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J. A. McINTYRE.

METHOD OF AND APPARATUS FOR LIQUEFYING PARAFFINE IN OIL WELLS.

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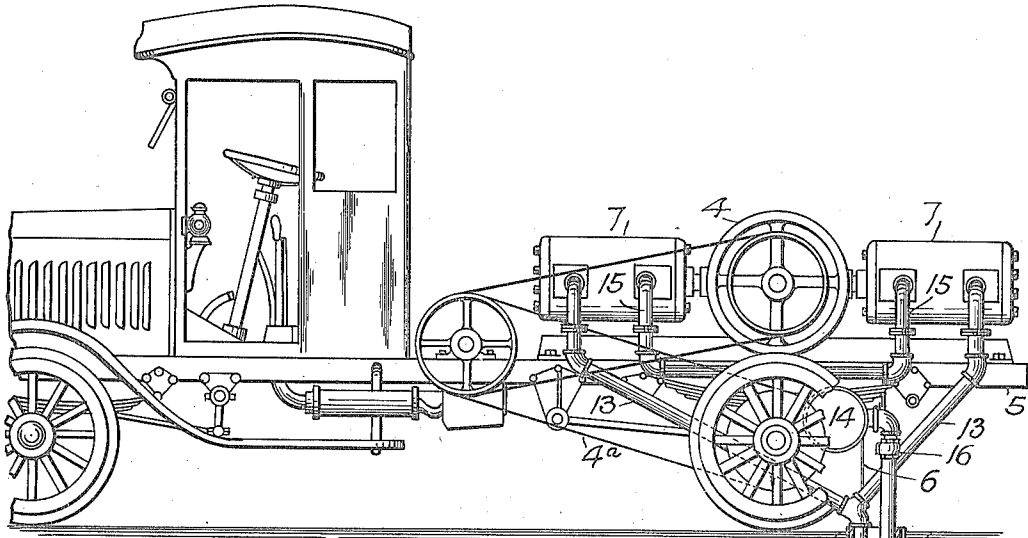


FIG. 1.

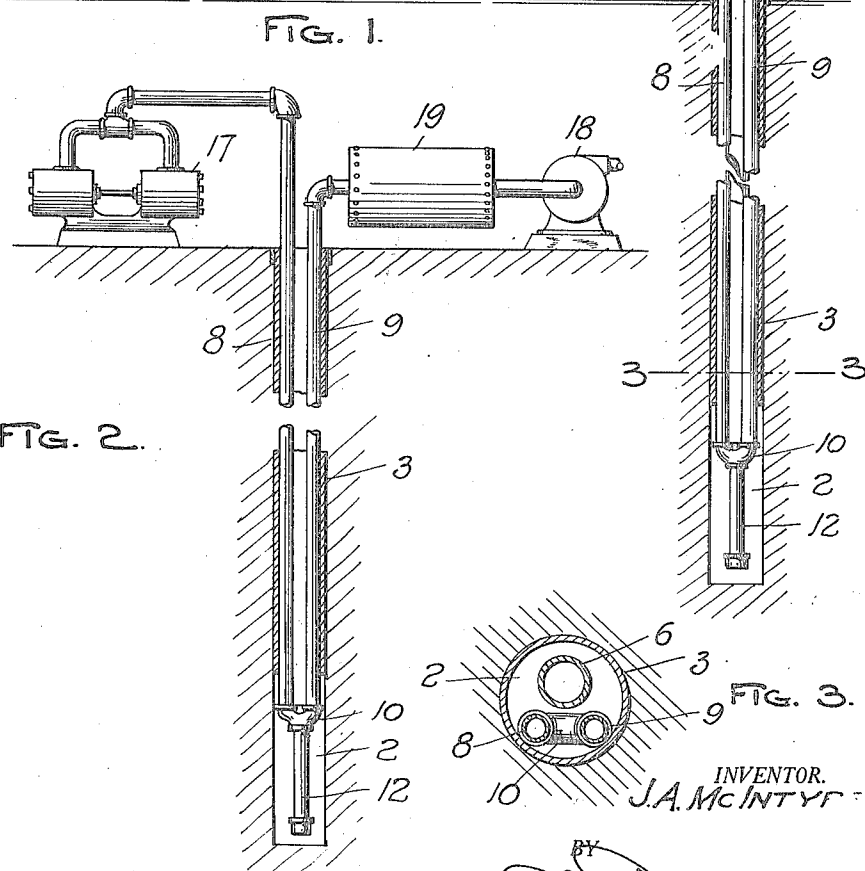


FIG. 2.

