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CIRCULATING OIL WELL HEATER

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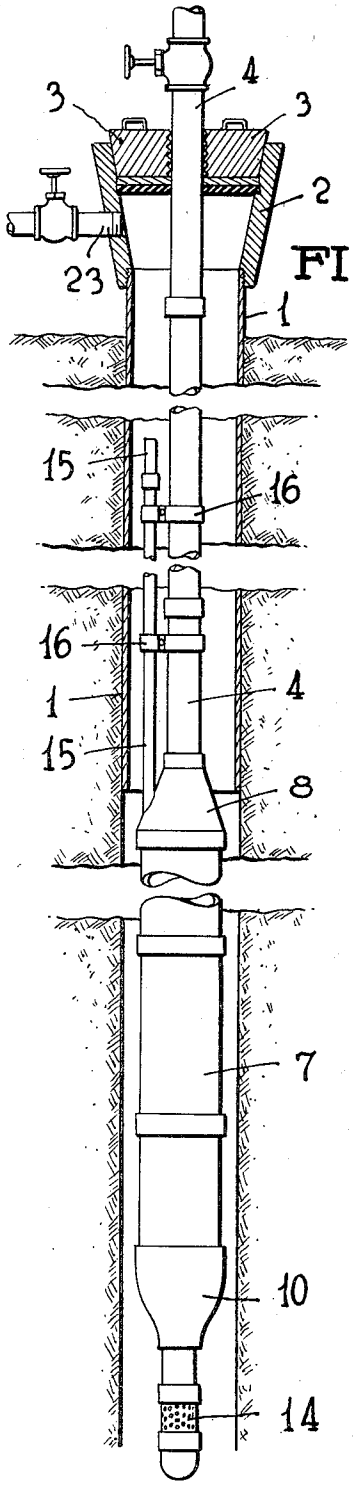


FIG. 1.

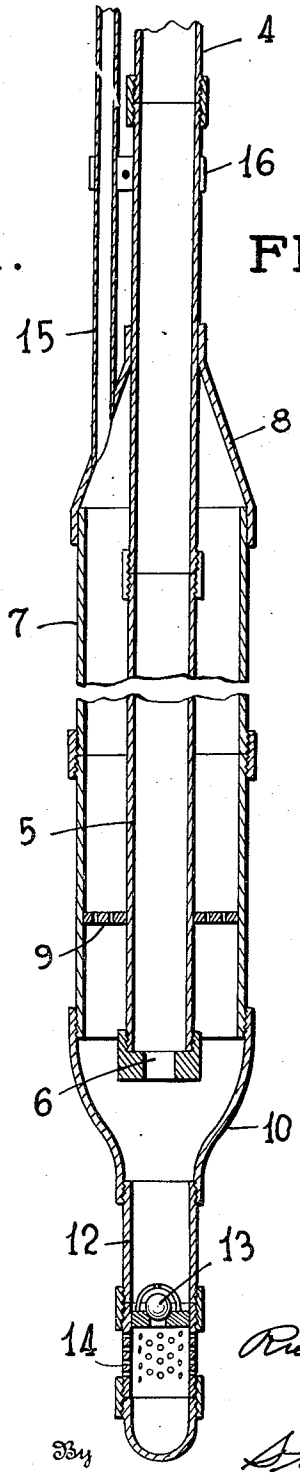
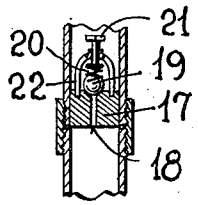


FIG. 2.

FIG. 3.



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CIRCULATING OIL WELL HEATER

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9 Claims. (Cl. 166—17)

This invention relates to heaters for oil wells. More particularly, it relates to that type of heater which comprises a housing adapted to be lowered to the oil producing strata and used to radiate heat thereto for the purpose of melting the paraffine and other impurities from the pores of the producing strata.

