F. A. FLANEGIN.

METHOD OF CLEANING OIL WELLS.

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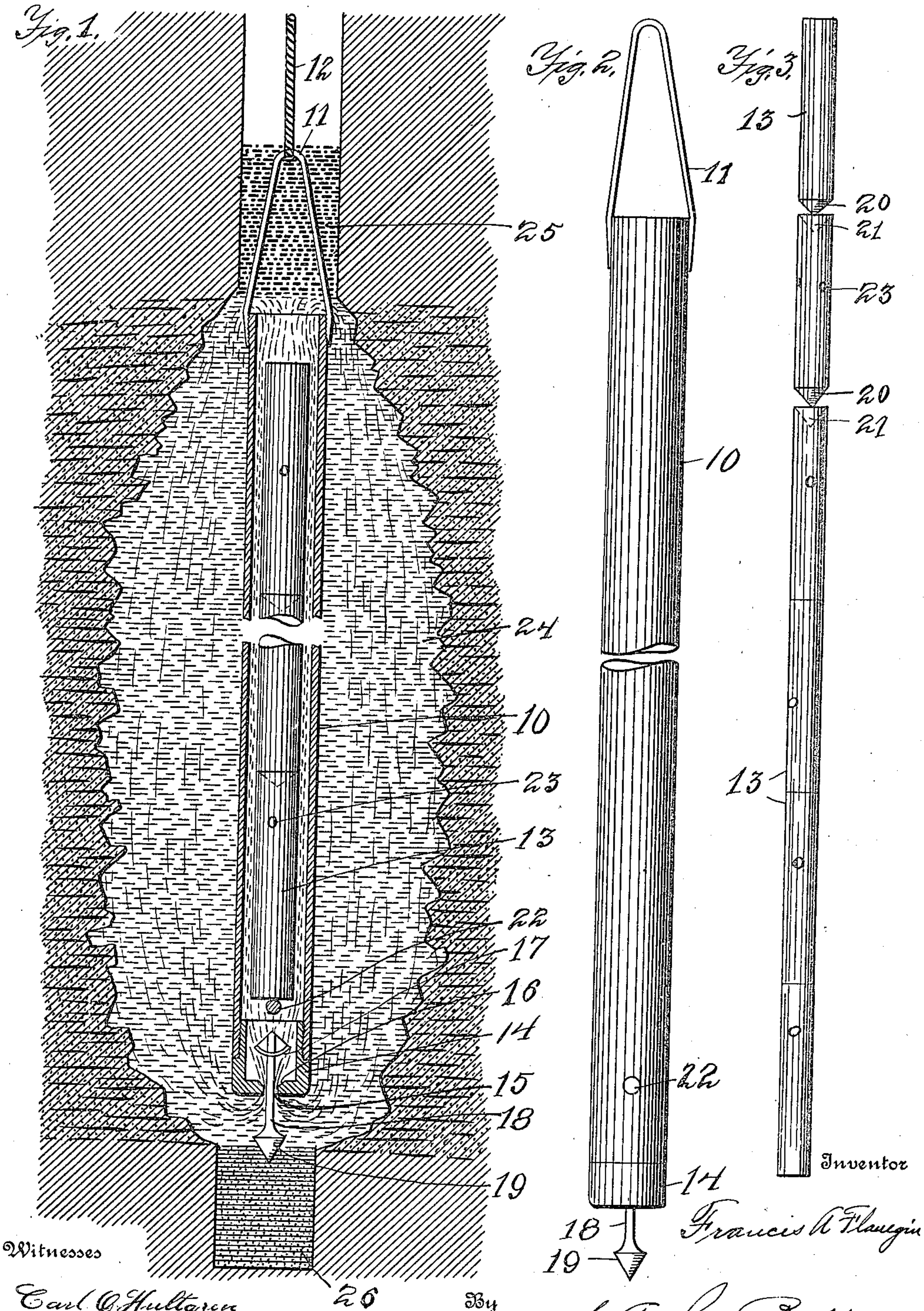
949,567. Patented Feb. 15, 1910.



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METHOD OF CLEANING OIL-WELLS.

949,567. Specification of Letters Patent. Patented Feb. 15, 1910.

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To all whom it may concern:

Be it known that I, FRANCIS A. FLANEGIN, a citizen of the United States, residing at Chautauqua, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Methods of Cleaning Oil-Wells, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The invention relates to oil wells and has for its object the removal of the paraffin, gypsum and other deposits which accumulate in the crevices of the oil bearing portion of the well.