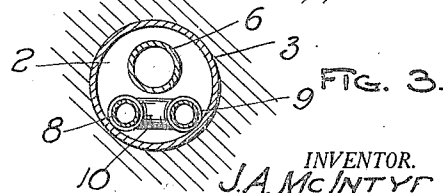


FIG. 3.

INVENTOR.
J. A. McINTYRE.

BY
[Signature]
ATTORNEY. S.

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UNITED STATES PATENT OFFICE.

JOHN A. MCINTYRE, OF DENVER, COLORADO.

METHOD OF AND APPARATUS FOR LIQUEFYING PARAFFIN IN OIL WELLS.

Application filed April 26, 1920. Serial No. 376,350.

To all whom it may concern:

Be it known that I, JOHN A. MCINTYRE, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Methods of and Apparatus for Liquefying Paraffin in Oil Wells, of which the following is a specification.

This invention relates to a method of and apparatus for liquefying paraffin in oil wells, its primary object being to provide a convenient means for causing the circulation of a heating fluid through an oil well at a very high temperature whereby to liquefy the paraffin collected in the bottom thereof and in the crevices and fissures of the surrounding rock.

It is well known that the flow of liquid into and from wells producing oils containing paraffin and other hydrocarbons, is often obstructed to a detrimental extent by the presence of the paraffin which clogs the fissures of the rock from which the oil issues and accumulates in the bottom of the bore.

These conditions frequently impede the flow of oil so that eventually it ceases altogether, and it is obviously of considerable value that a method be employed whereby the paraffin is melted and maintained in a liquid condition so that it may be removed from the well by pumping or by a natural flow, together with the oils.

In order to produce this result it is necessary that heat of a very high temperature be caused to circulate through the well at a velocity which prevents its cooling to any detrimental extent before the oil-yielding strata or paraffin deposits are reached.

I am aware that attempts have been made to melt the paraffin by the introduction of steam or hot water, but it was found that especially in very deep wells, these heating mediums lost their temperatures too rapidly to be of any practical value.

The present invention eliminates this difficulty by utilizing the exhaust gases of an internal combustion engine and drawing them through a conduit extending into the well, by a partial vacuum.

At every explosion of a combustion mixture in the cylinder of an internal combustion engine, heat is generated to a temperature often reaching 3000 degrees F. and by connecting a conduit extending into an oil-well at one end to an exhaust opening of the cylinder and producing a partial vacuum at

the opposite end thereof, the heated gases may be caused to travel through the conduit at a velocity of one thousand feet or more per second, so that even in wells of great depth the loss of temperature before they reach the bottom of the bore can never be enough to prevent their performing the function of liquefying the paraffin, the melting point of which is approximately 320 degrees F.

The enormous excess of heat contained in the gases above this melting temperature makes it possible to not only cause ebullition of the paraffin accumulated in the bottom of the well, but to heat the surrounding rock to a degree sufficient to melt the paraffin contained in the crevices and fissures of the same.

The conduit or radiator through which the heated gases are drawn does not interfere with the placement of the pipe through which the oil is pumped from the well so that a continuous flow of oil and paraffin can be assured by continuing the introduction of the heating fluid during the pumping operation.

An embodiment of my invention has been shown in the accompanying drawings in the various views of which like parts are similarly designated and in which

Figure 1 is a side elevation of an apparatus suitable for carrying out my improved method of liquefying paraffin in oil wells, shown in its operative position with relation to a well; Figure 2, a similar view showing a modified construction, and

Figure 3, an enlarged section taken on the line 3-3, Figure 1.

Referring first to Figure 1 of the drawings, the reference character 2 designates an oil-well which as usual is provided with a metal casing 3 to prevent its wall from caving in.

A pump 4 of the internal combustion engine type is mounted on a truck 5 so that it may be conveniently moved from one well to another. The pump is driven by the vehicle motor through suitable belting 4^a connected to the rear wheels of the motor vehicle.

In the operation of the pump the explosion of a combustible mixture causes a movement of the pistons in its cylinders 7 which produces a partial vacuum for drawing the gas through the pipe, and the heat of the explosions at one end of the two cylinders

and the vacuum produced at the opposite end thereof are utilized in the present invention to heat the lower portion of the well as hereinbefore explained

5 With this end in view I provide a conduit composed of two parallel members 8 and 9 connected at their lower ends by a return bend 10.

