

Aug. 26, 1952

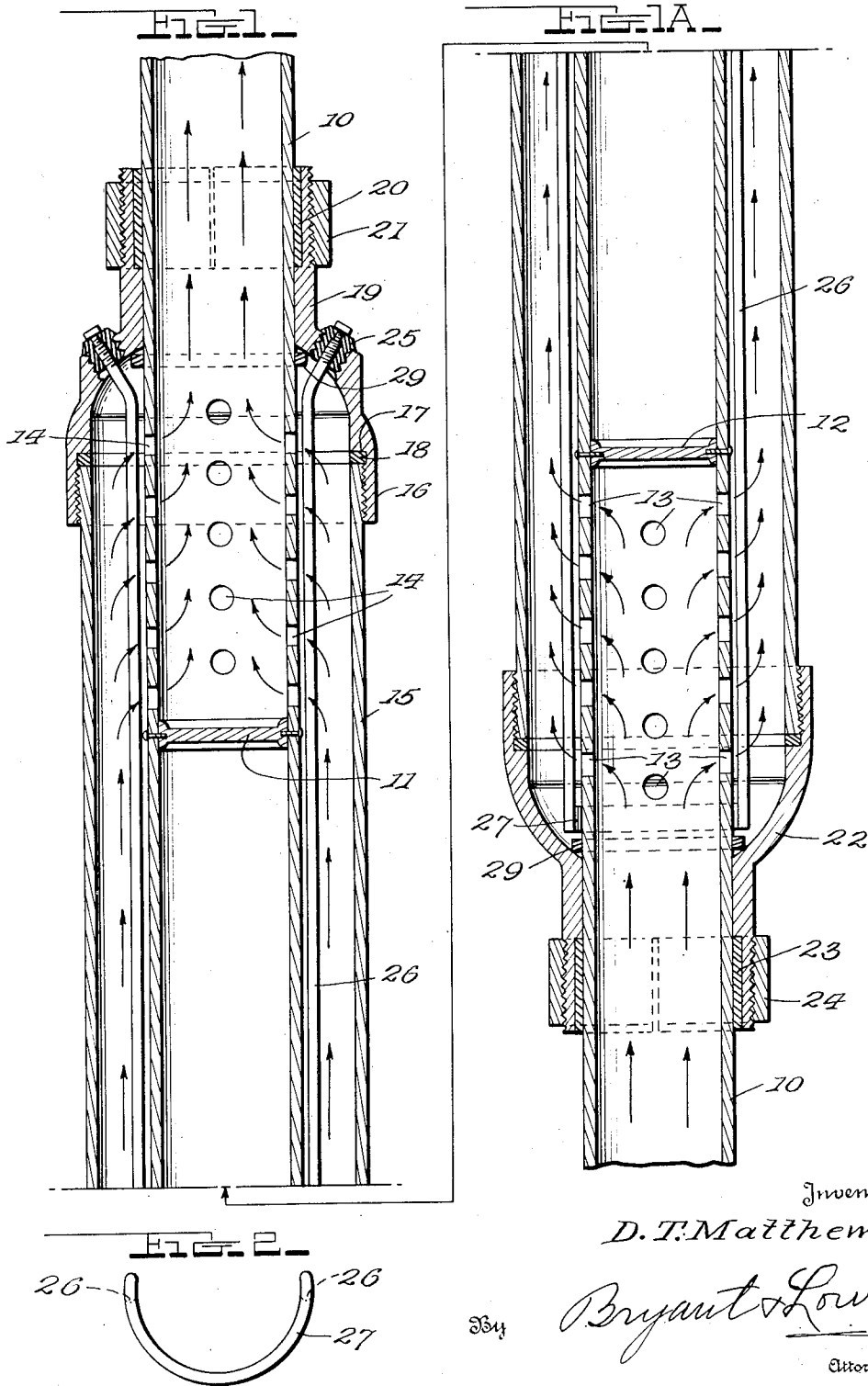
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HEATER FOR OIL WELLS AND PIPE LINES

