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PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

3199



Process for Producing Hydrocarbons by the Catalytic Conversion of Carbon Monoxide with Hydrogen.

We, RUHRCHEMIE AKTIENGESELLSCHAFT of Oberhausen-Holten, Germany, a Body Corporate organised and existing under the Laws of the German State, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

It is known that to carry out the hydrogenation of carbon monoxide for the purpose of producing mainly liquid or solid hydrocarbons it is essential to maintain narrow limits of temperature, so that the quantity of heat liberated during the exothermic reaction must be carefully removed. It has therefore been proposed to carry out the reaction in apparatus through which extends a system of cooling tubes on which heat conducting metal sheets have been disposed perpendicularly to the axes of the tubes at short intervals of a few mm. One cooling medium that can be used is hot water under pressure and the reaction temperature is regulated by employing a corresponding steam pressure. If synthesis is carried out under a pressure different from the pressure used in the cooling tubes the difference of pressure within the cooling tubes and in the contact furnace demands a construction of cooling tube that will resist pressure.

It has been found that tubes of a simpler structural material can be used if synthesis itself is carried out at an elevated pressure that corresponds approximately to the vapour pressure of the cooling agent at the necessary reaction temperature. By proceeding in this way there is no longer any necessity for making the walls of the cooling tubes resistant to pressure, which thus greatly reduces the cost of the plant.

For reasons of safety, a balance of pressure is provided between the chambers through which the cooling medium flows and the reaction chamber, connection being made for example between the vapour chambers of the two systems.

The process is now described by reference to an example.

The synthesis gas consisting of one part
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of carbon monoxide and two parts by volume of hydrogen is passed through a synthesis oven comprising a system of cooling tubes arranged in rows on which, at intervals of about 10 mm. sheets of smooth heat conducting metal, traversed by the whole set of cooling tubes, are arranged one behind the other. The catalyst mass completely fills the interstitial spaces between the cooling tubes and the sheets of metal. Through the cooling tubes flows hot water that is under a pressure of 11 atmospheres, so that the cooling agent has a temperature of 166° C. The reaction heat generated is carried off by the cooling agent so thoroughly that the reaction temperature in the whole synthesis furnace does not exceed 187° C. The reaction gas which has been carefully cleansed of sulphur compounds is, under a pressure of 11 atmospheres, passed from below into the synthesis furnace, and after leaving the apparatus is cooled in order to condense the condensable reaction products such as water, benzines and oils, whereupon the lower boiling benzines and the gasol-like hydrocarbons are withdrawn from the gas by treatment with active carbon. By using a cobalt catalyst activated with thorium 120 to 130 gm. of benzines and oils are obtained from 1 cu. m. of synthesis gas.

It has before been proposed, in a process for performing chemical reactions by means of highly heated gases, to heat the compressed gases prior to their admission into the reaction chamber, by passing them through superheaters under approximately the same pressure as the gases by which the heating is effected.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A process for producing mainly liquid or solid hydrocarbons by the catalytic conversion of carbon monoxide and hydrogen, in apparatus comprising cooling tubes and heat conducting metal sheets, in which the hydrogenation of the carbon monoxide is carried out under an

elevated pressure that corresponds approximately to the pressure of the cooling agent flowing through the cooling tubes.

- 5 2. A process for producing hydrocarbons by catalytic conversion of carbon monoxide and hydrogen substantially as hereinbefore described.

Dated this 5th day of April, 1938.

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Agents for the Applicants.

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