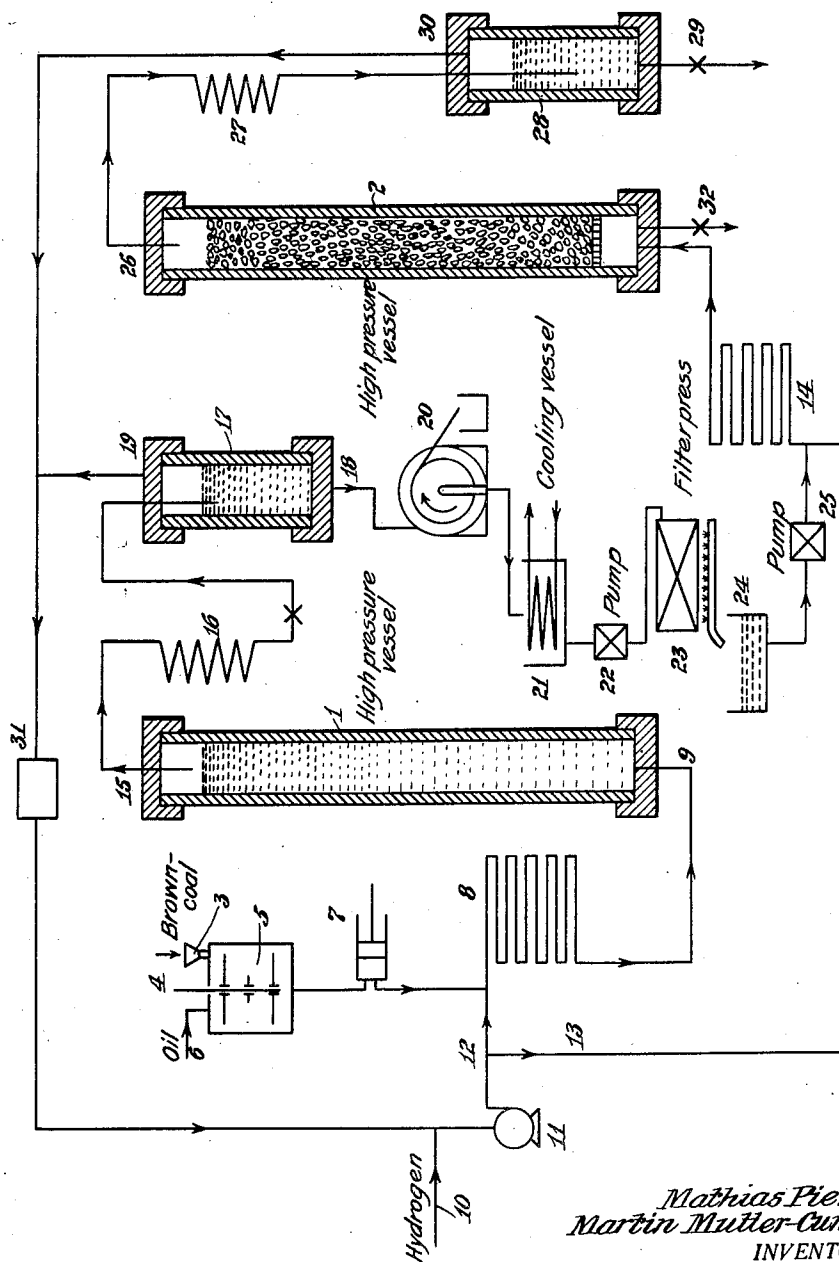


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PROCESS OF PRODUCING MOTOR FUEL BY DESTRUCTIVE
HYDROGENATION OF CARBONACEOUS MATERIALS
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Mathias Pier
Martin Muller-Cunradi
INVENTORS.

BY
Hauff & Warland
ATTORNEYS.

UNITED STATES PATENT OFFICE

MATHIAS PIER, OF HEIDELBERG, AND MARTIN MÜLLER-CUNRADI, OF LUDWIGSHAFEN-ON-THE-RHINE, GERMANY, ASSIGNORS TO I. G. FARBENINDUSTRIE AKTIENGESellschaft, OF FRANKFORT-ON-THE-MAIN, GERMANY, A CORPORATION OF GERMANY

PROCESS OF PRODUCING MOTOR FUEL BY DESTRUCTIVE HYDROGENATION OF CARBONACEOUS MATERIALS

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By the destructive hydrogenation of solid non-asphaltic carbonaceous materials, such as various kinds of pyrobituminous materials like 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 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 substances of the nature of benzene and its equivalents.

According to the present invention the "bitumen", which expression is also intended to include its primary conversion products, is eliminated during an intermediate stage in the treatment of the bituminous material.

Thus, 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, 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. This separation may be effected for example by cooling to low temperatures whereby the main portion of the "bitumens" is precipitated out in a solid or semi-solid form.

