

UNITED STATES PATENT OFFICE

2,024,968

METHOD OF PRODUCING LUBRICATING OIL

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No Drawing. Application June 27, 1932,
Serial No. 619,609

5 Claims. (Cl. 196—24)

This invention relates to a lubricating oil and also pertains to a method of treating hydrocarbon in effecting the production of lubricating oils and distillates therefrom.

5 An object of the invention is to provide a process whereby a sulphuretted hydrocarbon may be readily and economically desulphurized to effect the production of high grade lubricating oil.

10 Another object is to provide a method whereby petroleum of asphaltic base may be converted into a paraffin base hydrocarbon.

Another object is to produce a low gravity oil from hydrocarbon, which is characterized by the following qualities:

15 1. A specific gravity less than that of water.
2. Will not emulsify when agitated in water.
3. A high rate of flow not materially affected by lowering of temperature until approaching freezing point of 32° Fahrenheit.

20 4. Capable when added to a much greater volume of a hydrocarbon of higher gravity having high viscosity and low rate of flow to effect lowering of the gravity and increase the rate of flow of the hydrocarbon.

25 With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention resides generally in taking a low boiling asphaltic petroleum or petroleum product containing chemically combined sulphur, adding thereto a cellulosic vegetable matter, subjecting the mixture to the combined action of heat and pressure in a closed container for a period of time in such manner as to break the bond which links sulphur, hydrogen and carbon in the petroleum, so as to produce a hydrocarbon product from which a large portion of the sulphur content may be removed by washing in water, and at the same time produce a low gravity oil in which the asphalt has been converted into paraffin.

30 The petroleum or petroleum product to be treated may be either of paraffin or asphalt base, but the invention is especially applicable to the treatment of the latter, since by treating a petroleum or hydrocarbon of asphalt base in accordance with the invention it will be converted into a hydrocarbon product of paraffin base. However, the petroleum or hydrocarbon to be treated is preferably one that embodies a sulphur content since one of the features of the invention is to effect removal of the sulphur. Examples of hydrocarbon which may be treated are low boiling petroleum products from which all fractions passing off at temperatures above 650° Fahrenheit have been removed; low gravity oil

known as still residuum from which light oils and lubricants have been distilled off, which residuum has a gravity ranging from 15 to 18 Baumé; and heavy low boiling petroleum of from 10 to 15 gravity Baumé.

5 The cellulosic vegetable matter is used in a finely comminuted form, examples of which are any species of hard wood or pine wood, kelp, sugar-cane refuse, beet pulp, and the like, or mixtures thereof, but various other forms of cellulosic vegetable matter may be employed. In any event, the vegetable matter preferably is used in a green or saponaceous state, but in a dry form, that is free of mechanically mixed water.

15 The cellulosic vegetable matter is used in the proportion of from two to five per cent, by weight, to the oil being treated, but which proportions are subject to variation according to the character of the vegetable matter being used and also to the hydrocarbon being treated.

20 The temperatures to which the mixture of hydrocarbon and cellulosic vegetable matter is subjected is such as to produce vapors which pass off at temperature ranging from 580° to 650° Fahrenheit.

25 The pressures employed range from 100 to 140 pounds.

The time element varies according to circumstances; the materials being subjected to the temperature and pressure for whatever duration of time is necessary to accomplish the desired result.

Any suitable apparatus may be employed to carry the method into effect, but essentially involves a closed container fitted with a pressure gauge, a vapor temperature indicator, and having vapor and residuum draw-offs.