Filed Aug. 15, 1949

2 SHEETS--SHEET 1



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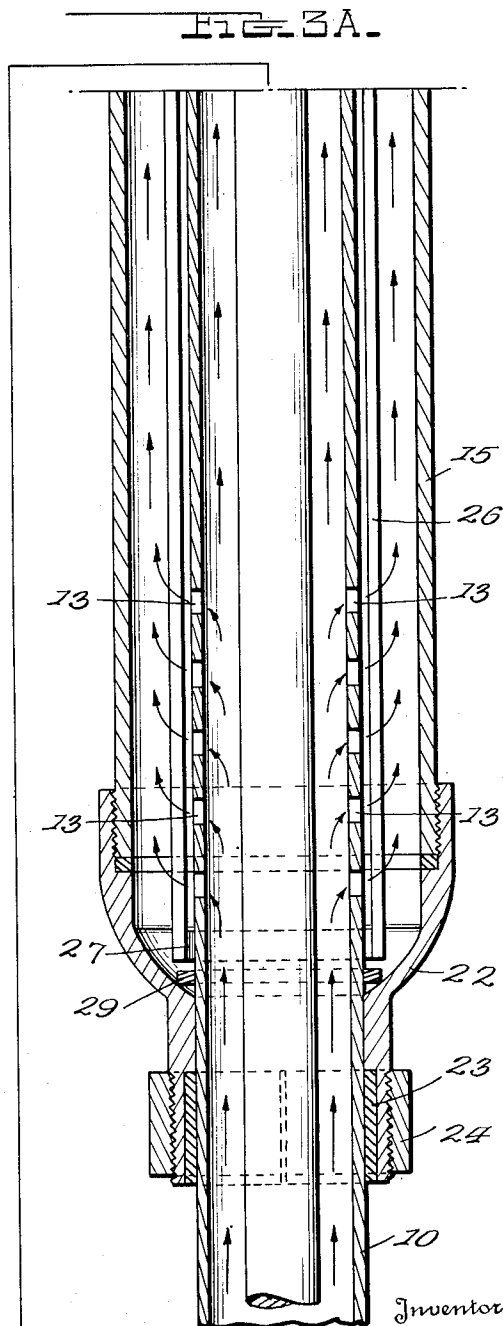
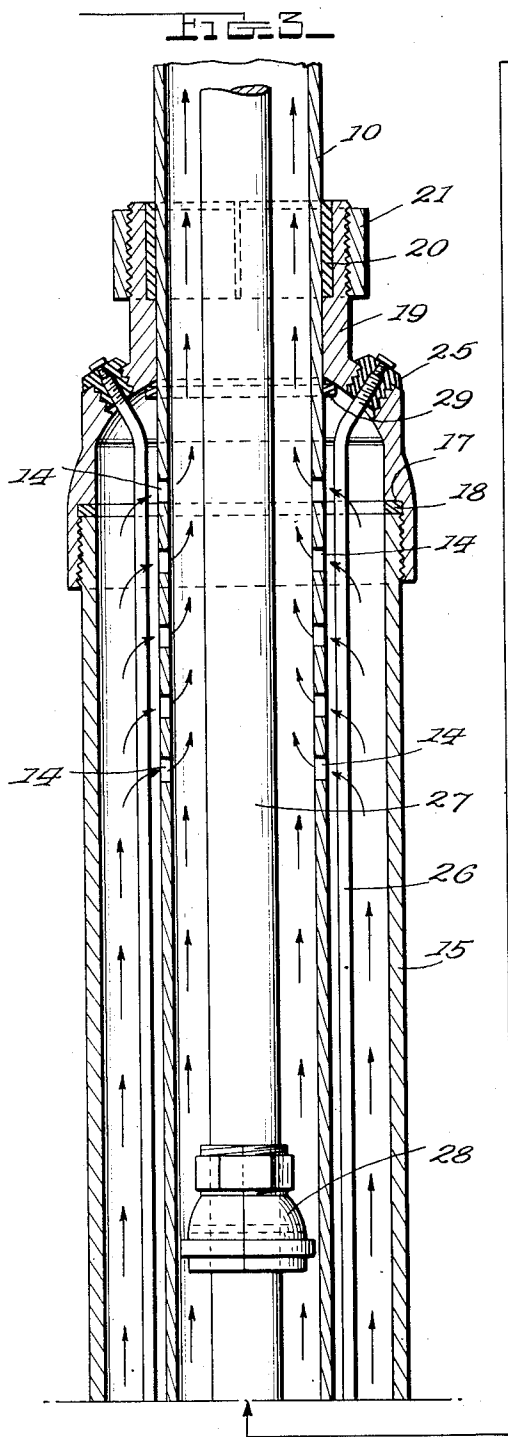
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,608,256

HEATER FOR OIL WELLS AND PIPE LINES

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Application August 15, 1949, Serial No. 110,446

8 Claims. (Cl. 166-17)

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This invention relates to the production of oil from oil wells and has special reference to means for preventing congelation of a paraffin content of oil when it is being delivered from the oil bearing strata.

