April 10, 1962 R. R. WATERMAN 3,028,916

OIL WELL HEATING SYSTEM

Filed March 27, 1958 2 Sheets-Sheet 1

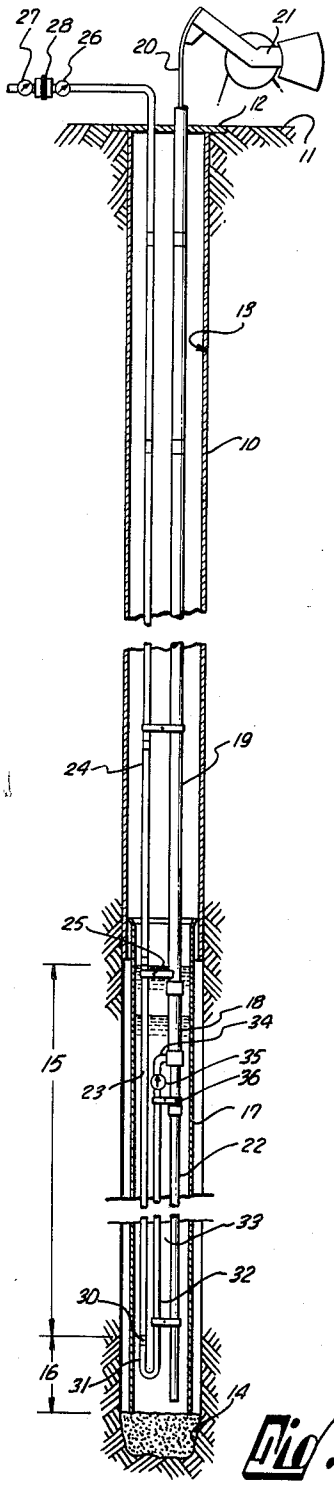


Fig. 1.

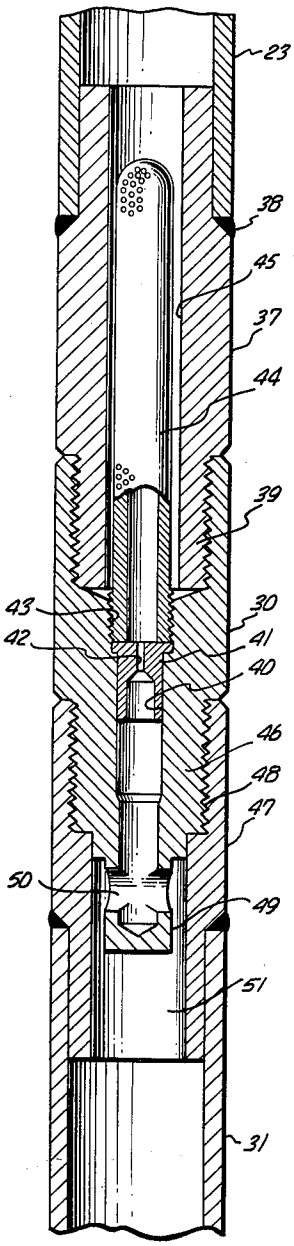


Fig. 2.

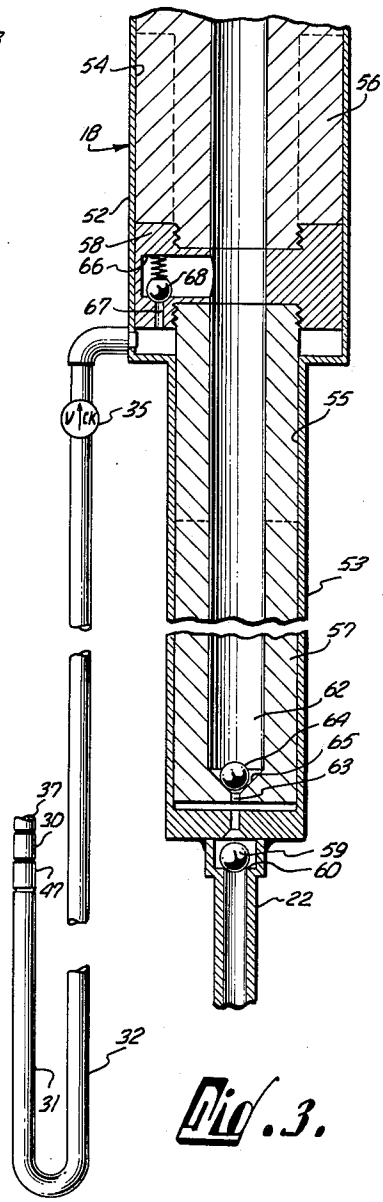


Fig. 3.

