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PROCESS OF PRODUCING MOTOR FUELS BY DESTRUCTIVE HYDROGENATION OF CARBONACEOUS MATERIAL

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By the destructive hydrogenation of solid non-asphaltic carbonaceous materials such as various kinds of pyrobituminous materials such as coal, especially brown-coal containing a high content of "bitumen", motor fuels, especially hydrocarbons of low boiling point, such as benzine, are obtained which are very liable to "knock".

We have now found that "knocking" of the said motor fuels is due to the presence of liquid hydrocarbon products of low boiling point formed by the destructive hydrogenation of the "bitumen" of the coal and the primary conversion products of the former such as paraffin wax and that excellent motor fuels, which are not inclined to knocking, are obtained from bituminous, and even highly bituminous kinds of coal, especially brown-coal when working under such conditions that the "bitumen" itself or its primary conversion products such as paraffin wax are not converted, or only to a slight extent, into low-boiling products, especially benzine, whereas the other constituents of the coal are converted to a large extent into such products. The term "bitumen" is intended to include for the purposes of the present invention all those constituents which can be extracted from the coal by means of a solvent of the nature of benzene and its equivalents. The process according to the present invention may be carried out in various ways.

An advantageous method of procedure is to eliminate the "bitumen", which expression is also intended to include its primary conversion products, prior to, or during any intermediate stage in, the treatment of the bituminous material.

The "bitumen" may be removed in any convenient manner, for example by extracting the raw material with benzene or similar solvents at atmospheric or elevated pressure. The resulting coal, free from or low in "bitumen" is then treated with hydrogen at elevated pressure and temperature, with or without catalysts and, under these conditions, a satisfactory non-knocking motor fuel is obtained.

The removal of the "bitumen" or its primary conversion products such as paraffin waxes, may also be effected in an intermediate stage of the treatment by separation, for example by cooling to low temperatures, from the rather heavy oils of approximately middle-oil character, that is to say such boiling mainly between about 200° and 325° C. obtained in the first stage of the process.

According to this manner of working, the heavy oils of approximately middle oil character are obtained without a substantial conversion of the "bitumen" by treating the pyrobituminous material under the mildest of the conditions of destructive hydrogenation capable of producing liquefaction of the pyrobituminous material in a reasonable time, that is, at a temperature near the lower end of the usual range of 300 to 700° C. and at a pressure near the lower end of the pressure range beginning at the usual 20 atmospheres, with, of course, an excess of hydrogen.

The valuable "bitumen," or its conversion products such as paraffin wax, recovered in the process may be further treated for any convenient purposes, or be employed directly.

The following example further illustrates how the invention may be carried out in practice but the invention is not restricted thereto.

Example 1

Brown-coal, containing 8 to 10 per cent of "bitumen" and furnishing, on treatment with hydrogen at an elevated temperature of about 425° C. and under a pressure of about 200 atmospheres in the presence of a catalyst prepared from molybdic acid and zinc oxide, a benzine exhibiting a tendency to "knock" in an internal combustion engine with the ratio of compression, that is to say the ratio between the volume of the cylinder at the end of the compression stroke and the volume of the cylinder at the beginning of the compression stroke 1:5, is freed wholly or for the most part from "bitumen" by extraction with benzene. The benzine then obtained by destructive hydrogenation under the same conditions does not knock under the same conditions of compression.

Instead of removing the "bitumen" prior to the hydrogen treatment, the products obtained from the "bitumen" during the treat-

ment of the coal with hydrogen by stages can be removed in any intermediate stage. For example, the coal may be extensively converted into middle oils which are cooled to a low temperature, say to about 40° to 60° C. below zero, so that the "bitumen" or paraffin wax can be removed in the solid form and the product thus freed from "bitumen" is then converted into benzine.

What we claim is:

1. A process for the production of motor fuels not inclined to knocking from a solid non-asphaltic pyrobituminous material having a high "bitumen" content which comprises removing substantially only the "bitumen" from said material and thereupon subjecting the resulting residue to destructive hydrogenation.

2. A process for the production of motor fuels not inclined to knocking from a solid non-asphaltic pyrobituminous material having a high "bitumen" content which comprises extracting the "bitumen" from said material with the aid of a solvent of the nature of benzene and thereupon subjecting the resulting residue to destructive hydrogenation.

3. A process for the production of motor fuels not inclined to knocking from a solid non-asphaltic pyrobituminous material having a high "bitumen" content which comprises extracting the "bitumen" from said material with the aid of a benzene hydrocarbon and thereupon subjecting the resulting residue to destructive hydrogenation.

4. In the process for producing non-knocking motor fuels by destructive hydrogenation of solid non-asphaltic pyrobituminous materials having a high "bitumen" content under pressure, the steps of effecting removal of the "bitumens" in a substantially unconverted state prior to the completion of the hydrogenation and completing the hydrogenation of the "bitumen" free material.

5. The process for the production of non-knocking motor fuels from solid non-asphaltic pyrobituminous materials having a high "bitumen" content which comprises extracting the "bitumens" from said materials by a treatment with benzene under an elevated temperature and pressure and subjecting the residual materials to destructive hydrogenation.

6. The process as defined in claim 5 wherein the solid non-asphaltic pyrobituminous material is brown coal.

In testimony whereof we have hereunto set our hands.

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