

Feb. 21, 1928.

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A. EHRLAT

METHOD OF WINNING PETROLEUM

Filed Oct. 8, 1920

Fig. 1.

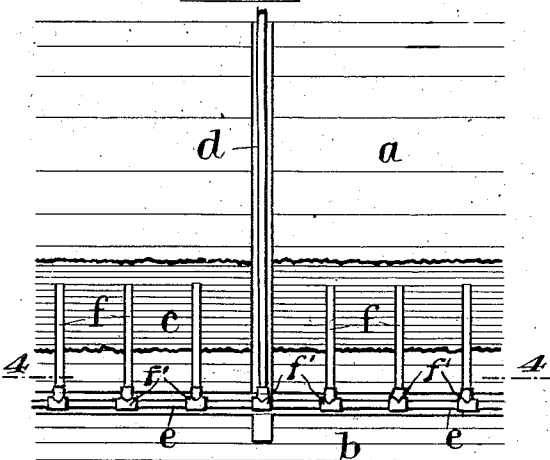


Fig. 2.

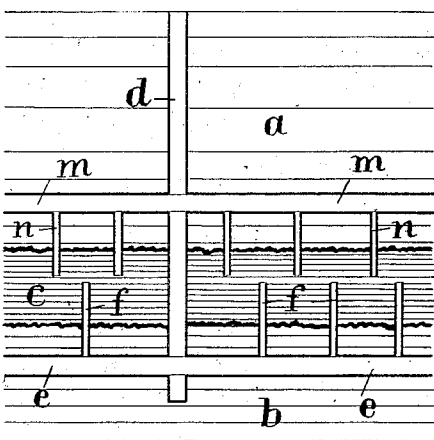


Fig. 4.

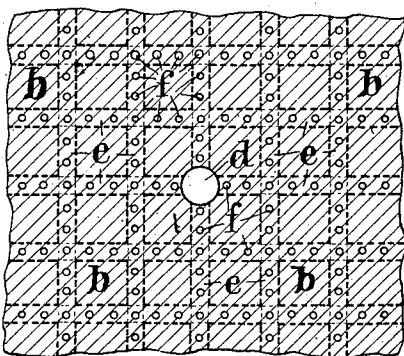


Fig. 3.

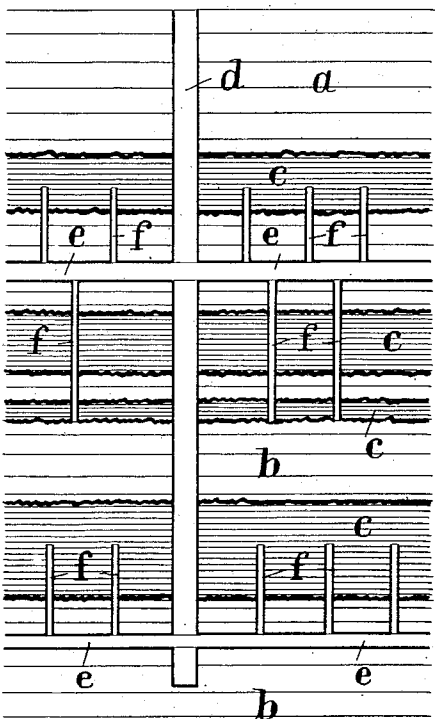
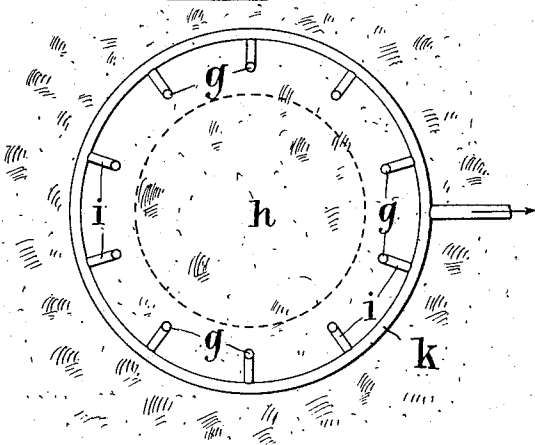


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD OF WINNING PETROLEUM.

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My invention refers to the production of petroleum, natural gas or both and its particular object is a method which permits of producing oil and gas in a more economical way than was hitherto possible and without running the risks resulting from the presence of easily inflammable gases.