INVENTOR.
RUSSELL R. WATERMAN

BY Beehler & Shanahan

ATTORNEYS.

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OIL WELL HEATING SYSTEM

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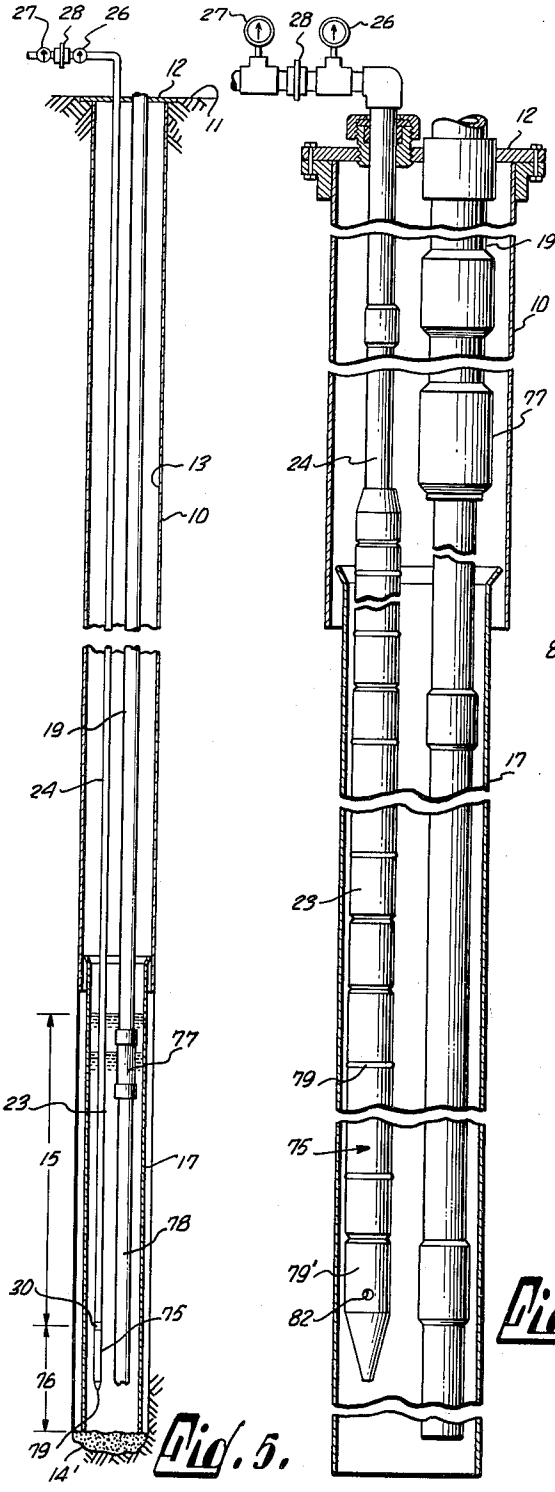


Fig. 5.

Fig. 6.

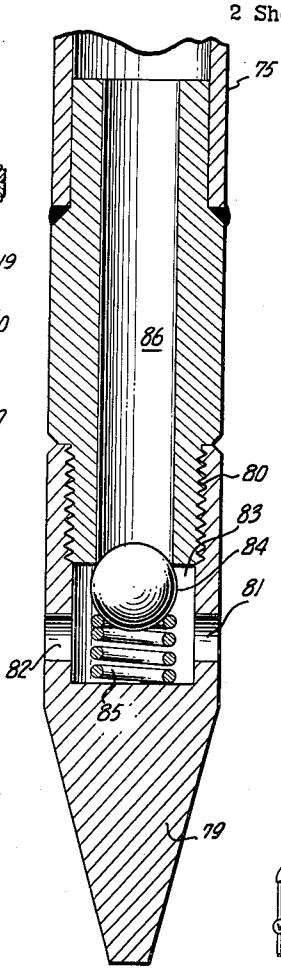


Fig. 7.

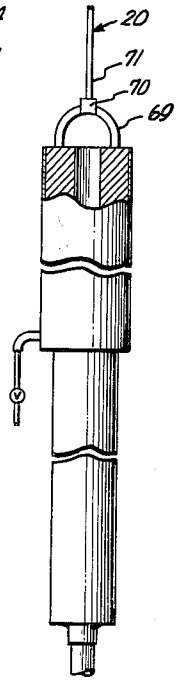


Fig. 4.

