J. ILLY.

METHOD AND APPARATUS FOR CLEANING OIL WELLS.

APPLICATION FILED JAN. 9, 1909.

968,851.

Patented Aug. 30, 1910.

Fig. 1.

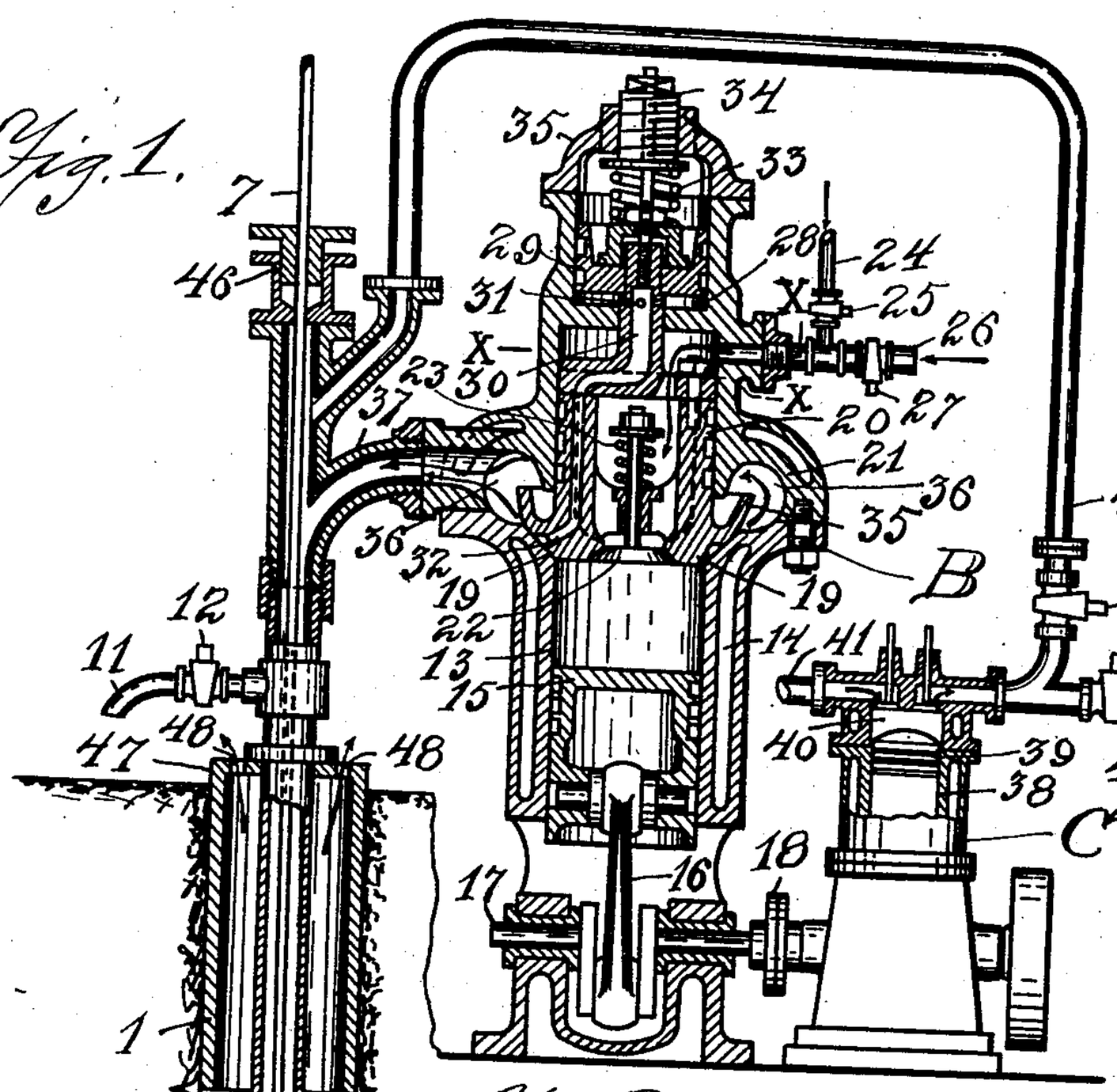


Fig. 2.