Up till now oil and gas have been produced mainly by drilling wells, the oil and gas flowing from these wells under their own pressure or being collected therefrom by pumping. In some parts of Europe and Asia oil has also been obtained by the sinking of dug wells or shafts, and quite recently this method has again been resorted to in some cases. From a shaft sunk into the petroliferous stratum horizontal galleries were driven right in the oil-bearing rock or sand, the oil seeping out being collected below ground, while the sand retaining part of the oil was brought up and the oil recovered therefrom by boiling with water or by other means.

This method although being more economical than the drilling method generally followed, inasmuch as most of the oil is recovered, nevertheless involved the loss of the gas accompanying the oil or which is developed therefrom, such gases moreover mixing with the current of air introduced into the mine for ventilating purposes and forming therewith an explosive mixture, thus greatly endangering the lives of the miners. Moreover the bringing to light of the oil-sand as well as the boiling procedure involves relatively high costs.

According to the present invention, these drawbacks are obviated and the gas accompanying the oil is collected without any risk by combining the two methods employed up till now, viz, oil mining by way of shafts and galleries and the sinking of wells by drilling. My combined method substantially consists in approaching the petroliferous stratum by means of galleries without however driving the galleries into the oil bearing rock or sand, and in then tapping the oil and gas deposit by drilling bore holes from the said galleries into the petroliferous stratum. The bore holes having been lined with tubes, the oil and gas are collected and brought out in the simplest and least expensive manner without coming in contact with the galleries nor with the air contained therein. However, in order not only to col-

lect the gas accumulated above the oil bearing rock or pool, but also to utilize the pressure exerted on the oil by the gas for the purpose of perfectly draining the oil bearing stratum, I prefer tapping this stratum from below by driving galleries underneath it and drilling bore holes from these galleries upwards. Wherever such bore hole has reached the oil bearing rock or pool, the pressure of the gas accumulated above it will drive out all the oil in the vicinity of the hole in the shortest possible time. After the gas pressure is thus relieved, the remaining oil will still drain out by gravity. On the other hand, if bore holes are drilled downwards from galleries driven above the oil-bearing stratum, the tubes, in order to utilize the gas pressure, should extend through the holes right down to the bottom of the stratum.

Obviously no loss of gas nor of the more volatile constituents of the oil can occur, if the oil and gas are thus led to the surface. As the galleries may approach the oil and gas deposit so as to be only a few feet distant therefrom, the tapping of the deposit by means of bore holes is an easy matter and a great number of holes can be drilled in a very short time whereby all the oil and gas accumulated in the deposit can be collected in the simplest and yet most effective manner.

In order to facilitate the understanding of my invention and how the same is to be performed, I have illustrated it in a diagrammatic manner in the drawings affixed to this specification and forming part thereof, the illustrations being merely given by way of example. In the drawings

Fig. 1 is a vertical section of an oil and gas deposit, the shaft, galleries and bore holes, the oil bearing rock being tapped from below in the preferred manner afore described.

Figs. 2 and 3 are similar views of modified forms.

Fig. 4 is a horizontal section on the line 4-4 in Fig. 1 illustrating the preferred distribution of galleries and bore holes, and

Fig. 5 is a similar view, disclosing the way in which a shaft may be sunk right through the petroliferous stratum or oil and gas pool in order to tap it from underneath.

Referring to Figs. 1 and 4 of the drawings, *c* is the petroliferous stratum, *a* is the

top, and *b* the bottom rock, *d* is the shaft sunk into the rock below the petroliferous stratum, *e* are galleries extending in different directions and at different distances, respectively, from the bottom end of the shaft, and *f* are the bore holes extending from the galleries upwards into the petroliferous stratum which in the present instance is assumed to be a porous rock impregnated with oil and gas and which is being drained by way of the bore holes which are lined as far as necessary with tubes *f'* which are sealed in the bottom rock *b*. The tubes *f'*, which are illustrated in Fig. 1, are connected to a system of pipings (shown diametrically in Fig. 1) conducting the oil and gas, respectively, to the surface. The natural flow of the oil is assisted by pumping.

In the instance disclosed in the drawings the shaft *d* is shown as traversing the oil bearing stratum, although it might as well be sunk laterally thereof. In order to facilitate the sinking of the shaft right through the petroliferous stratum I prefer proceeding as follows: Before starting digging I drill bore holes from the surface into the deposit of oil and gas, an appropriate number of such holes *g* (Fig. 5) being arranged at a distance of a few feet around the column *h* designed for the sinking of the shaft. From these holes which are preferably lined with casings, pipes *i i* extending radially outwards and leading into an annular main *h* are connected to a ventilating fan or vacuum pump (not shown) serving to evacuate as far as possible the gas from the column *h* of rock or sand which the shaft shall be sunk through. Instead of merely using the bore holes for draining the column I may also resort to a method resembling the well known freezing method: In order to block the pores of the rock in the vicinity of the bore holes and thus to prevent oil and gas from being sucked from outside into the said column, I inject into the said holes clay or some other suitable material suspended in water, thus barring the way to the oil and gas from the surrounding rock and allowing the column *h* to be dug out right through the oil bearing stratum without any risk.