INVENTOR.
RUSSELL R. WATERMAN
BY
Beehler & Shanahan
ATTORNEYS.

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3,028,916

OIL WELL HEATING SYSTEM

Russell R. Waterman, 641 E. Carson, Long Beach, Calif., assignor of ten percent to Vernon D. Beehler, Los Angeles, Calif.

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8 Claims. (Cl. 166—62)

The invention relates to heaters useful in heating the production strata and the production fluid in an oil well for the purpose of improving the rate and quantity of oil produced by a well. The invention is an improvement in Patent No. 2,705,535 and a continuation-in-part of copending application Serial No. 407,860, filed February 3, 1954, now Patent 2,828,821.

The prospect of improving the flow of oil in oil wells by use of heat has prompted the development of sundry types of heating apparatus for the past several decades. In the early stages of development of heaters steam heaters were attempted but the inability to control the steam and lack of a means or mechanism for preventing the steam from entering the well relegated these early attempts to the category of abandoned experiments inasmuch as they were incapable of satisfactorily heating oil wells. Other types of apparatus which attempted to employ condensate return lines have also been abandoned in part because of inability to control the heating system and also because of the double cost of employing a complete return pipe in addition to the fluid supply pipe throughout the many thousand feet of depth required to reach the bottom of a well. The necessity further of overcoming the hydraulic head in the return line has supplied an additional obstacle to the operability of these early attempts.

During the period covering some five or six years prior to this date the oil producing industry has gradually been persuaded to recognize the advantages of heating oil wells not only as a means of secondary recovery but also as a means of immediately improving the rate of flow of new wells. Heaters which have been made available and heating schemes which have been tried during the past five or six years with the exception of the orifice controlled steam heater have met with indifferent success and in frequent instances have failed to produce a sustained increase in the flow of wells. In those instances where recirculating liquid heaters have been tried, they have been successful only in very shallow wells, primarily because of the inability of the liquid to carry to the producing strata a sufficient quantity of heat to raise the temperature deep in the well to a satisfactory amount and to sustain the temperature at a producing point once it has been reached. Electric heaters, though in a different class of heat-producing apparatus, have met serious objections resulting from carbonizing due to overheating without the heat being capable of penetrating the production strata to a sufficient degree. The ever-present need for heating of some effective kind is evidenced by such elementary systems as dumping many barrels of heated light-bodied oil into a well to be later pumped out with the regular production in order to temporarily improve the flow. Some large scale operations have further resorted to underground burning of oil and gas in the strata by supplying oxygen thereto for the purpose of heating within the confines of a specific field.

Among successful heaters has been the method and apparatus described in applicant's Patent No. 2,705,535, but certain specific conditions dictated by the geology in certain fields have made it undesirable to eject the quantity of distilled water comprising condensate from the steam heating operation into the well itself. These conditions include installations where high casing pressure may

be present and also those installations where it may be desirable to have condensate not reach and perhaps accumulate in the sub-surface stratification or perhaps within the producing strata.

It is therefore among the objects of the invention to provide a new and improved oil well heating system which takes full advantage of a pressure steam heater subject to orifice control but wherein the condensate is passed directly to the outflow production line without being permitted to exist freely within the well.

Another object of the invention is to provide a new and improved oil well heating system and apparatus which makes use of an orifice controlled steam heating device wherein a condensate line from a heating jacket is passed reversely through the well near the bottom to a connection feeding the normal pumping system, thereby to pass condensate water directly into the production fluid as it passes upwardly from the well.

Still another object of the invention is to provide a new and improved oil well heating system and apparatus which makes use of an orifice controlled steam heater in such fashion that condensate from the heater is conducted directly to a specific stage of a production pump so that the condensate water is compelled to flow outwardly with the production fluid without prospect of any reverse flow into the well itself.

Still further among the objects of the invention is to provide a new and improved oil well heating system and apparatus wherein return liquid from the heating system is conducted directly to the production fluid pump, thereby making it possible to utilize the production line for the return of fluid and obviate employment of a separate heating fluid return pipe.

Also among the objects of the invention is to provide a new and improved oil well heating system of the orifice controlled type capable of being operated under a variety of circumstances without necessity of incorporating any substantial changes in the physical parts of the system.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a longitudinal sectional view partly foreshortened illustrating the installation of the heating system and apparatus in a well.

FIGURE 2 is a longitudinal sectional view of the orifice control of the heating apparatus in FIGURE 1.

FIGURE 3 is a longitudinal sectional view of a production pump equipped to serve the double purpose of handling also the pumping of the heating fluid back to the surface.