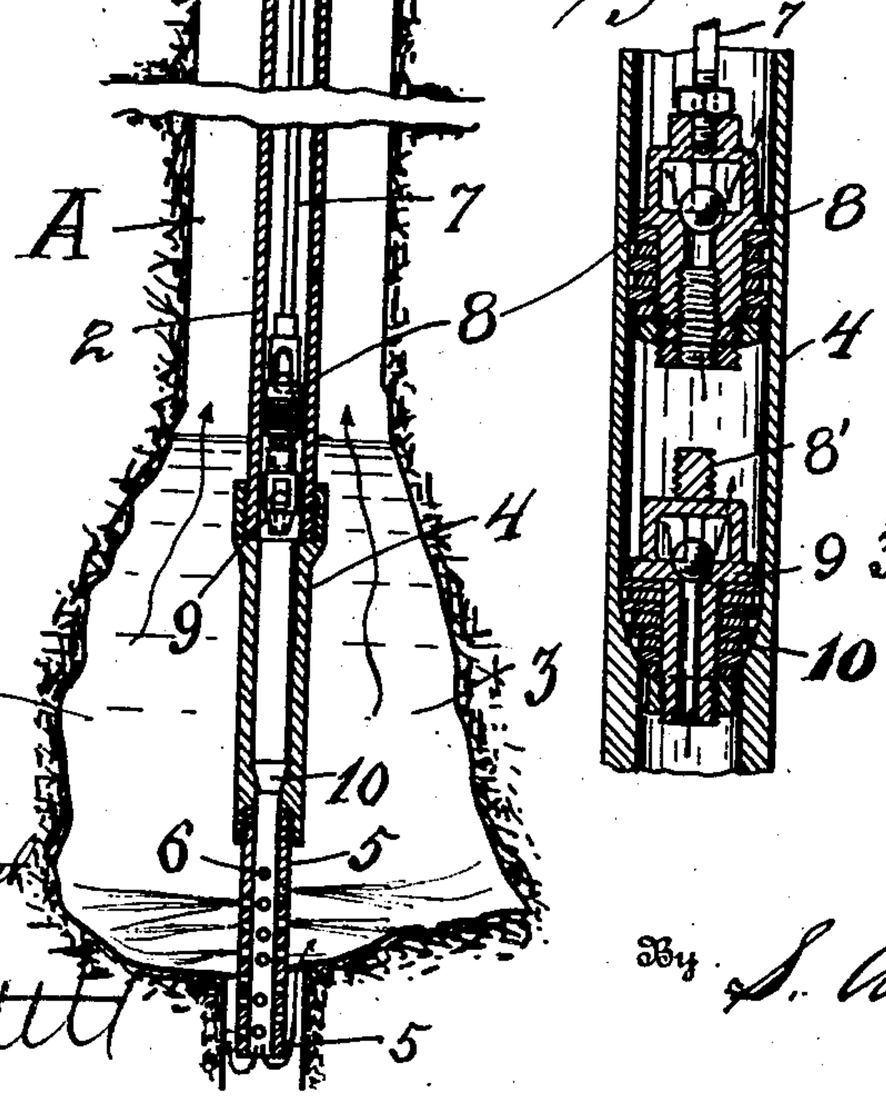
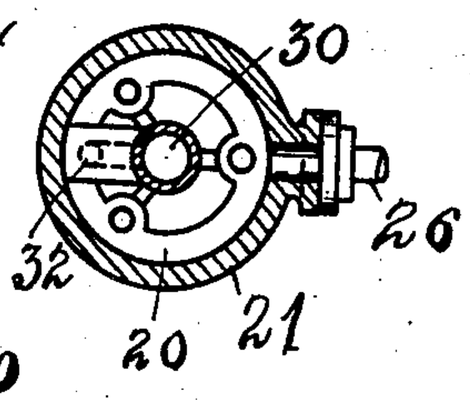


Fig. 3



Witnesses

J. A. Ellsworth

Inventor

John Illy

By S. Arthur Baldwin

Attorney

UNITED STATES PATENT OFFICE.

JOHN ILLY, OF JAMESTOWN, NEW YORK.

METHOD AND APPARATUS FOR CLEANING OIL-WELLS.

968,851. Specification of Letters Patent. **Patented Aug. 30, 1910.**

Application filed January 9, 1909. Serial No. 471,461.

To all whom it may concern:

Be it known that I, JOHN ILLY, a citizen of the Republic of Switzerland, and resident of the city of Jamestown, county of Chautauqua, and State of New York, have invented a new and useful Method and Apparatus for Cleaning Oil-Wells, of which the following, taken in connection with the accompanying drawing, is a full, clear, and exact description.

The invention has reference to improvements in methods of and apparatus for reproducing or renewing the flow of oil in oil wells. It is well known that the accumulations of paraffin and other materials on the walls of the producing portion of the well causes the yield of oil to continually decrease and often to stop entirely; and the object of my method and apparatus is to provide means for removing all such obstructing matter from the well and from the tubing within the well without removal of the tubing from the well.