In the sinking of an oil well it is necessary, at many times, to carry the bore down through water strata and other strata which tend to cool the oil flowing up from the bottom of the well. The consequence of this is that in certain wells the paraffin content in the oil is congealed and adheres to the near siding of the tube or casing through which the oil passes to the surface. This prevents the free flow of the oil, because it decreases the diameter available in the casing.

It is a principal object of this invention to provide novel means whereby, whenever the oil passes upwardly through a stratum which tends to cool the oil and cause deposition of paraffin, the oil will be heated by special means so that such deposition will be prevented.

Under ordinary circumstances there is provided in an oil well a tube or casing for the delivery of oil from the oil bearing stratum to the surface of the earth. In some instances this delivery is automatic. That is to say the pressure of gas or gravity forces the oil upward to the surface of the earth without necessitating pumping. In other instances the oil will not reach the surface of the earth unless pumping is provided.

In any case, when the tube or casing has reached the bottom of the bore means is provided to prevent any flow of liquid down the outside of the casing to the low end of such casing so that only oil from the oil bearing strata can flow up through the casing.

As above stated, such a casing is apt to pass one or more cooling zones wherein congelation of paraffin may occur. It is a second object of this invention to provide means for causing upwardly flowing oil to pass through a heating channel.

In the type of oil well in which no pumping is necessary, it is a third object of the invention to provide means whereby the oil cannot pass directly upwardly through the casing but must be deflected through a heating chamber thereby preventing deposition of paraffin effecting lowering of the flow upwardly through the casing.

A fourth object of the invention is to provide, in a well requiring pumping, means to so agitate the upwardly flowing oil that it will be

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caused to pass through a heating chamber for the purpose described.

With the above and other objects in view, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and particularly claimed.

In the accompanying drawings, wherein like characters of reference indicate like parts in the several views,

Fig. 1 is a vertical section through the casing of an oil well showing the upper part of the heating arrangement for a free flowing well,

Fig. 1A is a similar view showing the lower part of the heating arrangement for such a well,

Fig. 2 is a detailed plan showing the manner of connecting the lower ends of the heating elements,

Fig. 3 is a view similar to Figure 1 but showing the arrangement used with a well that requires pumping, and

Fig. 3A is a view similar to Fig. 1A and showing the lower part of the arrangement shown in Fig. 3.

As shown in the several views of the drawings there is illustrated a casing or tube 10. This casing being the ordinary well casing or tube through which oil flows from the bottom of the well to the surface of the earth, the flowing oil being there received by suitable piping connections not being deemed necessary here to be shown. In the type of free flowing well illustrated in Figs. 1 and 1A there is provided at about the middle point vertically of a chilling zone a partition 11 and in fact there may be one partition at a higher point and a second partition 12 at a lower point of this chilling zone. This effects sealing off of a considerable length of the tube or casing 10. Below lower partition 12 the casing is provided with a series of laterally disposed openings 13 and about the upper partition 11, there is a similar series of lateral openings 14. In the chilling zone just described, the tube 10 is surrounded by an outer casing 15. On the upper end of the casing 15 there is screwed a cap 16 having a shoulder 17, and a washer or grommet 18 is held between the upper end of the casing 15 and the shoulder 17 so as to make a fluid tight joint. The upper part of the cap 16 forms a cylinder 19 which closely surrounds the tube 10 and between the upper part of the portion 19 and the tube 10 there is provided a packing 20 compressed by a ring 21 so as to make a tight joint between the tube 10 and the cap 16. Simi-

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larly, at the end of the outer casing 15 there is provided a cap 22 which is secured by the packing 23 and a ring 24 to the tube 10 so as to make an oil tight joint at the lower end of the casing 15.

