(No Model.)

F. A. FLANEGIN.

METHOD OF AND MEANS FOR REMOVING PARAFFIN FROM OIL WELLS

No. 573,142. Patented Dec. 15, 1896.

Fig. 1.

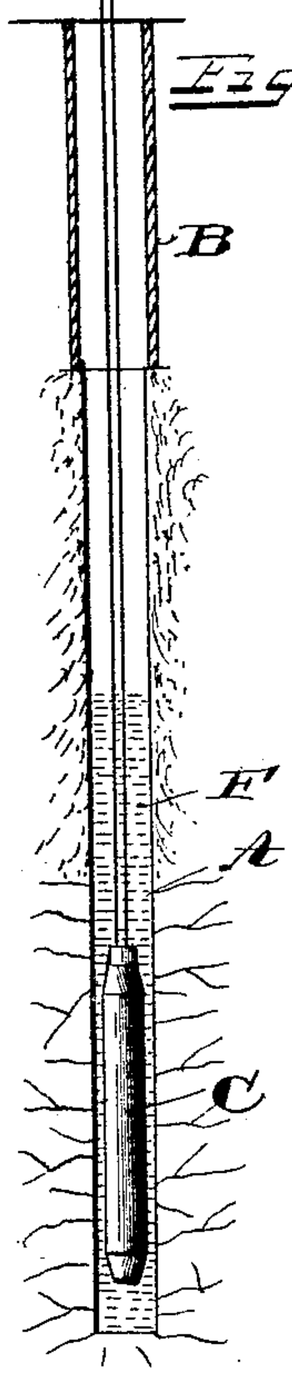


Fig. 2.

