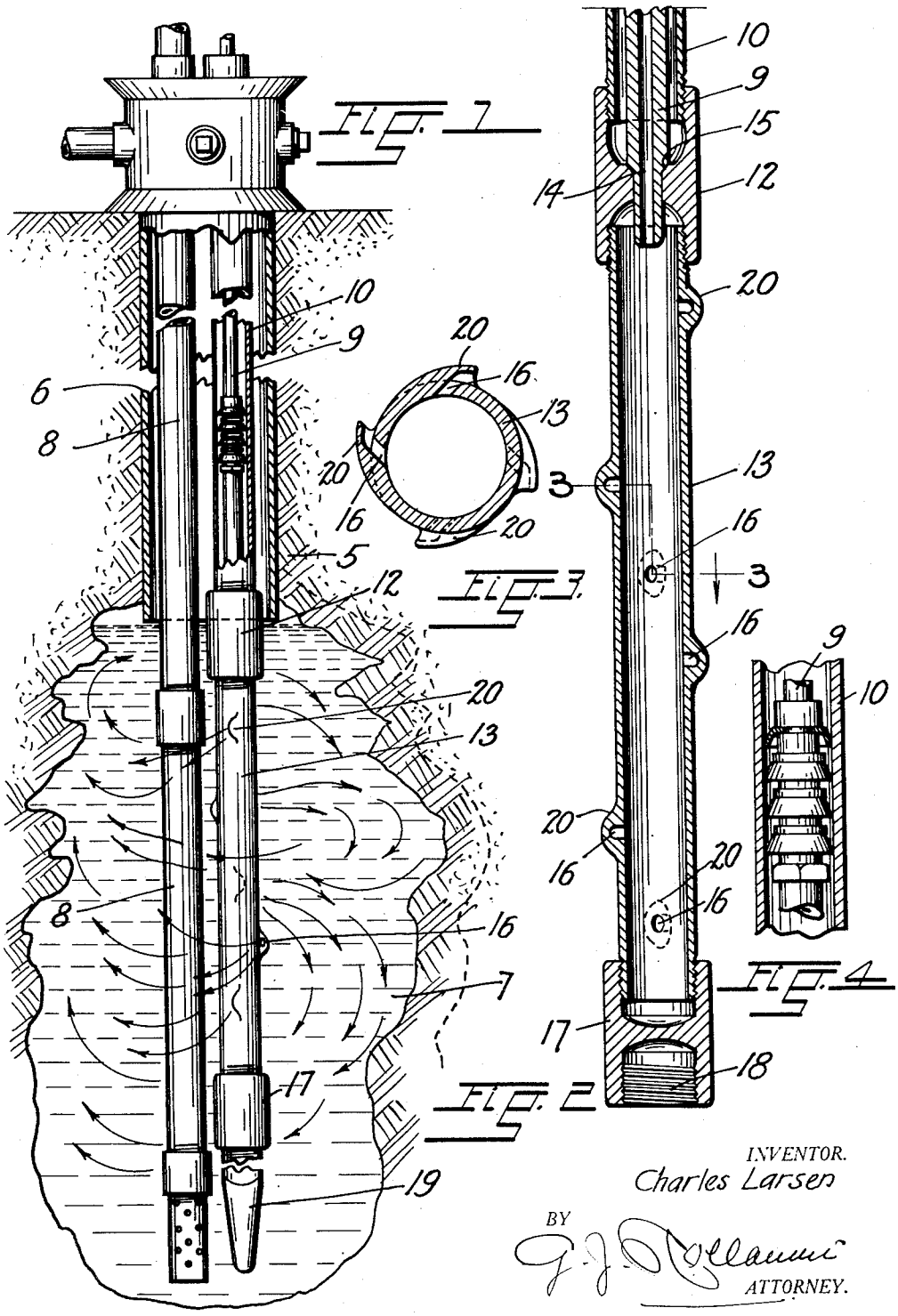
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APPARATUS FOR THE REMOVAL OF OBSTRUCTIVE MATTER FROM OIL WELLS

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APPARATUS FOR THE REMOVAL OF OBSTRUCTIVE MATTER FROM OIL WELLS

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My invention relates to a method and apparatus for the removal of obstructive matter from oil wells and more particularly to certain new and useful improvements in the method and apparatus described and shown in United States Letters Patent, No. 1,565,574 issued to me on the fifteenth day of December 1925.