In order to increase the flow of oil wells as is well known, it has been the practice for years to explode a charge of nitro-glycerin or some other explosive in the oil bearing portion of the well, thereby greatly increasing the capacity of the crevices by separation. These crevices are closed by the accumulation of paraffin, gypsum and other deposits from the oil which become exceedingly hard, in some instances, coating the entire wall of the shot cavity. The easiest way to remove this coating from the walls of the shot cavity has been to heat liquid within the well to a boiling point, thereby producing a strong ebullition of the liquid, dissolving the paraffin and opening the crevices. Heretofore, however, oil producers have never allowed the injection of a quantity of water in the well even to clean it since the water was liable to curdle the oil and entirely stop the flow of the oil. As is well known, oil wells are piped at great expense in order to shut the fresh water out of the wells. It has been found that water treated with salt, borax, ammonium-hydrate and the like, does not curdle the oil, that ebullition of the liquid is produced under a covering of oil with fewer heat units than when no covering is used, and that the ebullition of said liquids aids greatly in cleansing the walls of the shot cavity. It is also a well established fact throughout the oil bearing region and particularly with oil refiners that the ebullition of rock oil or crude petroleum occurs at a higher temperature than water which boils at 212 degrees Fahrenheit. Thus for example, crude petroleum from the Tiona fields in Pennsylvania, which is one of the lighter crude oils, reaches the point of ebullition at about 230 degrees F. It is apparent that a heavier crude oil would need a higher degree of heat.

My method of treating wells therefore, consists in bailing the well clean, or nearly so, then placing therein a sufficient amount of ammoniated, borated, salt, or fresh water, to fill the well to a point above the oil bearing rock, which point is usually indicated by the shot cavity, then placing above the water a sufficient amount of oleous liquid to form a liquid packing or covering to hold the heat in the water, and then inserting a heater through the oleous liquid into the water to heat the same.

It has been practically demonstrated that ammoniated water may be used without a packing of oleous liquid and may be raised to the boiling point or point of ebullition with a considerable reduction of heat units from the amount required for fresh water; but by the use of the oleous packing over the ammoniated liquid a much greater reduction of required heat units is attained. Thus the ammoniated aqueous liquid with a packing of oleous liquid requires only about one-third to one-half the number of heat units which fresh water would require. The practical demonstrations made also show that the use of ammonia is highly preferable to other salines such as borax or salt, since the ammoniated water boils at a much lower temperature. The cleansing effect of the ammonia also is well known. The use of any of these forms of saline treated waters or fresh water with such a covering of oil is much more advantageous than the use of said liquids without such a covering, for the following reasons: It has been demonstrated that the oleous liquid holds the heat down by absorbing the steam bubbles as they rise up through the water underneath. The oil thus acts as a resilient or adaptable packing, covering or plug for the water which prevents the escape of the heat from the water up into the bore of the well; that is, the oil will move upward as the water expands from the heat, yet continues to absorb the steam bubbles as they rise, thereby inclosing the water almost as in a vacuum and preventing the escape of the heat up the well bore. This prevents the heating of the casing and consequent damage from the expansion of the heated casing. Wells have been renewed by the use of steam or use of heat by other means, which caused the expansion of the casing to such a degree that the casing had to be entirely withdrawn and repacked. By my simple packing of oil over the water, all such danger is overcome and at the same time a great saving of heat units is attained, thereby greatly cheapening the process of cleaning the well.

As soon as a sufficient degree of heat and ebullition of the liquid is attained for the cleansing of the crevices of the shot cavity, all the liquids are bailed from the well and the sand pump is used to remove all the solid substances which may have been dislodged in the process.

Since my process attains its purpose by the use of the minimum amount of heat units, one of my objects is to provide as simple a means as possible for heating the saline treated water and causing its ebullition beneath the packing of oil.

In the drawings Figure 1 is a sectional view of a portion of the lower end of an oil well including the shot cavity and showing the oil bearing sand, also showing a sectional view of my heater within the same, the shot cavity being filled with water with the covering or packing of oil above the same. Fig. 2 is a side elevation of the heater. Fig. 3 is a side elevation of the metal billets placed one above another as placed within the heater casing.

Similar numerals refer to corresponding parts in the several views.

The heater consists of a casing or jacket indicated by the numeral 10, which jacket is preferably formed of a tube of the desired length, which is somewhat less in diameter than the casing of the oil well so that the tube may be easily raised and lowered within the bore of the well.

The casing 10 has a long bail 11 at its upper end for attaching the line 12. The long bail allows of the insertion of the metal billets 13 within the casing 10. The lower end of the tubular casing 10 is closed by means of a screw cap 14 which has a central opening 15 in the bottom.

A valve seat 16 is provided around the upper side of hole 15 and a valve 17 fits on to valve seat 16 within cap 14. Valve 17 has a stem 18 extending therefrom and ending in an enlarged lower end 19. Stem 18 is made sufficiently long to keep end 19 from closing the opening 15 in the bottom of the casing. It is apparent that the valve 17 will strike pin 22 and thereby prevent the valve stem from rising a sufficient distance to close the orifice 15.