In order to hasten the production of oil and gas, I may drive galleries *m* (Fig. 2) also above the petroliferous stratum and drill holes *n* from these galleries right down into the oil bearing rock. The drill holes *n* are also preferably lined with tubes similar to tubes *f'*.

In the case where several oil-bearing strata extend at different levels below one another, a shaft *d* may be sunk through all these strata, as shown for inst. in Fig. 3, and galleries *e*, *e* may be driven from said shaft underneath the lowest one and also intermediate between the strata, from which galleries bore holes *f*, *f* may then be drilled

through the intermediate rock into and even through the petroliferous strata, each bore hole connecting, if necessary, more than one oil-bearing stratum with a gallery.

In the case, where a petroliferous stratum approaches the surface, galleries may be driven in parallel and connected therewith by bore holes without any shaft being sunk.

In order to extract the oil still adhering to the rock or sand, I may resort to washing, water being pressed through the bore holes into the oil-bearing stratum and the oil which did not seep out by itself being thus collected.

In order to restore the gas pressure required for driving the oil out, whenever the pressure of the natural gas has fallen below a certain limit, I may introduce through the bore holes a compressed gas into the oil-bearing rock or sand.

I claim:

1. The method of recovering petroleum, comprising tapping upwardly into an oil-bearing stratum from below, and leading oil out through the tap and thence to the surface.

2. The method of recovering petroleum, comprising sinking a shaft through an oil bearing stratum, tapping upwardly into the lower part of the stratum from below, and leading the oil out into the shaft, and thence to the surface.

3. The method of recovering petroleum, comprising sinking a shaft through an oil bearing stratum, extending a gallery from the shaft underneath the stratum and tapping into the stratum from below and leading the oil to the shaft and thence to the surface.

4. The method of recovering petroleum products comprising sinking a shaft to a point adjacent to an oil and gas bearing stratum, extending a gallery out from the shaft substantially parallel to the stratum, tapping from the gallery into the oil bearing stratum to a point below the gas zone, the tap being out of communication with the gas zone, establishing a gas-tight communication between the tap and the surface, and recovering products through said communication.

5. The method of recovering oil and gas, comprising sinking a shaft through an oil and gas bearing stratum, extending a gallery out from the shaft below the stratum, tapping into the stratum from below establishing a gas-tight communication between the tap and the surface and recovering gas and oil through said communication.

6. The method of recovering petroleum products which comprises sinking a shaft to a point adjacent to a petroliferous stratum, driving a gallery out of contact with the stratum and substantially parallel thereto, tapping at an angle to the longitudinal axis

of the gallery into the oil stratum to a point below the gas zone, establishing a gas-tight communication between the tap and the surface and utilizing gas pressure in the upper portion of the stratum to extract the oil through said communication.

7. The method of producing petroleum and natural gas which comprises driving a gallery underneath a petroliferous stratum, establishing a gas-tight communication between said gallery and said stratum and between said gallery and said surface and conveying petroleum and gas to the surface through said communication.

8. The method of producing petroleum and natural gas which comprises freeing from oil and gas a column of rock extending through a petroliferous stratum, digging out said column through and below the lower level of said stratum, driving a gallery underneath said stratum, connecting said gallery with said stratum by a bore hole, lining said bore hole with a pipe and conveying petroleum and gas from said stratum through said pipe and thence to the surface by pumping.

9. The method of producing petroleum and natural gas which comprises drilling

bore holes around a column of rock extending through a petroliferous stratum, evacuating oil and gas from said column through said holes, digging out said column through and below the lower level of said stratum, driving a gallery underneath said stratum, connecting said gallery with said stratum by a bore hole, lining said bore hole with a pipe and conveying petroleum and gas from said stratum through said pipe and thence to the surface by pumping.

10. The method of producing petroleum and natural gas which comprises drilling bore holes around a column of rock extending through a petroliferous stratum, injecting into said holes a material adapted to block the pores of the rock, digging out said column through and below the lower level of said stratum, driving a gallery underneath said stratum, connecting said gallery with said stratum by a bore hole, lining said bore hole with a pipe and conveying petroleum and gas from said stratum through said pipe and thence to the surface by pumping.

In testimony whereof I affix my signature.

ADOLF EHRLAT.