FIGURE 4 is a longitudinal section view showing the manner in which the pump piston is attached to the pump rod.

FIGURE 5 is a longitudinal sectional view of the system installed in a well where condensate is discharged directly into the bottom of the well.

FIGURE 6 is an enlarged foreshortened longitudinal sectional view of the type of installation illustrated in FIGURE 5.

FIGURE 7 is a longitudinal cross-sectional view of the outlet end of the condenser pipe.

In an embodiment of the invention chosen for the purpose of illustration, a relatively typical oil well is shown in simplified form wherein a casing 10 extends downwardly from a surface 11 of the ground, at which level a head 12 closes the well indicated generally by the reference character 13. A sump 14 is shown at the bottom of the well located below a production strata 15 and pref-

erably a few feet below a substrata 16. A liner 17 extends from the bottom of the casing 10 through the strata 15 and substrata 16 to a location adjacent the sump.

Located within the liner and preferably adjacent the upper portion of the strata there is mounted a pump 18. A line of production tubing 19 extends from the pump upwardly through the casing to the surface 11 and suspends the pump at a desired level in the conventional way. A pump rod 20 within the production line is reciprocated in conventional fashion by a pump motor 21. At the lower end of the pump is an inflow pipe 22 frequently designated a "stinger" which extends downwardly through the liner within the level of the producing strata to a location adjacent the bottom of the well above the sump 14 within which sediment may accumulate. The precise location of the bottom of the stinger or inflow pipe will be determined by specific conditions in a selected oil well.

In order to supply heat to the producing strata, there is provided a heating jacket or heat exchanger 23 which extends throughout the depth of the producing strata. The heating jacket may be a single continuously open pipe which for average size casings and liners may vary between three-quarter inch pipe and one and one-half inch pipe, depending to a degree upon the depth at which the producing strata lies, the heat required to be supplied thereto, and other local conditions. The jacket may be attached to the production line by clamps 25, one of which is shown in FIGURE 1.

The jacket is supplied by an inflow steam line 24 which extends downwardly from the surface 11. At the surface gages 26 and 27 may be provided in the inflow steam line separated by a metering orifice fixture 28. Ordinarily the inflow steam line will be iron pipe of the same pipe size as the heating jacket which is made up customarily of twenty-foot lengths of pipe attached together by flush joints capable of withstanding steam pressures up to and about 450 pounds per square inch.

At the lower end of the heating jacket is a hydraulic flow-restricting orifice fitting 30 to which is attached a section 31 of a condenser pipe 32. The condenser pipe extends upwardly within the accumulation of fluid in the production area 33 to a connection 34 with the pump 18. A check valve 35 may be mounted in the condenser pipe in order to prohibit return flow of condensate to the heating jacket. Clamps 36 may be employed to secure the condenser pipe to the pump and the inflow pipe 22 to the pump where occasion may require.

In the interest of presenting herein a comprehensive disclosure of the heating mechanism, details of the hydraulic flow-restricting orifice are illustrated in FIGURE 2.

As illustrated in FIGURE 2 a connection 37 joins the heating jacket 23 to the orifice fitting by use of a welded joint 38. The connection between the fitting and the joint may be a threaded connection 39, as shown. Within the orifice fitting is a bore 40 in which is a plug 41. Extending through the plug is an orifice passage 42 which, for some conditions found present in wells from 2000 to 3000 feet deep and at temperatures in the neighborhood of 80° to 100°, may be substantially the size of a number 28 drill. A threaded enlargement 43 of the bore receives a strainer 44 which extends upwardly within a continuous recess 45 in the connection 37.

At the lower end of the orifice fitting is a threaded extension 46 to which a lower connection 47 is attached by means of threads 48. At the lower end of the extension 46 is a boss 49 within which a transverse outlet passage 50 provides for communication between the bore 40 and a continuous recess 51 at the lower end of the connection 47. By this means condensate passing out of the heating jacket will find its way into the section 31 of the condenser pipe 32.

Practice has demonstrated that for wells of a frequent depth of 2000 to 3000 feet where heating is needed, the cross-sectional area of the orifice 42 may be from about 2½% to 9½% of the cross-sectional area of the chamber of the heating jacket 23.

As an example incorporating the invention illustrated in FIGURE 3, there is shown a pump housing comprising an upper housing element 52 and a lower housing element 53. These housing elements encompass a chamber means exemplified by an upper chamber 54 and a lower chamber portion 55. A piston reciprocates within the chamber means and consists of an upper piston element 56 and a lower piston element 57. These elements may be connected together by use of a collar 58 which threadedly receives the piston elements.