The cap 16 has provided therein suitable threaded openings wherein are fitted insulated collars 25. Through each of these collars extends a heating element 26 which passes down into the space between the case 15 and the tube 10, these elements being connected at their lower ends by an arcuate member 27 as shown in Fig. 2 of the drawings. By means of this arrangement, one of the elements 26 may be connected to one of the poles of a power supply while the other of the elements is connected to the opposite pole of a suitable power supply. Accordingly, when current is turned on, the space between the outer casing 15 and the tube 10 is heated. Now, since the partitions 11 and 12 and the openings 13 and 14 are arranged as shown, oil flowing upwardly through the tube 10 must flow out through the openings 13, upwardly through the space between the outer casing 15 and the tube 12, and then back through the openings 14 into the upper part of the tube 10.

In the case of wells requiring pumping as shown in Figs. 3 and 3A the entire construction with the exception of the partitions 11 and 12 is identical with that just described but, in such case, a pump rod or sucker rod 27 is mounted in the tube 10 for vertical reciprocation. Since there are no partitions as 11 and 12, it is necessary to provide some means for forcing oil upwardly through the space between the outer casing and the tube. To this end, the sucker rod 27 has secured thereon an agitator 28 so that every time the sucker rod goes downwardly in the well a certain amount of the oil in the tube 10 will be forced outwardly of the tube through the openings 13 and thus will have to return to the tube through the openings 14, being heated in its passage from below the agitator 28 to the part of the tube above said agitator.

In order to prevent longitudinal movement along the tube 10 of the assembly formed of the casing 15 and the caps 16 and 22, supporting rings 29 are welded or otherwise attached to the tube 10, each of the rings 29 being so positioned on the tube 10 that it abuts the shoulder formed at the inner end of the cylindrical portion 19 of said cap at the point where the cap flares outwardly to receive the casing tube 15 of larger diameter. Thus any movement of the cap and casing assembly down the pipe will be prevented by the cap 16 striking the upper supporting ring 29 and any movement upwardly will be prevented by the cap 22 striking the lower supporting ring 29.

It will now be seen that by means of the arrangement described in the above specification any oil passing upwardly from the oil stratum through the surface of the earth and through a cooling zone will be heated during its passage through such a zone and will be kept sufficiently warm to prevent any deposit of material having a low melting point.

What is claimed is:

1. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube and spaced therefrom to provide an annular channel surrounding said tube, said outer casing having a fluid seal connection at its upper and lower ends with said tube, said tube

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having vertically spaced groups of openings in the wall thereof with the groups respectively adjacent the upper and lower ends of the outer casing, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube through the lower group of openings into and upwardly through the annular channel between the tube and outer casing and thereafter to return to said tube through the upper group of openings.

2. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said deflecting means comprising at least one partition interposed across said tube between the upper and lower ends of said outer casing and said tube having port communication between the tube and outer casing at opposite sides of said partition.

3. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said deflecting means comprising a pump rod and agitator carried on said rod intermediate the upper and lower ends of said outer casing and said tube having port communication between the tube and outer casing at opposite sides of said agitator.

4. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said deflecting means comprising at least one partition interposed across said tube between the upper and lower ends of said outer casing, said tube having port communication with the space between the tube and outer casing at the lower and upper ends of the latter.

5. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said deflecting means comprising a pump rod and agitator carried on said rod intermediate the upper and lower ends of said outer casing, said tube having port communication with the space between the tube and outer casing at the lower and upper ends of the latter.

6. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed be-

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tween said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said heating means including electrically energized heating elements mounted in the space between the tube and outer casing, said deflecting means comprising at least one partition interposed across said tube between the upper and lower ends of said outer casing and said tube having port communication between the tube and outer casing at opposite sides of said partition.

7. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said heating means including electrically energized heating elements mounted in the space between the tube and outer casing, said deflecting means comprising a pump rod and agitator carried on said rod intermediate the upper and lower ends of said outer casing and said tube having port communication between the tube and outer casing at opposite sides of said agitator.

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8. In an oil well, a vertical casing tube through which the oil of the well flows upwardly, an outer casing surrounding a selected length of said casing tube, heating means interposed between said outer casing and tube, and deflecting means causing at least a portion of the oil to be deflected and caused to pass from the tube into and through the space between the tube and outer casing and thereafter to return to said tube, said heating means including electrically energized heating elements mounted in the space between the tube and outer casing, said deflecting means comprising a pump rod and agitator carried on said rod intermediate the upper and lower ends of said outer casing, and said tube having port communication between the tube and outer casing at opposite sides of said agitator, said heating means including electrically energized heating elements mounted in the space between the tube and outer casing.

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