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 initial destructive hydrogenation in which the pyrobitumens are extensively converted into middle oils boiling between 200 and 325° C. is carried out under milder conditions than those usually employed in destructive hydrogenation for the production of low boiling hydrocarbons and are capable of producing liquefaction of the material in a reasonable time, that is at temperatures near the lower end of the usual range of 300 to 700° C. and at pressures near the lower end of the pressure range beginning at the usual 20 atmospheres, with, of course, an excess of hydrogen.

The nature of the present invention will be further described with reference to the accompanying drawing, which shows a form of apparatus particularly suitable for carrying out the process according to the present invention but the invention is not restricted to operations carried out in the said apparatus.

Referring now to the drawing in detail numerals 1 and 2 denote hydrogenation vessels capable of withstanding high pressure. In vessel 1 the destructive hydrogenation is carried out under mild conditions as regards temperature and pressure whereas in vessel 2 more rigorous conditions are employed. Finely divided brown coal is fed through bunker 3 into the mixer 5 where it is mixed by means of a stirring device 4 with oil introduced by pipe 6. The mixture of brown coal and oil is then pumped by means of the pump 7 from mixer 5 into the preheater 8 in which it is preheated together with hydrogen, whereupon it may be introduced at 9 into the first hydrogenating vessel 1. Hydrogen is supplied from pipe 10 and is passed by way of pump 11 into the pipes 12 and 13 leading to the preheaters 8 and 14 respectively. The materials leaving vessel 1 at 15 are led into the condenser 16, wherein the vapors are condensed, and then into the separator 17 from which the gaseous products may be withdrawn at 19 whereas the mixture of liquid and solid products is removed at 18 and supplied to the centrifuge 20 in which part of the solid products is separated from said

mixture. The liquids containing the remainder of solid substances, among the latter also the solid and semi-solid bitumens, are then conveyed into the cooling bath 21 maintained at a temperature of from 20° to 40° C. below zero, if desired even at still lower temperatures. In this bath the main portion of the bitumens precipitate out and, after passage through pump 22 may be separated from the liquids in the filter press 23. The liquid products issuing from the filter press are collected in the container 24 and from thence passed through pump 25 into the preheater 14 in which they are preheated together with hydrogen. The preheated mixture of liquids and hydrogen is then subjected to destructive hydrogenation in vessel 2. The hydrogenated products leave vessel 2 at 26 and are passed into condenser 27 and then into separator 28. The condensed products are withdrawn at 29. The uncondensed gases leave the separator at 30 and may be recycled to the process together with the gases issuing at 19, if desired after removing therefrom the gases other than hydrogen by cooling to very low temperatures in vessel 31. Sludges formed during the destructive hydrogenation treatment in vessel 2 may be removed at 32.

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

Example

Brown-coal, containing 8 to 10 per cent of "bitumen" and furnishing, on treatment with hydrogen at elevated temperature and under pressure, a benzine exhibiting a tendency to "knock" in an internal combustion engine with a high ratio of compression, that is to say the ratio of the cylinder volume in the compressed state to that in the expanded state, is freed from "bitumen" wholly or for the most part, by extraction with benzene. The benzine then obtained by destructive hydrogenation 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 treatment 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, so that the "bitumen" or paraffin wax can be removed in the solid form and the remainder is then converted into benzine.

This is a divisional application of Ser. No. 233,312 filed November 14, 1927.

What we claim is:—

1. A process for the production of non-knocking motor fuels from non-asphaltic pyrobituminous materials having a high con-

tent of "bitumens" which comprises subjecting said materials to destructive hydrogenation conditions milder than those usually employed in the production of low boiling hydrocarbons to cause an extensive conversion of said materials to middle oils boiling between 200 and 350° C. without a substantial conversion of said "bitumens", cooling the resulting oils to low temperatures to effect a precipitation of substantially all the unconverted "bitumens" in a solid and semi-solid state, separating said precipitated constituents and subjecting the oils freed from said constituents to a more energetic destructive hydrogenation.

2. A process for the production of non-knocking motor fuels from non-asphaltic pyrobituminous materials having a high "bitumen" content which comprises subjecting said materials to conditions milder than those usually employed in destructive hydrogenation for the production of low boiling hydrocarbons at a temperature near the lower end of the usual destructive hydrogenation range and a pressure near the lower end of the usual destructive hydrogenation pressure range so as to effect liquefaction of said materials to oils in a reasonable time without effecting a substantial conversion of said "bitumens", cooling the resulting oils to cause a precipitation of substantially all the unconverted "bitumens" in a solid and semi-solid state, separating said precipitated constituents and subjecting the oils freed from said constituents to a more energetic destructive hydrogenation to produce low boiling hydrocarbons.

3. A process as defined in claim 2 wherein said pyrobituminous materials comprise brown coal having a high "bitumen" content.

In testimony whereof, we affix our signatures.

MATHIAS PIER.

MARTIN MÜLLER-CUNRADI.