At the junction of the inflow pipe 22 with the lower housing element 53, there is provided a ball check 59 adapted to seat upon a seat 60 in lower position.

Within the pump piston is an outflow chamber 62 which extends from the lower piston element 57 upwardly through the collar 58 and into the upper piston element 56 wherein it communicates with the interior of the production line 19 in a conventional fashion. At the lower end of the lower piston element there is an inflow port 63 which is periodically closed by a ball check 64 operating in a valve seat 65. By operation of the elements just described, production fluid is drawn inwardly through the inflow pipe 22 past the check valve 59 and thence into the lower chamber portion 55 from which it passes through the port 63 and ball check 64 into the outflow chamber 62 from which it is lifted at periodic stages to the surface.

Another important element of the pump mechanism consists of a condensate communicating recess 66. The condensate communicating recess 66 forms a passage between the upper chamber portion 54 through a condensate port 67 and ball check 68 with the outflow chamber 62. As will be noted, the condenser pipe 32 is connected directly to the upper chamber element 54 and hence water of condensate can pass into the upper chamber element 54 and be pumped into the outflow chamber for mingling with the production fluid.

As shown in FIGURE 4, a saddle 69 attached to the top of the upper piston element 56 includes a collar 70 which threadedly receives the lowermost section 71 of the pump rod 20.

In operation and where occasion may require clamping of the heating jacket and condenser pipe 32 to the pump and appurtenant piping, this connection is made and the production line and inflow steam line lowered together section by section into the well 13 within the casing 10. They are ultimately set to positions shown wherein the heating jacket extends for virtually the full depth of the production strata so that the section 31 of the condenser line 32 extends a short distance downwardly and then reverses following an upward direction through the production area 33 in the bottom of the well to its connection with the pump 18. When the parts are at the locations described and the pump motor is ready to actuate the pump to begin pumping out production fluid, the flow of production fluid in the well may be materially increased by instigation of the heating operation. It is appreciated, of course, that there may be some water present in the oil and that mixture is customarily termed production fluid or the production of the well. It may, however, be undesirable to have additional water find its way into the well or to portions of the formation at the bottom of the well. This creates the need for an effective separate passage for the condensate directly to the production line.

When the heating operation is commenced, the heat transfer from steam in the heating jacket into the production area 33 is in such quantity and continues with such a degree of uninterrupted consistency that it heats not only the liner but extends its heating effect far out into the adjacent formation. To achieve this heating effect a large quantity of heat is required such as may be drawn from a steam heater. By extending the heated area far

out into the formation, the area between the more fluid heated production fluid and the more viscous oil within the producing strata is increased to a very marked extent in geometrical proportion as the radius of effective heating is increased.

When the heating operation is started, steam under pressure from a conventional steam generator (not shown) is passed to the inflow steam line 24. During the initial stages a large proportion of the steam will be consumed in first heating up the inflow steam line and to a degree the gas within the upper portion of the casing, the heating jacket and the production fluid at the bottom of the well. This causes an appreciable amount of steam to be converted to water of condensate which will tend to temporarily accumulate in the heating jacket.

Once the temperature within the production fluid has become hot, there will be a marked change in the pressures indicated by the gages 27 and 26. This initial heating phase may be achieved in a time interval of about fifteen minutes under many circumstances.

When the change in pressure is experienced, the flow of steam to the inflow steam line can then be modified to a material degree so as to maintain the gage pressure constant at a pressure which will supply the desired amount of heat to the production fluid at the bottom of the well and the formation. This proper setting is determined as the pumping of the production fluid continues and is measured for selected periods of time. No useful purpose is served in overheating the well beyond the point where the production rate ceases to accelerate. It will be understood further that the pump selected should be one of such capacity that it is capable of handling the volume of production fluid which will flow when the well is in a heated condition and which in most instances will require a pump of larger capacity than one used where the well is always pumped cold.

As condensate forms in the inflow steam line and more particularly within the heating jacket, it will pass directly to the bottom of the heating jacket adjacent the orifice passage 42. By conventional heat calculations taking into consideration the depth of the well, the depth of the producing strata and the temperature prior to heating, the amount of condensate formed can be accurately calculated. Hence, the orifice passage 42 will be made one capable of passing all of the condensate plus a slight amount of steam which will serve to throttle the passage of condensate into the orifice passage.

