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PROCESS OF PREPARING HYDROCARBONS.

No Drawing.

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This invention relates to the preparation of hydrocarbons and will be fully understood from the following description.

It has been previously proposed to make up compositions of oil and disintegrated coal or the like, but these however are inapplicable for many purposes, being relatively low in hydrogen content, and for example where distilled result in yields largely of unsaturated compounds.

In the practice of the present invention coal is first ground to a fineness of about 100-200 mesh. I may employ for this purpose culm, slack, or other grades of coal which by reason of their fineness or high ash content are of diminished commercial value. The grinding may be accomplished by means of a tube-mill preferably in the presence of sufficient water so that the product discharged from the tube-mill is a slurry of finely divided coal in suspension, in sufficient water to make it freely mobile. The slurry thus produced is preferably levigated by imparting to it in any suitable vessel a slight upward velocity sufficient to float and transport the coal particles while permitting the relatively heavier particles of ash, sulphide, etc., to pass downwardly to the bottom of the containing vessel from which that may be continually or periodically withdrawn. The levigated semi-purified material consisting of suspended carbonaceous particles in an aqueous vehicle is then agitated with a quantity of hydrocarbon oil equivalent to say from 25 to 50% (by weight), of the actual weight of coal particles present. The mixing is carried out in any suitable type of mixing equipment such as a paddle mixer or a tank provided with a propeller mixer or in which mixing is induced by the discharge of compressed air, etc. In the course of the mixing the oil associates with the carbonaceous particles to produce a plastic mass of oil containing disseminated particles of carbonaceous material which mass floats on the water and may be separated therefrom leaving the ash principally suspended in the water phase or at the bottom of the vessel. Additional water may be added at this stage if desired, to improve the separation of ash particles from the plastic mass or to facilitate removal thereof from the container. From the mixer the materials are discharged into any type of settling equipment from the bottom of which the water and suspended or deposited ash particles are with-

drawn and from the top of which the plastic mass of oil containing disseminated coal particles is withdrawn.

Such products may be prepared in accordance with the processes described in U. S. Patent to Trent 1,420,165, of June 20, 1922. As a result of the treatment there described, which is typical of the first step of my process, there is produced a carbonaceous paste or amalgam, of any desired degree of plasticity or fluidity, depending upon the amount of oil added, and free from any high percentage of ash and from water. This carbonaceous mixture, either with or without the addition of hydrocarbon oil is subjected in a suitable container to action of hydrogen or a gas containing free hydrogen, the action being carried on under substantial pressures, for example 50-200 atmospheres. If desired a catalyst may be used, such as, for example, an oxide of molybdenum and oxide of chromium or cadmium sulphide, but ordinarily where pressures of the order mentioned are employed special catalysts may be dispensed with. Heat may be used during the hydrogenation where desired; in such case, temperatures for instance around 700°-1000° F., although the temperature in any instance will depend upon the particular materials treated and will vary considerably. It is advantageous to thoroughly agitate or beat the carbonaceous and oil mixture so as to bring it well into contact with the hydrogen. The beating may be carried to such an extent as to produce a foam or emulsification of the gas and carbonaceous-oil mixture.

After treatment in such manner for several hours ordinarily, for example 3-9 hours, the products may be removed from the pressure vessel and be used as such if desired for fuel or may be mixed with other fuel oil. Preferably however the products of the hydrogenation treatment are subjected to distillation, the distillation being carried on in the hydrogenation vessel or in a suitable still or retort to drive off volatile products to the extent desired. Ordinarily there may be thus obtained yields of hydrocarbons available for motor fuel, as well as burning oils, and also heavy hydrocarbons, together with gaseous hydrocarbons. By running the distillation at relatively high temperatures, yields of hydrocarbons which are gaseous under ordinary conditions may be increased and where yields of such products are desirable this process is advantageous in that the products so obtained

are largely of saturated character. In like manner also where distillation is run to obtain a maximum yield of hydrocarbons for motor fuel the products are largely of saturated character hence result in low treating losses when refined according to the customary procedures.

As materials for the carbonaceous component there may be used besides the bituminous coal mentioned, coals of various character, coky residuums, etc.; in particular the coky residue left from the final distillation described above may be advantageously worked up with the oil used in the process for further operations.

While I have described my invention with reference to certain specific details, it will be understood that this is for the purpose of illustration and that changes may be made which come within the spirit and scope of the invention.

What I claim is:

1. The process of preparing hydrocarbons, which comprises subjecting a carbonaceous

solid containing a substantial percentage of ash to a grinding action, to reduce the mixture to a fine state of subdivision, subjecting the ground mass to the action of a hydrocarbon oil and an aqueous liquid, to produce separation of the bulk of the ash with the aqueous liquid, leaving as a residue carbonaceous material substantially devoid of ash and wetted with a hydrocarbon oil, and subjecting this last named material to the action of hydrogen at an elevated temperature and at a high pressure sufficient to cause reaction between the hydrogen and the carbonaceous mixture.

2. The process in accordance with claim 1, in which the last-named step is conducted in the presence of a hydrogenation catalyst.

3. The process in accordance with claim 1, including the following additional step—subjecting the hydrogenated mass to distillation.

4. The process in accordance with claim 1, including the following additional step—subjecting the hydrogenated mass to destructive distillation.

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