The invention is primarily concerned with that particular type of heater in which a hot fluid such as steam or hot oil or hot gas is circulated through the heater housing in order to provide the heat required.

The primary object of the present invention is to provide a heater of this general type which may be used with conventional oil well equipment and which will require a minimum modification thereof.

A feature of the invention consists in the provision of a heater which may be installed at the lower end of a string of oil well tubing surrounding a pump barrel in order that the heater housing may be permitted to remain in place during pumping operations and consequently permit the melted material to be pumped from the well immediately after the heating has been discontinued.

Still another feature of the invention consists in the provision of escape means for permitting the fluid or heated vapors circulated through the housing to escape from the housing at a point above the strata to be heated and the provision of a pressure controlled valve in this escape by which the maximum pressure permitted to exist within the housing may be regulated.

Many other and further features and advantages of the invention will become apparent from the following specification when considered in connection with the accompanying drawing forming a part thereof.

In the drawing:

Figure 1 is a vertical section of an oil well showing the improved heater mounted therein;

Figure 2 is a vertical section of the heater housing showing the relation of the housing with respect to the pump barrel and supporting tubing; and

Figure 3 is a detail view of the escape valve.

With more particular reference to the drawing, the modification of the invention herein disclosed comprises a conventional oil well having a casing 1 extending to any desired depth. On the upper end of the casing is mounted a closure shown in this instance as including a conical casing head 2 which has wedged in the upper end thereof a pair of jaws 3, which serve to support a string of well tubing 4. The well tubing 4 has a conventional pump barrel 5 formed at the lower end thereof. As is well known, this pump barrel is adapted for the reception of a reciprocating piston, not shown, which may be introduced into the pump barrel through the tubing 4 and may be removed without disturbing the mounting of the tubing or pump barrel. The pump barrel is provided with an aperture 6 at its lower end to permit the entry of liquid from the well thereinto.

A cylindrical housing 7 is mounted on the tubing 4 by means of a conical end fitting 8 which constitutes the upper end wall of the housing, and is maintained in uniformly spaced relation to the pump barrel by means of an apertured perforated spacer disc 9, mounted on the outside of the pump barrel and secured to the inner walls of the housing. The lower end of the housing 7 is provided with a conical reducing fitting 10 into which is threaded a section of tubing 12 which has mounted therein a conventional foot valve assembly 13 and below which is connected a conventional strainer 14. These elements are so well known in the art that detailed description thereof is not thought to be necessary herein.

It will be seen that the housing 7 in combination with the tubing 4 and pump barrel 5 together form an annular chamber surrounding the pump barrel. An escape pipe 15 is connected into the upper end of the housing 7 and extends upwardly parallel to the tubing 4 and may be supported thereon by means of a plurality of brackets 16. This escape pipe 15 may be extended upwardly any desired distance and is provided at its upper end with an escape valve shown in detail in Figure 3. This escape valve comprises a closure 17 having an aperture 18 extending axially therethrough. The aperture 18 is normally maintained closed by means of a ball valve 19 forced against a seat provided at the upper end of the aperture 18. The ball valve is maintained in engagement with its seat by means of a compression spring 20. The tension of the spring 20 may be adjusted by means of a suitable cap screw 21, mounted in a ball cage 22. The casing head 2 is provided with a vent 23 to permit the escape of fluid or gas from the well casing.

In the operation of the heater herein described, steam or other heated fluid or hot gas is introduced into the tubing 4, the pressure of this fluid or vapor being sufficiently great to close the foot valve 13 at the lower end of the housing. As the pressure in the housing is gradually increased, the housing becomes completely full of heating

fluid or vapor and until a predetermined maximum pressure has been reached, at which point the heating fluid or vapor will be permitted to escape by means of the valve 19 in the escape pipe 15. Thus, if it is desired, superheated steam, hot gas or heated liquids may be circulated through the heater housing and maintained in a condition of substantial pressure during the time it is within the housing. The continued circulation of the heating medium down through the tubing 4 and through the housing and out through the escape pipe 15 will raise the temperature thereof to a point where the housing will transmit substantial quantities of heat to the oil producing strata of the well, melting the paraffine, asphalt and other solidified petroleum products which tend to close the pores in the producing strata.

