

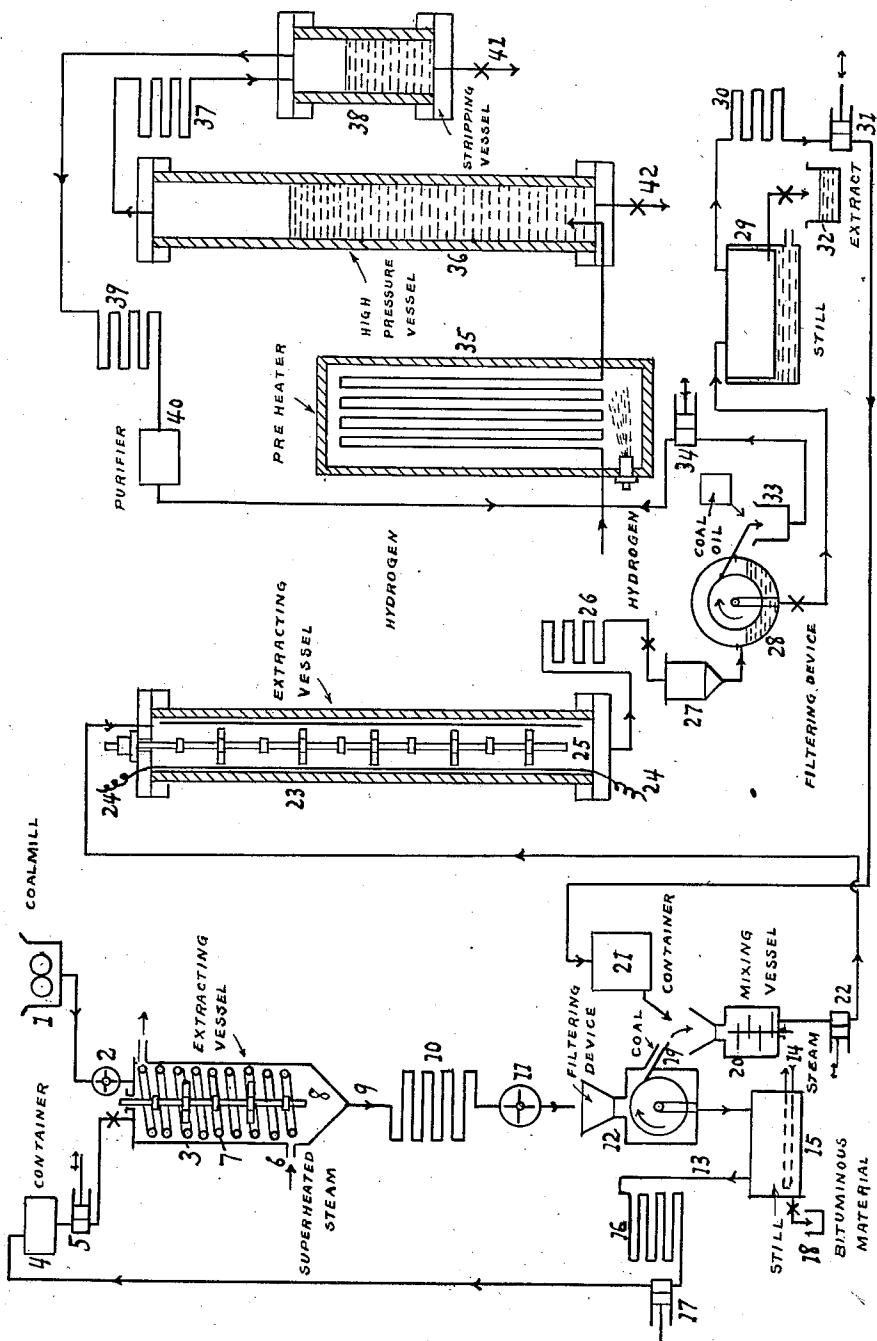
June 21, 1932.

