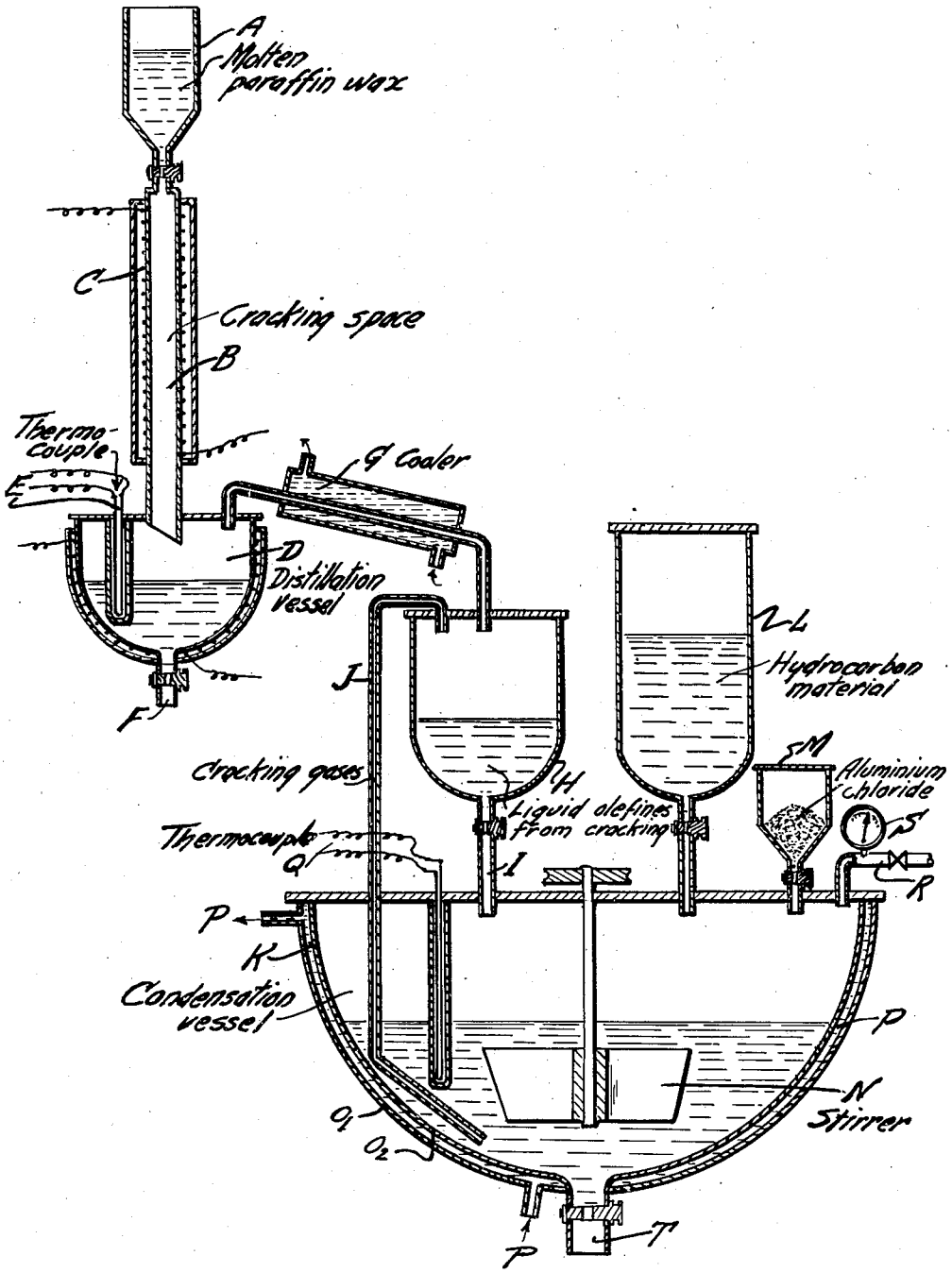
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PRODUCTION OF HIGH QUALITY LUBRICATING OILS

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PRODUCTION OF HIGH QUALITY LUBRICATING OILS

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The present invention relates to the production of high quality lubricating oils.

We have found that high quality lubricating oils are obtained by condensing, in the presence of condensing agents, and, if desired, while supplying heat and adding gaseous olefines, two different liquid hydrocarbons, one being liquid higher aliphatic olefines, such as aliphatic olefines containing more than five carbon atoms in the molecule or mixtures essentially comprising the same, and the second being liquid hydrocarbons capable of undergoing condensation or polymerization reactions under the influence of aluminum chloride, that is, unsaturated hydrocarbons different from said liquid olefines, or cyclic hydrocarbons. Mixtures containing said unsaturated or cyclic hydrocarbons as essential constituents with some paraffinic hydrocarbons can also be advantageously employed.