An example of the manner of carrying the invention into effect is as follows:

35 *Example 1.*—To a low boiling sulphur containing petroleum product of asphalt base and of a gravity of 15 Baumé, from which all fractions passing off above 650° Fahrenheit have been removed, is added two per cent, by weight, of comminuted cellulosic vegetable matter. The mixture is heated in a closed container until the temperature of resultant vapors reach about 580° Fahrenheit and under a pressure of about 140 pounds, which pressure and temperature are maintained for approximately one hour. During this cooking operation the cellulosic vegetable matter is reduced to charcoal and actions are set up in the mass resulting in breaking of the bond which links the sulphur to the hydrogen and carbon of the petroleum product, and at the same time the

asphalt has become converted into paraffin. The residual oil is then cooled to atmospheric temperature, and filtered to remove the charcoal. The resultant product is then washed in water, which effects removal of a large percentage of the sulphur originally contained in the petroleum, since the sulphur combines with the water and the latter is readily separated from the oil. The water washing of the oil may be carried to any desired extent. After having thus washed out a larger portion of the sulphur, such sulphur as remains in the oil may be readily removed by the usual treatment with sulphuric acid and caustic soda as ordinarily employed in removing simple sulphur compounds from oil. The resultant oil product will have a gravity above 40 Baumé, and will be free-flowing. No coke will be produced in this treatment.

By subjecting the oil product thus obtained to a refrigeration temperature, that is, below 32° Fahrenheit, it will be found that paraffin will be precipitated instead of asphalt, thus showing that the asphaltic oil has been converted into an oil of paraffin base.

Example 2.—Place low gravity asphaltic base oil of a specific gravity of 12 Baumé in a container equipped with a vapor pipe, together with two per cent, by weight, of the cellulosic vegetable matter, then apply heat to the mixture with the vapors confined until a pressure of from 100 pounds up to 140 pounds is reached, and the temperature of the vapors reaches 580° Fahrenheit, then draw off the vapors while maintaining the conditions of temperature and pressure constant, until thirty-five per cent of the oil has thus been taken off in the form of vapors. On condensing the vapors the condensate will be found to have a gravity of 60 Baumé, and will contain a large percentage of the sulphur which is readily removable by washing in water. The residual oil will have a gravity between 18 and 20 Baumé and will be free of coke, but will contain charcoal which is removed by filtration. Subjecting the residual oil to the refrigeration test, it will be found to be of paraffin base.

Example 3.—Take low gravity oil known as still residuum from which light oil lubricants have been distilled, with a gravity ranging from 15 to 18 Baumé. To this oil is added two per cent, by weight, of the cellulosic vegetable matter, whereupon the mixture is treated, as stated in the previous example, by subjecting the materials to a pressure of from 100 pounds to 140 pounds and to heat such as to cause the passing off of vapors at temperatures ranging from 580° to 650° Fahrenheit.

In this instance this condition of pressure and temperature is maintained until fifty per cent of the oil in the container has been vaporized, removed, and condensed. The condensate will have a gravity of 54 to 56 Baumé and from which most of its sulphur content can be removed by washing in water, and the remainder removed by the usual methods employed in oil refineries. The residual oil contains no petroleum coke, but will contain carbon resulting from decomposition of the cellulosic matter, which carbon is filtered out. This residual oil will have a gravity of 12 to 14 Baumé.

Example 4.—A further example consists in taking heavy low boiling petroleum of from 10 to 15 gravity Baumé and adding thereto from two to three per cent, by weight, of the cellulosic vegetable matter, subjecting the mass to heat such as to drive off vapors having a temperature

of from 580° to 650° Fahrenheit, and under a pressure ranging from 100 to 140 pounds; drawing off the vapor formed, and maintaining the pressures and temperatures until the liquid in the container is insufficient in quantity to maintain the pressure while drawing off the vapors. The vapors are condensed and washed as before described. The residuum oil will be found to have a gravity of from 4 to 7 Baumé, and will have the property of sinking in water, and when agitated, even when hot, will not emulsify with water. During the process of this example, coke will have been formed from the carbon of the cellulosic matter, and which solids are removed from the residual oil in a usual manner as by screening.

In each of the examples given, the residual oil produced will have a higher rate of flow or pour than the natural oils of the same gravity, and which rate of flow or pour due to the low viscosity of the residual oil is not materially reduced by decreasing temperatures until a point around freezing is reached.