A sufficient number of metal bars 13 are provided to fill the tubular casing 10. Bars 13 are of sufficiently less diameter than the tubular casing 10 to allow the fluid to flow up around the sides of the bars and out of the top of the heater in order to produce the flow and ebullition of the fluid desired. Bars 13 are preferably formed with holes 23 in the sides so that they may be easily and positively engaged by a suitable pair of tongs having jaws shaped to engage said holes. Also the lower ends 20 are slightly cone-shaped and the upper ends 21 are hollowed out similar to said cone-shaped lower ends so that as the metal billets are dropped one upon another they center themselves upon one another and thus keep the way clear between the sides of the same and the inner side of the casing 10.

In using this simple form of heater the bars 13 are heated to an intense degree of heat and then lowered into the casing by means of a suitable pair of tongs, which casing is preferably hung in the mouth of the well before the heated bars are dropped into the same. The bars will rest upon the crosswise pin 22 and as soon as the casing is filled it may be rapidly lowered by suitable means into the shot cavity. Before lowering the heater, a sufficient amount of water is placed in the well to fill the shot cavity 24 and a packing of oil 25 is placed over the same. The heater is then lowered quickly, the enlarged lower end 19 of the valve stem 18 is sufficiently heavy to close the heater valve 17 while the casing 10 is passing down through the bore of the well and the oil packing and water so that the heat is retained by the metal bars until the shot cavity is reached, then the lower end 19 strikes the deposit 26 which always accumulates in the pocket at the bottom of the well and pressing up on valve 17 allows the liquid to rush up through opening 15 around the heated metal billets 13. The heated billets 13 within the tubular casing 10 create steam which rises through the liquid thereby creating ebullition and circulation of the fluids.

It is apparent that if the weight 19 of the valve 17 is sufficiently light to allow the air or liquid to raise the same as the casing rapidly descends to the bottom of the well, thereby allowing the air or liquid in the well to flow around the heated billets, they would be cooled long before they reached the shot cavity. It is also obvious that liquid running into the casing 10 from the top as it passes down through the liquid will be raised to the boiling point and will prevent other liquid from flowing in and thus the heat of the billets 13 will be retained until the shot cavity or oil-bearing portion of the well is reached.

It is apparent that this simple heater will heat a sufficient quantity of water to fill the shot cavity in a very short space of time and with a minimum amount of heat when packed with oil, as above described, and also that the heater can pass down through the oil packing without obstruction. Should one insertion of the heater be insufficient to heat the water to the desired temperature, it can be drawn up and recharged with fresh heated irons and reinserted as many times as desired. It is also obvious that where saline compounds such as borax or ammonia can not be obtained, the difference in the number of heat units necessary to produce ebullition in oil and fresh water will still give a great advantage over the use of fresh water by itself. It is also apparent that the oil adjusts itself to the form of the well bore or shot cavity and thereby shows that a liquid packing forms the only sure packing for this purpose. This has been repeatedly demonstrated in removing the liquids from the wells. After cleaning the same it has been found that the temperature of the oil packing would allow of the insertion of the hand without any inconvenience, it being at such a low temperature, whereas the water under the oil was heated to a scalding temperature, which immediately produced a high degree of vaporation when exposed to the air, thus giving a very clear demonstration of the value of my process.

I claim as new:—

1. The method of cleaning oil wells, which consists in supplying two liquids to the well, one of which floats upon the other to form a covering for the lower liquid, and heating the lower liquid.

2. The method of cleaning oil wells which consists in filling the well to a point above the oil bearing rock with an aqueous liquid, then supplying oleous liquid to form a covering for said aqueous liquid, and applying heat to the lower liquid.

3. The method of cleaning oil wells, which consists in removing the contents of the well, filling the well to a point above the oil bearing rock with an aqueous liquid, supplying an oleous liquid to cover the aqueous liquid, inserting a heater in said aqueous liquid, and then removing the heater and the liquid from the well.

4. The method of cleaning oil wells, which consists in removing the contents of the well, filling the well to a point above the oil bearing rock with a paraffin solvent, supplying an oleous liquid to cover the solvent, inserting a heater in said solvent to heat the same beneath the oleous liquid, and then removing the heater and the liquids from the well.

5. The method of cleaning oil wells, which consists in removing the contents of the well, filling the lower portion of the well with an ammoniated aqueous liquid, heating said liquid and then removing the liquid from the well.

6. The method of cleaning oil wells, which consists in removing the contents of the well, filling the well to a point above the oil-bearing rock with an ammoniated aqueous liquid, covering said liquid with an oleous liquid, heating the ammoniated liquid beneath the oleous liquid, and then removing the liquids from the well.

7. The method of cleaning oil wells, which consists in removing the liquid contents of the well, filling the shot cavity of the well with an ammoniated aqueous liquid, covering said liquid with petroleum oil, heating said ammoniated liquid beneath said oil, and then removing the liquids from the well.

8. The method of cleaning oil wells which consists in removing the liquid from the well, filling the well to a point above the oil-bearing rock with a paraffin solvent, covering said solvent with an oleous liquid, heating said solvent beneath the oleous liquid and agitating the same, and then removing the liquid contents from the well.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANCIS A. FLANEGIN.

Witnesses:
I. A. ELSWORTH,
A. L. FURLOW.