The said liquid olefines may be obtained by cracking higher paraffinic hydrocarbons, i. e., paraffinic hydrocarbons containing more than five carbon atoms in the molecule as, for example, by cracking solid paraffins or paraffinic oils at temperatures ranging from about 450 to 500° C. or more, under elevated pressures and, if desired, with the addition of methane, or by dehydrating aliphatic alcohols or by other known methods.

The said other condensable hydrocarbons may, on the other hand, be supplied by the use of tars, mineral oils or their liquid distillation, extraction or cracking products of a nature different from said liquid olefines or the destructively hydrogenated products of coals, tars, mineral oils and the like. Hereinafter and in the claims coals, tars, mineral oils and the like are referred to as bituminous materials.

In carrying out the condensation, it is preferable not to mix the single initial materials before the addition of the condensing agent, but first to bring together one of the components with the condensing agent and to effect a partial condensation preferably at the temperature most favorable for the purpose, the other component then being added, and the treatment completed, if desired at a temperature most favorable for the condensation then proceeding. The most favorable temperature in each case may be readily ascertained by a preliminary experiment on a small scale. The temperature employed will usually be below 150° C. For example, starting with the condensation of liquid olefines, the amount of heat set free is usually sufficient to produce the most favorable reaction temperature. When the other components are then added, as for example a brown coal tar oil freed from phenol, it is preferable to supply heat since the further condensation usually necessitates a higher temperature than the first phase. However, when starting with tar oil and adding the condensing agent it is preferable to supply heat in order to attain the most favorable reaction temperature; when liquid olefines are added after the condensation, the external supply of heat is usually no longer necessary for the further course of the condensation process. Temperatures of up to 200° C. or sometimes higher have proved advantageous in practice.

According to the present invention, gaseous olefines, as, for example ethylene, propylene, butylene, such as are formed for example by the cracking of hydrocarbons may be employed conjointly, for example they may be led in during the condensation process.

Further, the process may be carried out by exposing each of the components to the action of the condensing agent singly, the resulting products including the condensing agents then being combined and further treated at a suitable temperature.

The process according to the present invention may be carried out at atmospheric or increased pressure. Anhydrous halides, which give rise to a considerable evolution of heat when mixed with water, such as aluminium chloride, ferric chloride, zinc chloride, tin tetrachloride, boron fluoride, anhydrous hydrofluoric acid and the like or complex acids, as for example zinc chloride-acetic acid, or boric acid-oxalic acid, are suitable as condensing agents. Bleaching earths, such as a naturally occurring bleaching earth of large surface, essentially consisting of aluminum hydrosilicate activated with aqueous hydrochloric acid may also be employed.

In some cases it may be preferable to carry out the single stages of the treatment with different condensing agents as for example first to treat the liquid olefines with boron fluoride and then, after the addition of the other component, further to condense with aluminium chloride, or

vice versa according to the nature of the material treated.

The expression "condensation" where employed in the present application also includes "polymerization" within its scope.

The invention will be more fully explained with reference to the accompanying drawing which shows a sectional elevation in a partly diagrammatic manner of an apparatus suitable for carrying out the process.

Molten paraffin wax, contained in the receptacle A, is continuously introduced into the cracking space B which is heated by means of the electrical heating C to cracking temperature. The products arising from the cracking are heated in the distillation vessel D the temperature in which is controlled by means of thermocouple E. Unconverted paraffin wax can be removed through the outlet pipe F and may be reintroduced into receptacle A. The products vaporized in vessel D are cooled in the cooler G from which the liquefied portion consisting mainly of olefines is collected in receptacle H from where it is passed into the condensation vessel K by way of the pipe I. From the receptacle M aluminium chloride is introduced into the vessel K where it is mixed with the liquid material by means of the stirrer N. The cracking gases containing the constituents not liquefied in the cooler G are passed through pipe J into the liquid mass, if desired under pressure. The condensation vessel K which will resist a pressure of some atmospheres has double walls O_1, O_2 between which a heating or a cooling liquid P is circulated securing a suitable temperature which is controlled by means of the thermo-couple Q. After the liquid cracking product has been condensed for a certain period of time a different hydrocarbon material which is stored in receptacle L, is added to the reaction material present in vessel K and mixed therewith by means of the stirrer N. Then the condensation is completed, if desired after adding a further quantity of aluminium chloride from receptacle M. The temperature is regulated by means of the liquid P. Any gaseous constituents from the cracking stage introduced through pipe J which do not react with the condensation mixture leave the vessel K through pipe R. The pressure in the vessel K is controlled by the manometer S. After finishing the condensation the condensation product is reremoved from the vessel R through the outlet T together with the aluminium chloride sludge formed from the catalyst.

The following examples will further illustrate the nature of this invention but the invention is not restricted to these examples. The parts are by weight.