It is an object of the present invention to provide novel means for clearing the walls at the bottom portion of an oil well by the dissolution and mechanical removal of obstructive matter such as mud, paraffine, bentonite, salts, asphaltum and other similar substances which frequently fill the crevices and interstices of the formation and thereby prevent the oil from flowing into the excavation.

I attain this object by producing in the bottom portion of the well a whirl or vortex of a hot fluid under pressure, which by its high temperature melts the paraffine and other liquefiable substances in the crevices of the wall of the well and which by its violent washing and abrasive action, dislodges the molten matter together with obstructive solids and holds said matter and solids in suspension to be drawn from the well by the pump ordinarily provided to raise the oil to the surface of the ground.

Further objects of the invention reside in providing a simple expedient to form and maintain an air insulating jacket around the pipe line through which the heating fluid is conducted to the bottom of the well and in providing a safety device to automatically arrest the downward movement of the pipe line in case of accidental breakage during installation.

Another object of the invention is to provide a positive and substantially continuous removal of the obstructive matter while the well pump is in operation and still other objects are to be found in details of construction and a novel and practical arrangement of parts as will be disclosed in the course of the following description.

In the accompanying drawings in which like characters of reference designate corresponding parts throughout the views,

Figure 1 represents a fragmentary and sectional elevation of apparatus suitable for carrying my invention into effect, in its operative relation to an oil well and the pump line by which in ordinary practice the oil is raised to the surface of the ground,

Figure 2, an enlarged longitudinal section of the lower or nozzle portion of the apparatus,

Figure 3, a further enlarged transverse section taken on the line 3—3 Figure 2, and

Figure 4, an enlarged elevation of the piston member included in the apparatus.

Referring further to the drawings, the well shown at 5 in Figure 1, has the usual casing 6, and below the same an enlarged chamber 7 produced by "shooting" the well through the medium of a high explosive.

The present invention is especially concerned with clearing the walls of this enlargement, of obstructive matter, and the apparatus provided for that purpose cooperates with the ordinary pump line designated at 8 in Figure 1, to remove the liberated impediments from the excavation.

The apparatus involved in the invention comprises a pipe line 9 connected with a source of steam which in the operation is superheated to a temperature of not less than six hundred degrees Fahrenheit at a high pressure. The pipe extends within the well inside a larger pipe 10 which provides an insulating air jacket for the purpose of preventing excessive loss of temperature during the passage of the heating fluid to the bottom of the well.

It is essential that the heating fluid be issued at as high a temperature as possible in order to speedily and effectively melt the liquefiable substances in the crevices of the wall of the chamber, and the air jacket promotes this object and at the same time protects the adjacent pump line from the influence of the heat of the fluid as it passes downwardly to the point at which it is discharged into the well.

The pipe which may be termed the tubing of the steam line, has at its lower end, a screw coupling 12 for the connection of a nozzle 13 by which the steam enters the chamber 7 beneath the casing of the well. The coupling

has an interior restriction to provide an annular seat 14 for a beveled shoulder 15 at the lower portion of the pipe line.

The engagement of the shoulder with the seat closes the air jacket at the lower end of the casing and thus prevents the escape of steam into the jacket when the apparatus is in operation. The nozzle 13 at the lower end of the casing has a plurality of outlets 16 staggered with relation to each other around the circumference of the nozzle, at different distances from the ends thereof.

The nozzle is closed at its lower end by a screw cap 17 which may be provided with a screw threaded socket 18 for the attachment of an anchor 19. The outlets of the nozzle are formed by non-radial holes slanting in corresponding directions to issue the steam at obtuse angles to the wall of the well.

In order to increase the angles at which the steam jets are issued from the nozzle and to maintain their direction without detrimental dissipation, the nozzle has rearward of its outlets, shrouds 20 which project over the outer ends thereof.