As condensate flows outwardly through the orifice passage into the bore 40, it will impinge against the inside of the bottom of the boss 49 and then flow outwardly through the transverse outlet 50 and thence into the condenser pipe 32. Where a slight amount of steam accompanies the stream of liquid condensate, that will be immediately condensed upon the walls of the section 31 of the condenser pipe or, in any event, within the condenser pipe before the liquid condensate reaches the check valve 35 and the pump 18. Should any heat be emitted by the hot liquid condensate in the condenser pipe or the condensing of the throttling steam therein, this heat will be added to the heat conveyed to the production fluid and materially increase the efficiency of the heating system.

As the liquid condensate reaches the top of the condenser pipe 32, it is passed into the upper chamber portion 54. Actually, as the piston elements reciprocate up and down by operation of the pump motor 21 working through the pump rod 20, liquid condensate is drawn by suction into the upper chamber portion 54 during the upper stroke of the upper piston element 56. At the same time production fluid is being drawn into the lower chamber portion 55 by upward movement of the lower piston element 57. Meanwhile, ball checks 64 and 68 are closed while checks 59 and 35 are opened. Thereafter as the piston elements move downwardly, the ball check 68 unseats and liquid condensate passes through the condensate port 67 into the condensate communicating recess 66 to the outflow chamber 62. At the same time production fluid passes through the port 63 into the same outflow chamber 62. Thereafter with the next succeeding upward motion of the piston elements, that portion of the condensate and the production fluid is lifted toward the surface 11. Continued reciprocating movement of the piston elements will draw both the production fluid and liquid condensate into the outflow chamber 62 by progressive increments and move the mixture to the surface 11 where, following customary procedure, it is deposited into a settling tank for separation of petroleum from water.

It will be clear from the description that no liquid condensate can find its way into any portion of the interior of the well. The entire amount of the condensate must pass within the closed system from the heating jacket to the pump. In the particular embodiment shown, two separate pumping mechanisms have been found advantageous rather than depending upon a single pumping piston to serve the double purpose of drawing both the production fluid and the liquid condensate into the pump for lifting thereafter together to the surface. Inasmuch as the amount of condensate which the pump will be required to handle is known in advance by simple engineering calculation at the time the orifice control is determined, the capacity of the portion of the pump for handling the liquid condensate can be adjusted simultaneously, by simple mechanical expedients well known to persons skilled in the art. One adjustment may involve, for example, the selection of a suitable number of condensate ports 67 of a desired capacity. By use of the system herein shown and described, advantages of the orifice controlled steam heating system can be enjoyed without having liquid condensate pass to the bottom of the well and there have access to the surrounding geologic strata while mixing with the production fluid prior to pumping. The system is accordingly advantageous where the absorption of liquid condensate into the strata is not expected to produce the advantages experienced where that type of heating is practiced.

Under those circumstances where the geological conditions may permit liquid condensate to be injected directly into a well, the condensate pipe may have the form illustrated by a straight condensate pipe 75, as shown in FIGURE 5. The heating jacket 23 is in the same form and relative location as was described in connection with FIGURE 1 in that it extends substantially throughout the depth of the producing strata 15. When opportunity presents, the well may be drilled below the lower level of the producing strata to provide for a reservoir 76 in which condensate may collect as the production finds its way through the liner 17 into the well.

A pump 77 of substantially conventional design may be employed and located near the top of the producing strata at a level wherein it will be at all times capable of picking up the desired amount of production fluid. Extending below the pump 77 is an inflow pipe 78 which extends downwardly within the reservoir 76 at a level preferably near the bottom, but sufficiently above a sump 14' to be clear of any accumulation of solid material which may collect there.

In an installation of the type last described, the heating jacket may be of the same type and construction as previously indicated. In the interests of a more comprehensive disclosure, however, it will be noted that the heater jacket 23 may, if necessary, be slightly larger in diameter than the inflow steam line 24 to accommodate necessary joining of sections of the heating jacket. As shown, the sections may be connected with flush joints 79 so that the overall outside diameter of the heating jacket will be no greater than the outside diameter of the pipe forming the heating jacket.