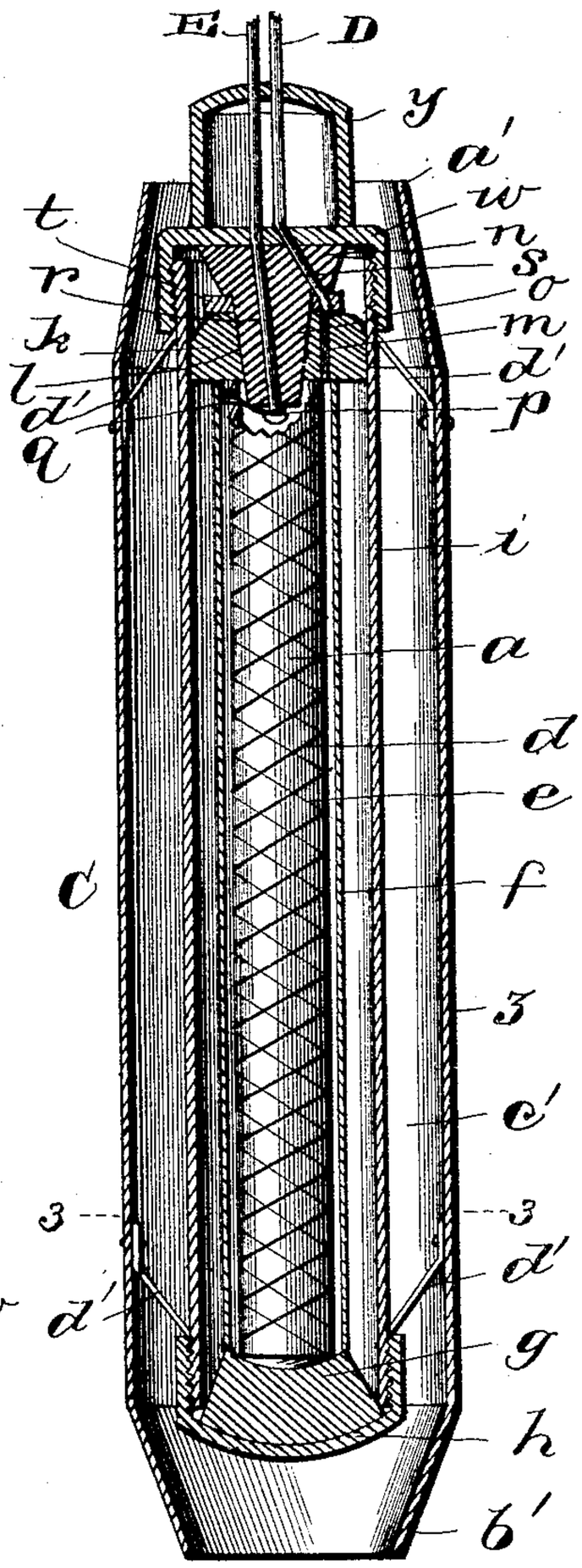


Fig. 3.

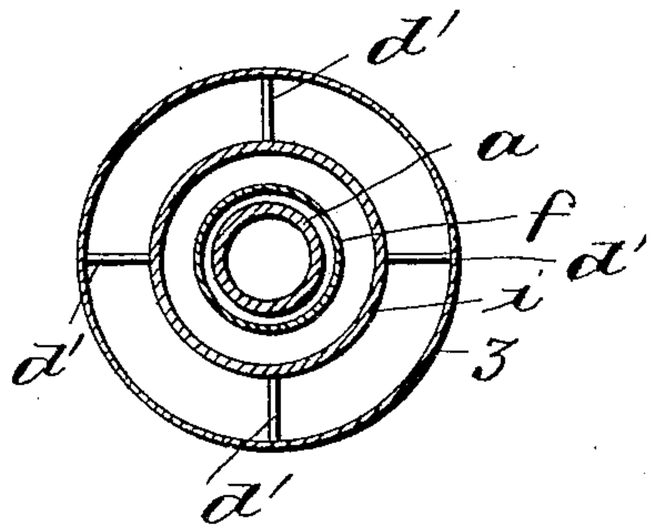


Fig. 4.

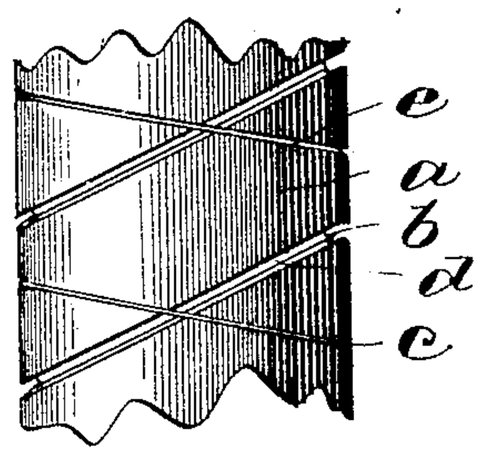


Fig. 5.

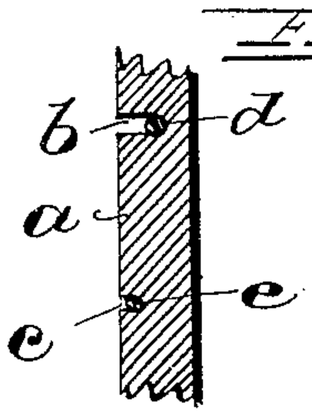
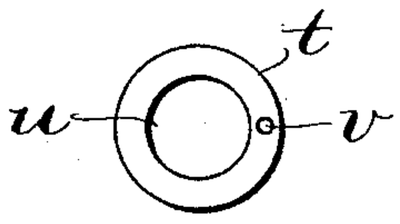


Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

FRANCIS A. FLANEGIN, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF AND MEANS FOR REMOVING PARAFFIN FROM OIL-WELLS.

SPECIFICATION forming part of Letters Patent No. 573,142, dated December 15, 1896.

Application filed April 7, 1896. Serial No. 586,520. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS A. FLANEGIN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Methods of and Means for Removing Paraffin from Oil-Wells; and I do hereby 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.

My present invention relates to oil-wells, and has for its object the removal of paraffin which accumulates in the crevices of the oil-bearing portion of the well.