M. PIER ET AL

1,864,496

PRODUCTION OF NONKNOCKING MOTOR FUELS

Filed July 25, 1929



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PRODUCTION OF NONKNOCKING MOTOR FUELS

Application filed July 25, 1929, Serial No. 381,063, and in Germany August 22, 1928.

This invention relates to improvements in the production of non-knocking motor fuels from solid non-asphaltic pyrobituminous materials.

A process has already been proposed for obtaining non-knocking motor fuels by the destructive hydrogenation of solid non-asphaltic pyrobituminous materials, such as bituminous coals and even such rich in "bitumens" by taking care that the "bitumen," which term also comprises its primary conversion products are not appreciably converted into products of low boiling point range, which can be effected by extracting the "bitumen" before the destructive hydrogenation, for example, with solvents, which are usually organic and which may be of aromatic nature, or by removing it at an intermediate stage of the said destructive hydrogenation in the form of solid paraffin wax or the like, the destructive hydrogenation being carried out under such mild conditions so long as "bitumens" or their conversion products are present in the materials under treatment, that no substantial conversion of "bitumens" or their primary conversion products takes place thereby. The term "bitumen" is intended to include for the purposes of the present invention all those constituents which can be extracted from the pyro-bituminous material by means of a solvent of the nature of benzene and its equivalents.

We have now found that it is particularly suitable to carry out the said process by removing the "bitumens" or their primary conversion products in stages, each stage being, preferably, carried out under conditions more rigorous than that preceding it and subjecting the residue to destructive hydrogenation. If the said removal be effected by extraction with solvents, the increase in the rigor of the successive stages may be effected by increasing the temperature, the pressure or the duration of the treatment or the quantity of the solvent, or any of these methods combined. Different solvents may be employed for each stage if desired. In this manner fractions of "bitumens" or their primary conversion products of different kinds are obtained which can each be treated by themselves and thus

yield valuable conversion products, for example solid paraffin wax, lubricating oils of different consistencies, benzene and the like. Thus for example, the separate products obtained, may be extracted by means of aromatic solvents under ordinary pressure, or they may be subjected to destructive hydrogenation, or to low temperature carbonization or they may be refined by distillation.

The accompanying drawing shows diagrammatically an elevation of a plant which is particularly advantageous for carrying out the process according to the present invention.

Referring to the drawing in detail coal is supplied from the coal mill 1 by way of conveyor wheel 2 into the extracting vessel 3 in which it is treated with benzene pumped in from container 4 by pump 5. Superheated steam is introduced at 6 into the coils 7. The stirrer 8 provides for a thorough stirring of the treated materials. The materials are then withdrawn from the vessel 3 at 9 and then passed by way of cooler 10 and conveyor wheel 11 into the filtering device 12 in which the solid coal is separated from the liquid matter. This liquid matter is then subjected to distillation in the still 15 heated by steam introduced at 14. The benzene vapors are carried off through pipe 13 and condensed in the condenser 16, the condensate being recycled by means of pump 17 into the container 4. The residue resulting in the said distillation which consists mainly of bituminous materials extracted from the coal is collected in container 18. The coal separated in the filtering device 12 is withdrawn at 19 and mixed in the mixing vessel 20 with a heavy oil from container 21. The mixture is then pumped by pump 22 into the second extracting vessel 23 heated by electrical means 24. Stirrer 25 provides for a thorough stirring of the treated materials. When the extraction is completed the materials are passed into the cooler 26 and from thence into the container 27. In the filtering device 28 the coal is separated from the liquid materials, the latter then being conveyed to the still 29 in which the heavy oil is separated from the extract. The heavy oil vapors are condensed

in the condenser 30 and recycled to the container 21 by pump 31. The extract is collected in vessel 32. The coal separated in the filtering device 28 is mixed with oil in the vessel 33, the mixture being introduced by means of pump 34 into the preheater 35. Initial hydrogen is joined with the said mixture of coal and oil at a point before the preheater 35. The preheated materials are then supplied into the high pressure vessel 36 in which they are subjected to destructive hydrogenation. The vapors issuing from the vessel 36 are passed into the condenser 37 in which the condensable portions are liquefied. The liquids are collected at the bottom of the stripping vessel 38. The uncondensed materials are joined with the initial hydrogen, if desired after having passed a second condenser 39 and a purifier 40. The liquids collected in the stripping vessel 38 are withdrawn at 41. Any sludge formed during the destructive hydrogenation is removed from vessel 36 at 42.