The conduit is proportioned to enter the casing of the well in addition to the pipe through which the oil is pumped and the return bend may if so desired have a downwardly projecting extension 12 which provides a trap to receive carbon and other solids which may enter with the gas.

One member of the conduit is connected with the ends of the cylinders of the pump at which the explosions take place by means of diverging branch pipes 13 and the other member connects with a vacuum tank 14 which by means of conduits 15 is connected with the suction ends of the cylinders.

A check-valve 16 in the member 9 of the conduit prevents a return flow during the intervals between the strokes of the pistons or when the pump is stopped and other valves are suitably arranged in the connections between the conduit and the pump to regulate the flow of heated gases.

30 Inasmuch as these valves or their arrangement are not a part of my invention and must naturally vary in pumps of different types, they have not been shown in the drawings.

35 In the operation of the pump the vacuum produced at one end of the conduit causes the gases of explosion exhausted from the cylinders to enter the opposite end of the same and circulate through the conduit with a velocity which prevents any material loss of temperature as hereinbefore explained.

The paraffin in the bottom of the well and in the surrounding rock is thereby liquefied to be removed with the oil through the suction pipe 6.

45 In the form of my invention shown in Figure 2 of the drawings the intake member 8 of the conduit is connected with exhaust openings in the explosion ends of the cylinders of an ordinary internal combustion engine 17 and a separate exhaust fan or vacuum pump 18 is employed, if necessary in connection with a tank 19, to produce the required suction at the end of the other member of the same.

55 The gases upon entering the vacuum producing device of either form of my invention are as usual discharged through the exhaust ports thereof.

60 The cylinders or pumps 7 are divided by the piston into two chambers, one of which is an explosion chamber and the other a suction chamber. By jacking the car up, the belt passing from the rear wheel of the car energizes the movement of the piston

in the cylinders 7 thereby giving the full advantage of the explosive force in the cylinders 7 to driving the gases through the radiator.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for liquefying paraffin in an oil-well, comprising in combination with a pump operated by an explosive engine, a closed conduit adapted to convey a heating fluid through an oil well, an end of said conduit being connected with a suction space of the pump and the other end of the conduit having a connection with the exhaust port of an explosion chamber of the same.

2. Apparatus for liquefying paraffin in an oil-well, comprising in combination with a pump operated by an explosive engine, a vacuum-chamber connected with a suction space thereof, and a closed conduit adapted to convey a heating fluid through an oil well, said conduit being connected at one end to said vacuum chamber and having at its other end a connection with the exhaust port of the explosion chamber of the pump.

3. Apparatus for liquefying paraffin in an oil-well, comprising in combination, an explosion chamber for gaseous fuel, a suction-producing element, and a closed conduit adapted to convey a heating fluid through an oil well, said conduit being at one end connected with an exhaust port of said explosion chamber and having at its other end a connection with the suction element.

4. Apparatus for liquefying paraffin in an oil-well, comprising in combination, a suction pump operated by an explosive engine, including a cylinder and an explosion driven piston therein, and a closed conduit adapted to convey a heating fluid through an oil-well, said conduit being at one of its ends connected with an exhaust opening of the cylinder at the explosion side of the piston and having at its other end a connection with the cylinder at the suction side of the same.

5. Apparatus for liquefying paraffin in an oil-well comprising in combination with an explosive engine, a closed conduit adapted to convey a heating fluid through an oil well, in connection with an exhaust port of an explosion chamber of the engine.

6. An explosion chamber, a piston within the chamber, and a radiator conduit making a circuit from the surface to underground and back to the surface, the piston forcing gas from the explosion chamber through said radiator.

7. An explosion chamber, a piston within the chamber, and a radiator conduit making a circuit underground from the surface of the ground and back to the surface, the piston forcing gas from said explosion chamber through said radiator conduit by both positive and negative pressure.

8. A method of heating a radiator conduit comprising exploding an explosive material within a closed chamber and releasing the heated gases therefrom while under
5 pressure into the said conduit, and providing at the other end of said conduit a negative pressure.

9. In combination, a radiator adapted to extend into the well and provided with a
10 downward and return coil, and means for producing high temperature gases by explosion, and means for directing and ac-

celerating the flow of gas from said explosive means through the said radiator coil.

10. An apparatus for heating a radiator 15 conduit comprising a cylinder, a piston movable within the cylinder, mechanical means for driving the piston, and an explosion chamber within the cylinder and means for exhausting the gases from the explosion into 20 the conduit.

In testimony whereof I have affixed my signature.

JOHN A. McINTYRE.