Where the condenser pipe 75 extends downwardly to

a location adjacent the sump 14', it may be preferable to have a back-flow check of the type illustrated in FIGURE 7. As shown, a head 79' is located at the lowermost end of the condenser pipe, the head 79 being attached as by means of a threaded connection 80. Lateral outlet passages 81 and 82 communicate between a valve chamber 83 and the exterior at a location within the reservoir 76, or in any event within the lower portion of the well. A ball check valve 84, held closed by a spring 85 of relatively light tension, serves to close a passage 86 against reverse flow of production fluid into the interior of the condenser pipe 75. The spring 85 is sufficiently light to permit the ball check valve 84 to be readily unseated by accumulation of liquid condensate in the condenser pipe 75 as it is ejected into the bottom of the well. Where the last described installation is employed, the liquid condensate after being deposited in the bottom of the well is picked up by the inflow pipe 78 and, mixing with the production fluid, is pumped by the pump 77 upwardly through the production line 19 to the surface.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

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

1. In a producing oil well having a casing extending through a producing strata, a pump in the well, a line of production tubing and pump rod means from the pump to the surface, a valved inlet passage to the pump for production fluid and an inlet pipe communicating between the inlet passage and an accumulation of production fluid in the well, the combination of a heat exchanger comprising a section of heater pipe in the casing and within the producing strata for steam under pressure, a continuous section of steam pipe from the surface to said heat exchanger for conducting steam thereto under pressure, a constantly open hydraulic flow restricting orifice at the lower end of the heater pipe many times smaller in cross-section than the cross-section of the heater pipe and having a capacity enabling the passage of all the condensate water produced in the heat exchanger and only a very small amount of steam, a condenser pipe connected to the orifice for condensing steam which passes the orifice, said condenser pipe being connected to the pump whereby all the condensate from the heat exchanger passes directly to the pump for expulsion from the well with said production fluid.

2. In a producing oil well having a casing extending through a producing strata, a pump in the well, a line of production tubing and pump rod means therein from the pump to the surface, a valved inlet passage to the pump for production fluid and an inlet pipe communicating between the inlet passage and an accumulation of production fluid in the well, the combination of a heat exchanger comprising a continuous section of heater pipe in the casing and within the producing strata for steam under pressure, a continuous section of steam pipe from the surface to said heat exchanger for conducting steam thereto under pressure, pressure measuring and control means for said steam pipe at the surface, a constantly open hydraulic flow restricting orifice at the lower end of the heater pipe many times smaller in cross-section than the cross-section of the steam pipe and having a capacity enabling the passage of all the condensate water produced in the heat exchanger and only a very small amount of steam, a condenser pipe connected to the orifice having a length enabling the condensing of all the throttling steam, said condenser pipe being connected to the pump whereby all the fluid passed from the steam pipe to the heat exchanger passes directly to the pump for expulsion from the well with said production fluid.

3. In an oil well having a casing, a liner at the lower end extending within an oil producing strata, a pump adjacent the producing strata having a pump chamber therein, a line of production tubing and pump rod means therein from the pump to the surface within said casing, a valved inlet passage for the pump and an inlet pipe communicating between the inlet passage and the well at the location of production fluid therein, the combination of a heat exchanger comprising a continuous substantially straight section of heater pipe in the casing and within the producing strata for steam under pressure, a continuous substantially straight section of steam pipe from the surface to said heat exchanger for conducting steam thereto under pressure, pressure control means for said steam pipe at the surface, a constantly open hydraulic flow restricting orifice at the lower end of the heater pipe, many times smaller in cross-section than the cross-section of said steam pipe and having a capacity enabling the passage of all the condensate water produced in the heat exchanger and only a very small amount of throttling steam, a condenser pipe connected to the orifice having a length enabling the condensing of all the throttling steam, said condenser pipe being connected directly to the pump chamber on the downstream side of said valved inlet passage whereby all the condensate from the heat exchanger passes directly to the pump for expulsion from the well with said production fluid.

4. In an oil well having a pump near the lower end of the well and having a column of production fluid standing in the well, a production line for production fluid from the pump to the surface of the ground, a steam heating jacket comprising a pipe within the production fluid, an inflow steam line from the surface to the heating jacket for conducting steam under pressure thereto, a constantly open hydraulic flow restricting orifice in communication with the heating jacket having a cross-section many times smaller than the cross-section of the heater jacket and having a capacity enabling all the water of condensate in the heating jacket and a portion of the steam to pass therethrough, and a condenser pipe for condensing said steam and passing said condensate from the orifice to the pump, said pump comprising a pump housing having chamber means for said production fluid and said condensate, said condenser pipe being connected respectively to the orifice and to the chamber means, a pump element operatively mounted in said chamber means, said pump having an outflow chamber, and a pump actuating means attached to the pump and extending to the surface for operating said pump element, a production fluid inflow pipe connected to the housing in communication with said chamber means and extending into said production fluid, a check valve means between said inflow pipe and the chamber means adapted to admit and retain production fluid in the pump, said pump having a condensate communicating recess between said chamber means at a location downstream from the connection of the condenser pipe to the chamber means and said outflow chamber, and valve means operably connected to said condensate communicating recess and adapted to admit and retain condensate in the pump.