The following example will further illustrate the nature of this invention, but the invention is not restricted to this example.

Example

Two parts of brown coal rich in "bitumen" are extracted for about from $\frac{1}{2}$ hour to $\frac{3}{4}$ hour with 4 parts of benzene at ordinary or slightly elevated pressure, say 12 atmospheres, and at about 200 to 250° C. "Bitumen" is dissolved out to the extent of from 5 to 15 per cent of the initial carbon content and a product is obtained which can be worked up for example into Montan wax or into solid paraffin wax.

This may be carried out by distilling off the solvent, and if desired treating the product with chromic acid.

Two parts of the residue are then further extracted with 3 parts of a heavy oil, for example anthracene oil, at about 200 atmospheres, at a temperature varying from about 380° to 400° centigrade, 40 to 80 per cent of the original coal content being thus removed in all. The duration of this extraction is about 1 hour and should preferably not exceed 1 hour and a half. The extract can be worked up into lubricating oil by destructive hydrogenation with condensing catalysts. This extraction may be followed by a third extraction at still higher pressure and temperature, for example at pressures of up to about 1000 atmospheres or more, for example 5000 atmospheres and at temperatures of up to about 450° centigrade.

Finally a product remains, which only contains from 30 to 50 per cent or even less of the original carbon content, and this is destructively hydrogenated under elevated pressure, for example at about 200 atmospheres or more, and even 1000 or 5000 atmospheres with hydrogen at a temperature

of from 440° to 450° centigrade in the presence of a catalyst prepared from molybdic acid and zinc oxide. Benzine and in some cases also even middle oils and lubricating oils can be recovered from the liquid product by distillation after removal of the ashes.

What we claim is:

1. A process for the production of non-knocking motor fuels from brown coal rich in "bitumen", which comprises subjecting the said brown coal to a treatment by extraction with benzene at pressures ranging between about 1 and 12 atmospheres and at temperatures of between about 200 and 250° C., then subjecting the residue to a further extraction with anthracene oil at about 200 atmospheres and at a temperature varying from about 380° to 400° C., then subjecting the residue to a further extraction at pressures up to about 1000 atmospheres and at temperatures of up to about 450° C., and finally subjecting the residue to destructive hydrogenation at a temperature of about 440 to 450° C. and at a pressure of about 200 atmospheres in the presence of a catalyst prepared from molybdic acid and zinc oxide.

2. A process for the production of non-knocking motor fuels from non-asphaltic pyro-bituminous materials having a high "bitumen" content which comprises subjecting the materials to a treatment by extraction with aromatic solvents in at least two successive stages, the first stage being carried out under a high pressure and at a high temperature to extract "bitumens" suitable for producing paraffin wax, subjecting the extracted residue to extraction at a higher temperature and pressure to produce a product suitable for condensation into lubricating oils and finally subjecting the residue to destructive hydrogenation to produce low boiling hydrocarbons.

3. A process as defined in claim 2 wherein the pyrobituminous material is brown coal.

4. A process for the production of non-knocking motor fuels from brown coal having a high "bitumen" content which comprises subjecting said coal to an extraction treatment with benzene at an elevated temperature and pressure to extract "bitumens" suitable for producing paraffin wax, subjecting the extracted residue to extraction at a higher temperature and pressure with anthracene oil to produce a product suitable for condensation into lubricating oils and finally subjecting the residue to destructive hydrogenation to produce low boiling hydrocarbons.

In testimony whereof we have hereunto set our hands.

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