The residual oil produced by each of the above examples are washed in water to effect removal of sulphur and may be fractioned into the ordinary cuts of lubricating oils.

Furthermore, the residual oil by reason of its extremely low gravity and high rate of flow renders it especially applicable for use in thinning hydrocarbons of such high viscosity as not to flow through conduits at atmospheric temperatures, and which ordinarily require the application of heat of approximately 180° Fahrenheit in order to permit of pumping. By intermixing with such a highly viscous hydrocarbon from 15 to 20 per cent of the residual oil obtained by my method, aforesaid, the thick or heavy hydrocarbon will have its rate of flow increased and its gravity reduced.

By subjecting heavy hydrocarbon together with cellulosic vegetable matter to the action of heat and pressure, as herein set forth, hydrocarbons of asphaltic base are converted into hydrocarbons of paraffin base; and the sulphur content of the hydrocarbon is converted into such form that it may be readily removed, at least in most part, by washing the products in water.

An important feature of the present invention resides in the fact that by this process high grade lubricating oils of paraffin base and of low gravity and viscosity may be produced from low grade petroleum of asphalt base and of high sulphur content.

However, any petroleum oil from which sulphur is hard to remove may be treated as herein set forth, whether of asphalt or paraffin base, since the essence of the invention resides in the production of a lubricating oil having the described properties from a low grade petroleum having a high sulphur content.

In carrying out the process the petroleum may be treated either in batches or by a continuous run.

I claim:

1. The method of conditioning low gravity petroleum oils for removal of sulphur therefrom, comprising subjecting the petroleum in a closed container together with cellulosic vegetable matter to a temperature sufficient to effect decomposition of the vegetable matter, effecting such treatment under a pressure not exceeding 140 pounds for sufficient length of time to effect breaking of the bond linking the sulphur to hydrogen and carbon in the oil whereby the sulphur may be readily removed from the resultant distillate

and residual oil at least in substantial part by washing with water.

2. The method of producing a hydrocarbon lubricating oil of paraffin base from a petroleum of asphaltic base, consisting in subjecting petroleum together with finely comminuted cellulosic vegetable matter in a closed container to a temperature sufficient to drive off vapors having a temperature of from 580° to 650° Fahrenheit and to develop a pressure of from 100 to 140 pounds within the container, separating the vapors and residual oil, filtering the oil, and washing the oil in water.

3. The method of treating sulphur containing petroleum of asphaltic base, to effect removal of sulphur and produce a residual oil of paraffin base, consisting in subjecting the petroleum in a closed contained together with cellulosic vegetable matter to a cooking action under pressure for such length of time and at such temperature as to reduce the vegetable matter to carbon and to cause breaking of the bond linking the sulphur to the hydrogen and carbon in the petroleum, separating the resultant distillates and residual oil, filtering the oil and washing it in water.

4. The method of treating sulphur containing low gravity petroleum of asphaltic base to produce lubricating oil of paraffin base, consisting

in adding a quantity of comminuted cellulosic vegetable matter to the petroleum in the proportion of from two to five per cent, by weight, of the vegetable matter relative to the petroleum; subjecting the mixture to heat such as to drive off vapors at a temperature of from 580° to 650° Fahrenheit, and to a pressure of from 100 pounds to 140 pounds in a closed container for such length of time as to decompose the vegetable matter and effecting breaking of the bond linking sulphur to hydrogen and carbon in the petroleum, separating the resultant distillates and residual oil, and filtering the oil.

5. A process for obtaining a hydrocarbon oil of paraffin base from a low gravity petroleum oil of asphaltic base requiring treatment to effect removal of sulphur, comprising adding comminuted cellulosic vegetable matter to the petroleum oil, effecting decomposition of the vegetable matter in the petroleum by the action of heat of less than cracking temperature, maintaining the mass and generated vapors under pressure and at said heat for a sufficient length of time to cause breaking of the bond linking sulphur to hydrogen and carbon in the petroleum, separating the vapors and residual oil, screening the oil and washing it in water.

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