It has been found that after these various products have been melted, they settle to the bottom of the hole and that unless they are removed from the well almost immediately, they again solidify and serve to impair the productivity of the well. It is apparent from the construction herein shown that as soon as the circulation of the heating fluid or vapor through the housing is discontinued, the pump piston may be lowered into the pump barrel 5 and the heated and liquefied petroleum products pumped from the well before they have had time to cool and while they are still in liquid condition.

It is noted that in the construction herein shown, a very slight modification of the conventional oil well equipment is required and that time need not even be taken to withdraw the heater housing from the well after the heating operation has been discontinued.

It will further be apparent that the presence of the heating housing surrounding the pump barrel in no way impairs the functioning and operation of the pump. Many other and further modifications of the invention herein described will be apparent to those skilled in the art.

I claim:

1. Means for increasing the productivity of an oil well comprising in combination with a well casing, a pump barrel, an annular chamber surrounding said pump barrel and having an upper end wall secured to said pump barrel, and means for circulating a heating fluid through said pump barrel and chamber.

2. Means for increasing the productivity of an oil well comprising a pump barrel, a housing surrounding said pump barrel forming together therewith an annular chamber therearound, means for circulating a heating fluid through said pump barrel and housing and a foot valve mounted in said housing for permitting the movement of liquid in said well into said pump barrel, said valve being adapted to close when the pressure within the housing exceeds the pressure of the liquid in said well.

3. Means for increasing the productivity of an oil well comprising in combination with a well casing, a pump barrel, a housing surrounding said pump barrel and having an upper end wall secured to said pump barrel, means for circulating a heating fluid through said pump barrel and housing, and means for controlling the maximum pressure within said housing.

4. A well heater comprising in combination with a well casing, a string of well tubing having a pump barrel at the lower end thereof, a housing surrounding said tubing and pump barrel and forming together therewith an annular chamber therearound in communication with said pump barrel, said housing having an upper end wall secured to said tubing and pump barrel, and means in communication with said chamber for conducting fluid therefrom.

5. A well heater comprising a string of well tubing having a pump barrel at the lower end thereof, a housing surrounding said tubing and pump barrel and forming together therewith an annular chamber therearound, a foot valve in said housing for allowing the entry of fluid from said well into said pump barrel, and means for conducting fluid from said chamber.

6. A well heater comprising a string of well tubing having a pump barrel at the lower end thereof, a housing surrounding said tubing and pump barrel and forming together therewith an annular chamber therearound in communication with said pump barrel, and a conduit for conducting fluid from said housing, said conduit being provided with an escape valve for controlling the maximum pressure permitted to exist in said housing.

7. A well heater comprising in combination well tubing, a pump barrel at the lower end thereof, a housing surrounding said barrel and a portion of said tubing and forming together therewith an annular chamber extending through the area of the well to be heated, said housing being reduced in diameter at its upper end and secured to said tubing, the lower end of said housing being provided with a foot valve preventing fluid in said housing from passing into said well and means for circulating heated fluid through said annular chamber.

8. Means for increasing the productivity of an oil well comprising a string of well tubing, a pump barrel at the lower end thereof, a housing adjacent said pump barrel and in communication therewith, an outlet pipe for permitting escape of fluid from said housing to a point above the producing strata of said well.

9. Means for increasing the productivity of an oil well comprising a string of well tubing, a pump barrel at the lower end thereof, a housing mounted adjacent said pump barrel and in communication therewith, an outlet pipe in communication with said housing and extending upwardly to a point substantially above the oil producing strata and an escape valve in said housing for controlling the maximum pressure permitted to exist within said housing.

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