The method consists in providing a generator for the hot products of combustion, which generator is also provided with means for pressing said hot products of combustion immediately after generation and while under high pressure into the tubing conducting to the oil producing portion of the well or shot cavity, which cavity is preferably filled with liquid. The hot products of combustion are released from the tubing below the level of the liquid therein or preferably at the bottom of the shot cavity and the upward passage of the said hot products of combustion through the liquid causes a high state of ebullition of the same which dislodges the substances on the walls of the cavity, and at the same time allows the liquid to absorb the larger portion of the heat from said hot products of combustion. The heated liquid forms an instrument for melting the paraffin or other substances in which melted state the paraffin and other substances mix with the liquid so that they may be bailed or pumped from the well. In the highly heated condition produced by the hot products of combustion the melted paraffin and other substances and the heated liquid may be pumped through the tubing through which the gases were forced into the well, thereby rendering the whole process convenient and economical.

In the drawings, Figure 1 is a sectional view of the oil well, heat generator and apparatus for forcing the hot products of combustion into the oil well, and for cleaning the tubing leading into the well. Fig. 2 is a lengthwise sectional view of the working barrel with the pump therein and separated in two parts. Fig. 3 is a sectional view of the heat generator at line X X in Fig. 1.

Similar numerals refer to corresponding parts in the several views.

The letter A indicates the oil well.

The letter B indicates the heat producing apparatus or generator.

The letter C indicates a motor to actuate the generator.

In the oil well A the numeral 1 indicates the casing for the upper portion of the well which usually extends down to the bed rock.

The numeral 2 indicates the tubing leading to the oil bearing portion or shot cavity 3 at the lower end of the well. The tubing 2 has attached thereto at its lower end the working barrel 4, the inner diameter of which is less than that of the tubing 2 and at the lower end of the working barrel is attached a pipe piece or nozzle 5 which is provided with a number of small openings 6 through which the hot products of combustion are forced out into the well cavity. The pipe piece 5 may be extended to act as an anchor where it reaches the bottom of the well, though this is not essential for the operation of the same.

The pump rod 7 is placed within the tubing 2 and supports on its lower end the pump 8 with working valve within it, which pump has on its lower ends a threaded opening, within which a check valve 9 is attached by means of a threaded projection 8′. These parts are thus constructed so that after valve 9 is seated upon its seat 10 at the lower end of the working barrel 4 the pump 8 may be turned off from the same by means of pump rod 7, thereby leaving the check valve 9 in the fixed position at the lower end of the working barrel during the pumping operation and leaving the pump 8 free to work within barrel 4. When it is desired to raise the check valve, as shown in Fig. 1 to a position within the tubing 2 so that the hot products of combustion may flow freely around said pump and check valve, the pump 8 is secured on to projection 8′ on check valve 9, thereby uniting the two so that they may be withdrawn, as shown.

The generator or heat producing appa-

ratus B consists of an upright cylinder 13 which cylinder has double walls to provide the space 14 therebetween for air or water cooling of the cylinder. A piston 15 is slidably mounted within cylinder 13 and is actuated by the piston rod 16 and crank shaft 17. Crank shaft 17 is connected by coupling 18 to a motor C.

On the upper end of cylinder 13 is a double seated valve 19 which forms an exit for the hot products of combustion from the cylinder 13. Valve 19 has a vertical cylindrical extension 20 which is guided within the cylinder head 21. Within the valve 19 and the cylindrical extension 20 is placed the inlet valve 22 which is pressed to its seat by the coil spring 23.

Pipe 24 is the fuel supply pipe which is controlled by cut-off valve 25 and pipe 26 is the air supply pipe with its cut-off valve 27. The fuel from pipe 24 and air from pipe 26 are united in a fuel charge and admitted into the cylinder 13 through inlet valve 22. In the upper portion of the cylinder head 21 is a cylindrical opening which has slidably mounted therein the piston 29 to form a closed chamber 28 between the head and piston. Piston 29 and valve 19 are rigidly connected by a hollow tubular shaft 30. Tubular shaft 30 is connected at its upper end by means of small tubular openings 31 with the chamber 28 and at the lower end with the passage 32 up through extension 20. Valve 19 is pressed upon its seat by means of a coil spring 33, which coil spring presses upon piston 29 and thereby upon the rigid connections between valve 19 and piston 29. The pressure of spring 33 is controlled by the regulating screw 34 in the cap 35.

Valve 19 is provided with an upwardly extending flange 35 which extends out into a passage 36 around said valve which passage 36 provides plenty of room for the immediate escape of the hot gases or hot products of combustion from the explosion chamber between piston 15 and valve 19 within the cylinder 13. Flange 35 extends cylindrically around the valve and protects the upward extension 20 of said valve from the direct action of the hot gases immediately after explosion. The hot gases rush from the explosion chamber into the passage 36 and from whence they are conveyed immediately to tubing 2 in the well by connection 37.