Example 1

8 parts of aluminium chloride are gradually added at from 60° to 80° C. without any external supply of heat and if necessary while cooling to 100 parts of a cracking product having an iodine value of 215 obtained by cracking solid paraffin, while stirring. After the addition of the last fraction of aluminium chloride, when considerable evolution of heat no longer occurs, 200 parts of a destructive hydrogenation product of brown coal tar boiling from 225° to 325° C. are introduced into the reaction product, and the whole is further treated at about 105° C. with the supply of heat and while gradually adding a further 16 parts of aluminium chloride. When the condensation is completed, the contents of the reaction vessel are poured into an aqueous solution of common salt in order to decompose the compound of aluminium chloride and hydrocarbon and the oil is washed with water to which a little common salt has preferably been added to prevent the formation of emulsions. The oil is then dried and subjected to a fractional vacuum distillation. In addition to an oil obtained as first runnings, 180 parts of lubricating oil are obtained of which 100 parts boil at from about 200° to 300° C. (1 millimeter mercury gauge) and have a viscosity of 8.3° Engler at 50° C. and 80 parts boil above 300° C and have the properties of a hot steam cylinder oil (flash point 323° C., viscosity 10.3° Engler at 100° C.). The two products mixed together yield an oil which when adulterated with an ordinary gas machine oil has the quality of a good motor oil.

Example 2

200 parts of a cracking product having the properties described in Example 1 are treated in the same way with 16 parts of aluminium chloride. 100 parts of a fraction of a brown coal tar oil boiling at from 200° to 300° C. and freed from paraffin wax and phenol are then introduced together with a further 8 parts of aluminium chloride and the whole is stirred for some hours at from 80° to 90° C., 5 parts of gaseous olefines (propylene and butylene) then being led in at 105° C. When the absorption is completed the reaction product is worked up as described in Example 1. In addition to first runnings of oil, 239 parts of lubricating oil are obtained of which 135 parts boil above 300° C. (1 millimeter mercury gauge) and have the properties of a hot steam cylinder oil (flash point 338° C., viscosity 6.3° Engler at 100° C.).

Example 3

100 parts of a fraction boiling between 200° and 325° C. which is derived from a product obtained by cracking brown coal tar oil and which has been treated for 4 hours at 160° C. with 4 parts of bleaching earth is added to 100 parts of a product obtained by cracking paraffin wax, which product has the properties described in Example 1 and which has been treated for 2 hours at 60° C. with 2 parts of aluminium chloride. After addition of 2 parts of aluminium chloride the mixture is then subjected to condensation for about from 2 to 3 hours at a temperature of from 120° to 130° C. The condensation product is freed from the solid residue formed, then treated, while stirring, for 2 hours at about 100° C. with 1 part of bleaching earth and distilled under a pressure of 1 millimeter mercury gauge. After distilling off the first runnings and the spindle oil, 120 parts of a highly viscous lubricating oil are obtained of which 75 parts boil about 300° C. under a pressure of 1 millimeter mercury gauge and have the properties of a hot steam cylinder oil (a flash point of 325° C. and a viscosity of 6.2° Engler at 100° C.).

Example 4

100 parts of a product obtained by cracking paraffin wax which has the properties described in Example 1 are condensed for 2 hours at 80° C. with 4 parts of anhydrous iron chloride, then mixed with 4 parts of aluminium chloride and 100 parts of a product obtained by cracking American gas oil under mild conditions and which boils between 200° and 330° C. The mixture is condensed for 4 hours at 150° C. The condensation product is then worked up as described in Example 1 and yields by distillation under a pressure

of 1 millimeter mercury gauge, in addition to the first runnings and spindle oil, 130 parts of highly viscous oils which may be fractionated by distillation into motor oil and hot steam cylinder oil or which, when mixed with oils of a moderate temperature viscosity curve, give a very valuable motor oil.

Example 5

7.5 parts of anhydrous aluminium chloride are added at 125° C. within a time of 45 minutes to 100 parts of a mixture of liquid olefines obtained by cracking a soft paraffin wax under pressure. After addition of further 100 parts of a product obtained by destructive hydrogenation of brown coal tar and having the properties described in Example 1 the mixture is subjected to further condensation at 90° C. for several hours. The crude lubricating oil obtained may be worked up in the manner described in Example 1. When subjecting it to distillation under a pressure of 1 millimeter mercury gauge, in addition to 60 parts of first runnings, 130 parts of lubricating oil are obtained which by distillation may be fractionated with good yields into motor oil and hot steam cylinder oil, both of excellent qualities.