It will be evident that the steam forcibly ejected through the outlets of the nozzle impinges upon the wall of the chamber at the lower end of the well in an abrasive and penetrative manner and that the jets of steam, by their oblique directions will produce a whirl or eddy which churns and agitates the mass in the chamber and maintains the solid and completely or partially dissolved matter dislodged from the crevices in the well in a state of suspension so that all of this matter may be drawn from the well by the action of the pump at the upper end of the pump line.

The heat melts the liquefiable matter in the crevices of the wall of the well, such as paraffine, bentonite, salts, etc., the forcible impact of the steam jets with the wall removes the liquefied substances and also liberates obstructive solid matter and the chamber is constantly filled with a churning, whirling and agitating mass which scrapes, digs and washes the obstructive matters from the wall and keeps them in suspension until their removal by the pump.

In order that the steam may issue from the nozzle without detrimental loss in pressure and with all the force necessary to cause it to produce the herein described effect, it is desirable that the sum of the areas of the several outlets of the nozzle be less or at least not exceed the area of the bore of the steam line.

It is to be understood that the supply of steam to the steam line and the operation of the pump are simultaneous and continues so that the oil supply may be maintained without interruption by the constant removal of any matter which might prevent its entrance into the well.

The invention is thus adapted for use in wells in an operative condition as well as for the restoration of abandoned dry wells to a productive state. The steam line as shown in Figure 1 of the drawings, is preferably equipped near its lower end with a piston preferably provided with a number of inverted cup-shaped rings for frictional engagement with the inside of the tubing.

When the pipe line is lowered into the tubing, the piston pushes all oil and other matter in the tubing downwardly and out through the nozzle outlets until the shoulder at the end of the steam line is brought in engagement with the seat between the tubing and the nozzle when further communication between the nozzle and the tubing is permanently obstructed.

It will be apparent that in this manner a clear air space around the steam line is formed and maintained so that the line is insulated from the surrounding matter by air which is constantly heated, expelling a large portion of the air and thereby creating a vacuum effect.

The piston also functions as a braking medium in the event of a break in the steam line while it is being lowered into the tubing. It will be seen that in such an event the cup-shaped rings will engage the wall of the tubing by expansion and cause the piston to have a cushioning effect by its engagement with the fluid standing in the tubing.

The downward movement of the pipe line is thus arrested and opportunity is provided for making the necessary repairs.

Having thus described the apparatus employed in carrying my invention into practice, it is to be understood that variations in the construction and arrangement of the elements and parts included therein, may be resorted to without departure from the scope of the invention as defined in the hereunto appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. Apparatus for the removal of obstructive matter from an oil well comprising a source of fluid under pressure, tubing in the well, having interiorly, an annular seat, a pipe line in the tubing connected with the source and having adjacent its lower end, a shoulder upon the seat, a piston on the pipe line frictionally engaging the tubing above the seat, and a nozzle at the lower end of the tubing for the emission of fluid conducted thereto by the pipe line.

2. Apparatus for removing obstructive matter from oil wells comprising inner and outer tubings providing a space therebetween, means to remove liquids from the space between the tubings, means to close the space against the entrance or return of liquid to the space, a source of heated fluid con-

nected with the inner tubing, and pumping means adapted to remove liquid from the well simultaneously with the introduction of the heated fluid.

3. Apparatus for removing obstructive matter from oil wells comprising inner and outer tubings providing a space therebetween, means to remove liquids from the space between the tubings, the outer tubing having a seat and the inner tubing having a shoulder engaging said seat, and a source of heated fluid connected with the inner tubing.

4. Apparatus for removing obstructive matter from oil wells comprising inner and outer tubings providing a space therebetween, means to remove liquids from the space between the tubings, a nozzle, a coupling joining the outer tubing and the nozzle and having a seat, the inner tubing having a shoulder engaging the seat and disposed to discharge into the nozzle, and a source of heated fluid connected with the inner tubing.

5. Apparatus for removing obstructive matter from oil wells, comprising inner and outer tubings providing a space therebetween, means on the inner tubing to remove liquid from said space when the inner tubing is lowered into the outer tubing, the tubings having cooperating seat and shoulder closing said space when in engagement, and a nozzle at the end of the outer tubing, the inner tubing discharging therein, and a source of heated fluid connected with the inner tubing.

In testimony whereof I have affixed my signature.

CHARLES LARSEN.