To increase the flow of oil-wells, it has heretofore been the practice to explode torpedoes, which increased the capacity of the crevices by separation, but the paraffin was driven back into compactness in the crevices, so the increased flow was not effected by the removal of the paraffin which had accumulated in the crevices. Heated bars of metal have been lowered into the oil-bearing strata of wells for the purpose of heating water for removing the paraffin, but by the time the bar reached the bottom of the well it had cooled to a great degree, so that the water could not be heated to the boiling-point, and the result was that but little good was effected in the removal of the paraffin except on the surface of the wall of the well. Steam has been introduced into wells for the same purpose and the results were no better than produced by the heated metal. Steam has also been conducted into wells through pipes extending to the bottom of a well and communicating with a steam-boiler. Electrical heaters have also been proposed, but in every instance the heat operated upon a small portion of the crevices adjacent to the heaters only and did not penetrate the crevices to any considerable extent and remove the paraffin therefrom, because of the limitations nature imposes upon the power of the heated body to diffuse its heat beyond a certain distance from the heated body.

Because of the impractical character of the several means enumerated, thousands of oil-wells have been abandoned on account of the accumulation of paraffin, which has filled the crevices in the well and prevented the flow of oil.

It is my purpose to remove paraffin from oil-wells by heating a liquid, preferably petroleum-oil or its distillate, to the boiling-point as a minimum degree of heat, augment and maintain the heat to produce ebullition, and circulate the liquid through the heater, on the surface of the walls, and into and out of the crevices in the oil-bearing rock or other strata from which the oil issues to dissolve the paraffin, open the crevices, and cause the melted paraffin to form a union with the hot petroleum, coal-oil, gasolene, benzene, or other distillate or liquid.

The invention will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a vertical section of an oil-well, showing the heater in the bottom of the well surrounded by a liquid; Fig. 2, a vertical section of the heater, on an enlarged scale; Fig. 3, a transverse section on the line 3 3, Fig. 2; Fig. 4, a side view of a section of the core of the heater; Fig. 5, a section of the wall of the same, and Fig. 6 a top plan view of the electrical contact-disk detached.

Reference being had to the drawings and the letters thereon, A indicates an oil-well, B its casing, and C the heater.

The heater consists of a central porcelain core *a*, which is preferably made hollow and provided with external spiral grooves *b c*, running in opposite directions, the former to receive and support the positive wire *d* and the latter the negative wire *e*, which are electrically connected to the main and like positive and negative cables D E, which extend to the top of the well and are attached to a suitable generator of electricity, (not shown,) and around said core is an insulating-jacket *f*, preferably of mica, and serves as a conductor of heat and a non-conductor of electricity. The core with its jacket rests upon a seat *g*, of plaster-of-paris, in the lower end of and resting upon the lower head *h* of the metal tube *i*, which may be made of ordinary gas or steam pipe and surrounds and incloses the core *a* and its jacket *f*, and at the upper end of the core is an annular block *k*, of plaster-

of-paris or other suitable material, which is provided with a central bore *l*, preferably conical, and a vertical hole *m*, through the latter of which connection is made with the wire *d* and the cable D, and through the former connection is made with the wire *e* and cable E, as will hereinafter more fully appear.

Above the block *k* is a block *n*, also of plaster-of-paris or like suitable material, and is provided with a projection *o*, preferably conical, and said projection is provided at its end with a disk or button *p*, of copper or other suitable conductor of electricity, and the projection extends through the bore *l* of the block *k* into the tubular core *a* to make electrical contact with the upper end of the negative wire *e*, which is passed through a hole *q* in the upper end of the core and brought to the center of the core, so that the disk *p* will engage it when inserted. The projection *o* is also provided with a bore *r*, through which the lower end of the negative cable E extends and makes electrical contact with the disk or button *p*, or a separate piece of wire may be used to connect the cable with the disk. Through the upper portion of the block *n* is a hole *s* for the passage of the lower end of the positive cable D.

Surrounding the upper portion of the projection *o* of the block *n* and resting upon the upper side of the block *k* is a disk *t*, of copper, which serves to connect the wire *d* and the cable D electrically. The disk is provided with a central opening *u*, through which the projection *o* passes, and with a hole *v*, through which the lower end of the cable D passes and is secured on the under side of the disk by upsetting or spreading the wires which compose the cable.