Example 6

Gaseous olefines are introduced at 60° C. into a suspension of 30 parts of anhydrous aluminium chloride in 200 parts of hexane for such a long period that the whole of aluminium chloride is converted into a compound thereof with the said olefines. The hexane is then separated off and 300 parts of liquid olefines obtained by cracking soft paraffin wax at 480° C. and under a pressure of 5 atmospheres in the presence of methane, are added, whereupon the mixture is subjected to partial condensation at 125° C. for about 45 minutes. 300 parts of a product obtained by destructive hydrogenation of brown coal tar and boiling between 240° and 340° C. are then added to the partially condensed product, the mixture being subjected to further condensation for one hour at 90° C. When working up the products of first runnings 450 parts of lubricating oils are obtained which by distillation may be fractionated into valuable motor oils and hot steam cylinder oils.

What we claim is:—

1. A process for the production of lubricating oil from two different liquid hydrocarbons of which one comprises liquid higher aliphatic olefines of the type derived from the cracking of paraffin wax and the second comprises substantial quantities of liquid hydrocarbons of the types derived by pyrogenous conversions of bituminous materials other than paraffin wax, said liquid hydrocarbons being different from said liquid olefines and capable of undergoing condensation or polymerization reactions under the influence of aluminum chloride which comprises separately partially condensing at a temperature between ordinary temperature and 150° C. at least one of said liquid hydrocarbons in the presence of a condensing agent, mixing the two hydrocarbons and completing the condensation of the mixture at a temperature between ordinary temperature and 150° C.

2. A process for the production of lubricating oils from two different liquid hydrocarbon mixtures of which one comprises the mixture of higher aliphatic olefines derived by cracking paraffin wax and the second comprises a liquid hydrocarbon mixture containing substantial quantities of liquid hydrocarbons of the types derived by pyrogenous conversions of bituminous materials other than paraffin wax, said mixture being different from the mixture of said liquid olefines and capable of undergoing condensation or polymerization reactions under the influence of aluminum chloride which comprises separately partially condensing at a temperature between ordinary temperature and 150° C. at least one of the said liquid hydrocarbon mixtures in the presence of a condensing agent, combining the two mixtures and then completing the condensation of the resulting mixture at a temperature between ordinary temperature and 150° C.

3. A process for the production of lubricating oil from two different liquid hydrocarbon mixtures of which one comprises liquid higher aliphatic olefines of the type derived by cracking paraffin wax and the second comprises substantial quantities of unsaturated liquid hydrocarbons of the types derived by pyrogenous conversions of bituminous materials other than paraffin wax, said unsaturated hydrocarbons being different from said liquid aliphatic olefines which comprises separately partially condensing at a temperature between ordinary temperature and 150° C. at least one of said liquid hydrocarbon mixtures in the presence of aluminum chloride, combining the two mixtures and then completing the condensation of the resulting mixture at a temperature between ordinary temperature and 150° C.

4. The process as defined in claim 3 wherein said second mixture is a mineral oil containing substantial amounts of unsaturated hydrocarbons different from said liquid aliphatic olefines.

5. A process for the production of lubricating oil from two different liquid hydrocarbon mixtures of which one comprises liquid higher aliphatic olefines obtained by cracking paraffin wax at a temperature between 450 and 500° C. and the second comprises substantial quantities of liquid hydrocarbons of the types derived by pyrogenous conversions of bituminous materials other than paraffin wax, said hydrocarbons being different from said liquid olefines and capable of undergoing condensation or polymerization reactions under the influence of aluminum chloride which comprises separately partially condensing at a temperature between ordinary temperature and 150° C. said liquid higher aliphatic olefines in the presence of aluminum chloride, mixing the partially condensed product with said second mixture and then completing the condensation of the resulting mixture at a temperature between ordinary temperature and 150° C.

6. A process for the production of lubricating oil from two different hydrocarbon mixtures, one of which comprises higher liquid aliphatic olefines obtained by cracking paraffin wax and the second comprises liquid cyclic hydrocarbons of the types derived by destructive hydrogenation of bituminous materials which comprises separately partially condensing at a temperature between ordinary temperature and 150° C. at least one of the said mixtures in the presence of aluminum chloride, combining the partially condensed material with said other mixture and completing the condensation of the resulting mixture at a temperature between ordinary temperature and 150° C.

7. The process as defined in claim 6 wherein said liquid cyclic hydrocarbons are derived from the destructive hydrogenation of bituminous materials.

8. The process as defined in claim 6 wherein

the liquid aliphatic olefines are first partially condensed.

9. The process as defined in claim 2 wherein the complete condensation is effected while passing gaseous olefines into the mixture undergoing condensation.

10. A process for the production of lubricating oil, which comprises gradually adding anhydrous aluminium chloride to a liquid olefinic cracking product of paraffin wax, while maintaining a temperature of between 60° and 80° C., adding a product of the destructive hydrogenation of brown coal tar and condensing further at a temperature of about 105° C.

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