5. In an oil well having a pump near the lower end of the well and having a column of production fluid standing in the well, a production line for production fluid from the pump to the surface of the ground, a steam heating jacket comprising a pipe within the production fluid, an inflow steam line from the surface to the heating jacket for conducting steam under pressure thereto, a constantly open hydraulic flow restricting orifice in communication with the heating jacket many times smaller in cross-sectional area than the cross-sectional area of the heating jacket and having a capacity enabling all the

water of condensate in the heating jacket and a small portion of steam to pass therethrough and a condenser pipe for condensing said steam and passing said condensate from the orifice to the pump, said pump comprising a pump housing having chamber means for said production fluid and said condensate, said condenser pipe being connected respectively to the orifice and to said chamber means, a piston reciprocatably mounted in said chamber means, said pump having an outflow chamber, and a pump rod means attached to the piston and extending to the surface for reciprocating said piston, a production fluid inflow pipe connected to the housing in communication with said chamber means and extending into said production fluid, an inflow check valve means between said inflow pipe and the chamber means adapted to admit and retain production fluid in the pump, said pump having a condensate communicating recess communicating between said chamber means at a location downstream of the connection of said condenser pipe to the chamber means and said outflow chamber, and check valve means operably connected to said condensate communicating recess and adapted to admit and retain condensate in the pump.

6. In an oil well having a pump at the level of production fluid in the well, a production line from the top of the pump to the surface of the ground, a steam heating jacket comprising a pipe extending within the production fluid, an inflow steam line from the surface to the heating jacket for conducting steam under pressure thereto, a constantly open hydraulic flow restricting orifice in communication with the heating jacket many times smaller in cross-sectional area than the cross-sectional area of the heating jacket and having a capacity enabling all the water of condensate in the heating jacket to pass therethrough plus a small amount of steam and a condenser pipe from the orifice to the pump comprising a condensate passage, said pump comprising a pump housing having a first chamber section for said production fluid and a second chamber section for said condensate, said condensate passage being connected respectively to the orifice and to said second chamber, a piston having parts respectively reciprocatably mounted in said chamber sections, said piston having an outflow chamber therein and a pump rod means attached thereto and extending to the surface for reciprocating said piston, a production fluid inflow pipe connected to the housing in communication with said first chamber section and extending into said production fluid, an inflow check valve between said inflow pipe and the first chamber section, said piston having therein a condensate communicating recess in communication between said second chamber section and said outflow chamber, an inflow check valve in said condensate passage communicating recess, and an inflow check valve in said condensate passage.

7. A steam heating system for oil wells which extend from ground surface through the ground and a producing strata comprising a steam heating jacket adapted to extend within the producing strata, an orifice fitting having a constantly open hydraulic flow restricting orifice therein in communication with the heating jacket many times smaller in cross-sectional area than the cross-sectional area of the heating jacket and adapted to pass condensate from the heating jacket, a condenser pipe connected to the orifice fitting and adapted to extend into the well, a pump having intake chamber means therein, a pump element operatively mounted in the intake chamber means, a production inflow pipe connected to the pump in communication with said intake chamber means, and check valve means between the inflow pipe and said intake chamber means, said condenser pipe being connected to said pump and said intake chamber means, check valve means between the condenser pipe and said intake chamber means, and a production fluid delivery pipe connected to the pump in communication with said intake chamber means for passing mixed production fluid and condensate from the pump.

8. In a heating system for an oil well having a pump at the level of production fluid in the well, and a production line from the pump to the surface of the ground, the combination of a heating jacket comprising a pipe extending within the production fluid, an inflow fluid line from the surface to the heating jacket for conducting fluid thereto from the surface, a constantly open orifice in communication with the heating jacket and a fluid pipe from the orifice to the pump, said pump comprising a pump housing forming a first chamber section for said production fluid and a second chamber section for said fluid traveling from the orifice to the pump, said fluid pipe being connected respectively to the orifice and to said second chamber, a piston having parts respectively reciprocatably mounted in said chamber sections, said piston having an outflow chamber therein and a pump rod means attached thereto and extending to the surface for reciprocating said piston, a production fluid inflow pipe connected to the housing in communication with said first chamber section and extending into said production fluid, an inflow check valve between said inflow pipe and the first chamber section, means forming a fluid recess in said piston in communication between said second chamber section and said outflow chamber, and an inflow check valve in said fluid recess.

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