator 13, shown in the form of a propeller, at the upper end thereof. The circulator is secured to the shaft to rotate therewith and is disposed within the reenforcing sleeve 10.

The shell 1 and the reenforcing sleeve 10 are provided with a plurality of respectively registering apertures 14. The apertures are arranged in a plurality of circumferentially extending rows, which are disposed below the circulator 13 and above the upper end of the motor frame.

A supporting disk 15 of insulating material is mounted in the shell 1 and is secured adjacent to the upper end of the latter by screws 16. A plurality of suitable electric heating elements 17 have their upper end portions fixed in the supporting disk with the upper ends thereof projecting slightly above the top face of the supporting disk.

The heating elements 17 depend from the supporting disk 15, and have the lower ends thereof disposed adjacent to but spaced from the fluid circulator 13. A plurality of openings 18 are provided in the shell 1 and are arranged in a plurality of circumferentially extending rows, which are disposed below but adjacent to the supporting disk.

An electric current distributor 19, of any suitable construction, is mounted in the shell 1 above the supporting disk 15, and is connected with the main current conductors 20 carrying the current from the source of electrical supply, and with proper conductor connections 21 with respective heating elements 17. A conductor 22, extending through the supporting disk and through a groove 23 in the outer wall of the reenforcing sleeve 10, provides connection between the distributor and the motor 8.

A suitable thermostatic mechanism 24 is mounted in the shell 1 and is connected in the operating circuit for automatically controlling and regulating the temperature generated by the energized heating elements 17 during the operating of the apparatus.

A substantially inverted cup-shaped casing 25 is mounted in the shell 1, between the collar 6 and the supporting disk 15, in a manner to provide a leakproof enclosure or housing for the distributor 19, and the conductor connections 21 and the thermostatic mechanism 24. A bushing 26 provides leakproof passage for the main conductors 20 into the casing 25. Such enclosure of the mentioned parts assures the proper functioning of the latter by protecting same from contact with any liquid during the operation of the apparatus in the manner to be described.

A suspension cable 27 is connected with the top cover 5 and winds upon a suitable winch mechanism 28, which is operable for lowering and for elevating the heating apparatus in the well 1 when required.

A plurality of adjustable supporting legs 29 are carried by and depend from the lower end of the shell 4, and are intended to rest upon the bottom of the sump 3 to space the heating apparatus from the sump bottom and thereby promote the more efficient operation of the heating apparatus.

When the apparatus is in the operative position within the well, the shell 4 may be partly or entirely immersed in the congealed mass to be liquified in the sump 3 depending on the depth of the latter. The dome-shaped top cover 5 of the shell 4 will function to direct the heating apparatus into the well when initiating the elevation of the apparatus in the latter.

In practice, after the apparatus has been lowered to the desired position in the well, the heating elements 17 are energized to liquify the congealed mass in the sump 3. Such liquification is greatly accelerated by the simultaneous operation of the circulator 13. Initially, the operation of the circulator will tend to force the heated air from the shell, through the apertures 14 and openings 18, into the congealed mass. When the congealed mass turns into liquid, the latter, by the continued operation of

the circulator, will be drawn into the shell through the apertures 14 and forcibly discharged from the shell through the openings 18, or vice versa depending on the direction of rotation of the circulator. Such circulation of the heated liquid will expedite further liquification over a considerable area surrounding the heating apparatus in the sump 3.

The operations of the circulator 13 and of the heating elements 17 may be controlled independently of each other, and a gauge may be provided, remote from the operating apparatus, to indicate the temperature within the latter. Further, the circulator, instead of being in the form of an electrically driven propeller as shown, may comprise a suitable pump mechanism driven by either electric or air power means.

What I claim is:

A well heating apparatus of the class described, comprising in combination, an elongated cylindrical shell including a removable top, a plurality of electric heating elements mounted in said shell, electric conductors having connections with said elements, said shell provided with

a plurality of fluid-passage openings positioned directly outward of said elements, a fluid circulator mounted in said shell below said elements, driving means for operating said circulator, said shell provided with a plurality of fluid-passage apertures positioned adjacent to and below said circulator, thermostatically operated means for controlling and regulating the temperature of said elements, a casing mounted in said shell and forming a leakproof enclosure for said thermostatically operated means and for said connections, and means connected with said top operable for lowering and elevating the apparatus in the well.

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