The motor C is preferably an internal combustion motor which will furnish the power necessary for the generator B and consists of the cylinder 38 and the piston 39 therein, which piston is shown at the upper end of its stroke and showing between the cylinder head and the piston a combustion chamber 40, an inlet pipe 41 is provided for the admission of combustible fuel charge and an outlet pipe 42 is provided connecting the motor with the tubing 2 and controlled by cut-off valve 43. When it is not desired to pass the hot products from motor C to the tubing within the well, the valve 43 is cut off and valve 45 is opened allowing the exhaust to pass out through the pipe 44. A suitable stuffing box 46 is provided at the top of tubing 2 for pump rod 7.

The operation of the mechanism is as follows: The piston 15 within the cylinder 13 is started by motor C and the dead volume between piston 15 and valve 19 at the end of the upward stroke of piston 15 is reduced to the minimum so that as soon as a semi-vacuum is produced by the downward or outward stroke of piston 15 a charge of combustible fuel is drawn into cylinder 13 through valve 22 and fuel pipe 24 and air pipe 26. When the piston 15 begins to move upward on its return stroke this combustible charge is compressed between valve 19 and piston 15 until it reaches the ignition point, thereby exploding the charge and heating the hot products of combustion. The pressure resulting from said explosion overcomes the pressure of spring 33 on valve 19 thereby allowing the immediate escape of the hot products of combustion into the hollow passage 36 and through connection 37 into the tubing 2. Piston 15 continues on its upward stroke thereby driving or pressing out all the hot products of combustion from the cylinder 13 and aids the force of the pressure of the hot products of combustion in forcing said hot products of combustion down the tubing 2 and into the bottom of the well.

With the lifting of valve 19 by the explosion, the opening to passage 32 is uncovered and the pressure of the hot products of combustion into tube 30 and chamber 28 and against the under surface of piston 29 causes a counter-pressure for spring 33, thereby nearly balancing the valve 19 so that the hot gaseous products of combustion are given full freedom and a sufficient length of time to rush into the tubing 2 with full force and down into the well A. The pressure of spring 33 is not entirely overcome by the counterpressure of the hot gases in chamber 28. Accordingly the valve body has the tendency to reseat itself with the cessation of the outflowing of the hot gases from the cylinder 13, after which the piston 15 renews its downward stroke, drawing in a fresh charge of fuel through valve 22 and the entire process is repeated.

The paraffin and other substances gather within the tubing 2 as well as within the shot cavity ofttimes cutting off the flow of oil through the tubing and so clogging the tube 2 that the removal of the pump 8 from the tubing is an impossibility. In order to clean the tubing while it remains in the well

with the pump and rod within it, the tubing 2 is provided at its upper end with a stuffing box 46 for the rod 7 to prevent the escape of hot products of combustion. Hot gases are then forced into the tubing 2 thereby melting the accumulation of paraffin and other substances and the withdrawal of the pump 8 into the tubing 2 and valve 9 from the working barrel 4, gives an outlet for the melted paraffin and the hot products of combustion in gaseous form around the same. The pump 8 and rod 7 are preferably kept in motion for a short distance upward and downward while the hot gases are being forced into the well in order to aid the passage of the melting paraffin and also to open the way for the hot gases thereby preventing the obstruction of the tubing 2 by the melting paraffin and other substances. When it is again desired to pump the well the pump 8 is lowered into the working barrel 4 and the check valve 9 is brought again to its seat 10 and detached from the pump as hereinbefore described. The check valve 9 by its valvular end fits upon the seat 10 checking the downward flow of the fluid when the pump is in operation.

The exhaust from the motor C as above stated may be utilized to heat the well in addition to the hot products of combustion from the generator B, though it will act with much lesser degree and in much the same manner as the hot products from the heat generator B.

It is apparent that the expansion of the hot gases in addition to the pressure of the piston 15 as it presses them out of the cylinder 13 into the tube gives said gases a tremendous velocity as they are pressed down the tubing and they will be forced out into the shot cavity through the openings 6 with great force. The return of the valve 19 to its seat keeps the pressure within the pipe 2 at a high level. The gases after giving off the major portion of their heat escape into the bore of the well around the pipe 2 and up through the casing head 47 through suitable openings 48.

I claim as new:

The process of applying heat to the shot cavity of an oil well which consists in filling said shot cavity with liquid, exploding a charge of fuel and air in a cylinder to quickly attain the requisite pressure from the ensuing heat and by said explosion forcing the heated products into the liquid in said shot cavity.

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

JOHN ILLY.

Witnesses:
A. W. KETTLE,
I. A. ELLSWORTH.