United States Patent Office 2,833,516 Patented May 6, 1958

2,833,516

METHOD OF DRIVING HOLES IN BITUMINOUS STRATA

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No Drawing. Application July 10, 1952
Serial No. 298,189

Claims priority, application Sweden February 21, 1952

10 Claims. (Cl. 255—1.8)

The main object of my present invention is to provide a novel method for driving holes permitting saving of time and costs and at the same time to make use of simpler apparatus than previously required.

A further object of my invention is to provide a method for driving holes which method at the same time and particularly in granular, nonconsolidated layers or strata, such as tar sand, gives the wall of the hole such strength as to prevent the same from caving.

For this purpose one characteristic feature of the invention consists in supplying heat releasing material in the form of a fluid, preferably a gas such as air or oxygen, for example, to the bottom of the hole by means of a jet directed toward the bottom. At a suitable distance from the bottom of the hole the fluid is discharged from a nozzle which by means of a hose or tube is connected to a source of fluid, for example a pressure chamber. By applying suitable guiding devices it is ensured that the hole or well becomes straight if such is required, for example when a tube or casing is to be inserted thereinto.

If a formation of non-consolidated material is to be treated, it may many times be sufficient to use pre-heated gas which renders the organic substance holding together the grains, such as the tar, sufficiently thinly liquid to release the grains of sand so that these are carried to the surface of the ground by the returning stream of gas. In such cases, however, it is preferable, to cause combustion of the organic substances at the bottom of the hole. When proceeding in this way no exterior source of heat is required, but the combustion is maintained in itself, the hole being continued in a downward direction and the unburned portions of mineral being carried upward in the shape of minor particles such as grains, flakes or the like. The residue after the combustion or the ashes may be conveyed up to the surface of the ground in the shape of melted drops. A combined method wherein the heat is introduced from the outside while at the same time combustion of the deposit is performed, may be suitable when the content of combustible substances in said deposit is low. By varying the quantities of or proportions between introduced oxygen and inert gases, such as, for example, nitrogen of the air, the temperature may be regulated in order to avoid or obtain, depending on the nature of the deposit to be exploited, slagging or melting of the same.

Simultaneously with or after the provision of the hole in the manner described above, the wall of the hole may be heated over a portion or all of its length by combustion of fuel present in the deposit or introduced from the outside, at a temperature sufficient to cokify the bituminous substance, a layer of coke thus formed encasing the hole preventing its wall from caving in or at least counteracting such tendency. In this way it is possible to accomplish in fuel-containing sand such as tar sand, for example, a casing of coke of such thickness as to make it necessary to cover the wall of the hole with casing. If a surface layer is produced or reinforced along the wall

of the hole while at some distance therefrom the combustion is performed at the bottom of the hole, the hot combustion gases ascending from the bottom become usable, since one at the utmost only has to raise the temperature of the gas somewhat further by introducing oxygen gas or air and/or fuel supplied from the outside to the zone in question.

A casing of coke of the kind described around the hole can in certain minerals be of advantage for facilitating the leading of the gases through or collecting them in said holes in the oil-recovery process proper. The thickness of the casing of coke is regulated by adjusting the temperature and the time of treatment to the thermic properties of the deposit.

The bituminous substances in and about the wall of the hole may instead of being cokified be burned more or less completely in order to increase the gas-permeability of the wall, for example.

In the same way the wall of the hole over a portion or the entire length of the well may be subjected to heating to such a temperature as to cause melting of the surface layer resulting after solidification in a glazing cover of the wall of the hole further increasing the solidity thereof. A cover of melted mineral may also serve to make the wall of the hole more or less impervious to gas or liquid, for instance by introducing gas (e. g. combustion air) or water under pressure, while other layers are to be sealed off by means of well-known so-called secondary-recovery methods.

The methods described above to provide, by heat-treatment, casings of coke or molten mass around the wall of the holes or wells are applicable also if the holes have been driven by means of conventional drilling methods. In order to provide the required temperature at the bottom or along the wall of the hole as disclosed above, a fuel such as a combustible gas or fuel oil may be supplied either through a separate pipe or in admixture to the scavenging gas containing oxygen.

While several more or less specific embodiments of my invention have been described, it is to be understood that this is for purpose of illustration only, and my invention is not to be limited thereby, but its scope is to be determined by the appended claims.

What I claim is:

1. The method of driving holes in unconsolidated tar sands which comprises burning organic substances in the tar in situ to form volatile products and to release sand grains from the tar sand, and removing the sand grains by a stream of gas ascending in the hole produced.

2. The method as set forth in claim 1 in which the burning is carried out to convert an upper layer of the wall of the hole into a structure different from that of the surrounding strata.

3. The method as set forth in claim 2 in which the bottom of the hole is subjected to burning simultaneously with the wall treatment.

4. The method as set forth in claim 2 in which the upper layer of the wall is caused to cokify.

5. The method as set forth in claim 4 in which the cokified layer of the wall is produced in a zone spaced from the bottom of the hole.

6. The method of driving holes in unconsolidated tar sands which comprises combustion in situ of fuel directed toward the tar sand in the presence of an oxygen containing gas to form volatile products and to release sand grains from the tar sand and removing the sand grains by a stream of gas ascending in the hole produced.

7. The method as set forth in claim 6 in which the combustion is carried out to convert an upper layer of the wall of the hole into a structure different from that of the surrounding strata.

8. The method as set forth in claim 7 in which the bottom of the hole is subjected to combustion simultaneously with the wall treatment.

9. The method as set forth in claim 7 in which the upper layer of the wall is caused to cokify.

10. The method as set forth in claim 7 in which the cokified layer of the wall is produced in a zone spaced from the bottom of the hole.

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