The block *k* is held down in connection with the upper end of the core *a* by the upper cap *w* of the tube *i*, which engages the upper surface of the block *n*, and also secures it in its position in the block *k*.

The cap *w* may be provided with a bail *y*, by which to lower the heater into a well and withdraw it therefrom by a suitable line, (not shown,) but it is my purpose to lower and raise the heater through the medium of the cables D and E.

The tube *i* is surrounded by a casing *z*, of galvanized iron or other sheet metal, and preferably extends above and below the tube *i* and is contracted at its ends *a'* and *b'* and forms an annular chamber *c'* between the tube and the casing, through which chamber liquid F, preferably crude petroleum, coal-oil, gasolene, or other distillate of petroleum-oil, is circulated, the cooler liquid entering at the bottom of the heater and being discharged at the upper end into the center of the body of liquid in the well, and by its circulation through the chamber *c'* is heated to such a degree as to produce ebullition of the liquid, in which state the liquid is brought in contact with the paraffin coating the surface of the bore of the well in the oil-bearing rock and forced into the crevices of the rock and dissolves, and by the motion imparted to the liquid by its circulation cuts or washes the paraffin off the surface and out of the crevices. The paraffin thus removed readily unites with the hot liquid and is therewith removed from the well after the heater has been withdrawn from the well either by the force of the gas which is now free to pass through the crevices or by a pump.

The contracted ends of the casing *z* serve to guide the heater in its descent and ascent in a well and prevent its lodging on joints of the casing or projections in the well below the casing of the well, and in the operation of the heater in a well the cold or cooler liquid enters at the bottom of the heater, is heated and expanded in the chamber *c'*, and expelled at the upper end, the liquid being directed by the contracted upper end of the heater toward the center of the body of liquid in the well, which causes the cooler liquid adjacent to the wall of the well to descend rapidly and reënter the heater at its lower end and effect a thorough circulation of the liquid through the heater. The casing *z* is maintained in proper relative position with reference to the tube *i* by braces *d'*.

Liquid having been supplied to a well and the heater C having been let down into the well and the cables D E attached to a dynamo or other generator of electricity, the current is turned on and the core *a* and its jacket *f* heated to incandescence and the tube *i* heated by the heat radiated from the core. The liquid which fills the chamber *c'* is heated to such a degree that it boils and produces ebullition of the liquid and causes it to rise in the chamber and discharge at the upper end of the heater, while cold or cooler liquid enters the chamber *c'* at its lower end and thus causes and maintains a thorough and constant circulation of the liquid through the heater, the heat being continually augmented by the current of electricity and maintained until the paraffin has been melted off the surface of the bore of the well and out of the crevices in the oil-bearing strata of the well, the liquid being expanded by the heat and forced into the most remote parts of the oil-bearing rock through the crevices.

In flowing wells the pressure of gas at the head of the casing will indicate the progress being made in the removal of paraffin.

The heater may vary in length from four to six feet and is about four inches in diameter.

Having thus fully described my invention, what I claim is—

1. The method of removing paraffin from oil-wells, which consists in heating a paraffin solvent, circulating the solvent in the well and its crevices, thereby dissolving the paraffin by contact with the hot solvent and removing the solvent and contained paraffin from the well.

2. The method of removing paraffin from oil-wells, which consists in heating a paraffin

solvent to the boiling-point, circulating the solvent in the well and its crevices, augmenting the heat and maintaining the circulation of the solvent, thereby dissolving the paraffin by contact with the solvent, and removing the solvent and contained paraffin from the well.

3. A device for removing paraffin from oil-wells, consisting of a heater provided with a surrounding casing having a contracted upper end and forming a chamber between the heater and the casing.

In testimony whereof I affix my signature in presence of two witnesses.

FRANCIS A. FLANEGIN.

Witnesses:
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D. WEIMER REINOHL.