[Second Edition.]

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Process for the Production of Paraffin-hydrocarbons with more than one Carbon Atom.

We, Professor Dr. FRANZ FISCHER, a citizen of the German Republic, and Dr. HANS TROPSCH, a citizen of the Cechoslovak Republic, both residing at 1, Kaiser-Wilhelm-Platz, Mülheim on the Ruhr, Germany, 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 generally known that the oxides of carbon can be converted into methane by catalytic reduction (see Sabatier, "Catalysis in Organic Chemistry" translated by Reid), the best temperature for this conversion differing according to the employed catalyser. The present invention relates to the obtention not of methane, but of its higher homologues such as ethane, propane. Applicants have found that these hydrocarbons can be obtained at ordinary, only slightly increased or even reduced pressure, by carrying out the reaction at a temperature below that at which methane is mainly formed with the catalyst used that is to say that at which the reaction product contains more than 50% methane.

It has been proposed to produce the higher homologues of methane by the reduction of carbon oxides over catalysts, but in these known processes high pressure generally of more than 5 atmospheres has been used. In the known processes of reducing carbon oxides over catalysts at ordinary pressure, no formation of higher hydrocarbons had been observed till now, and no separation of such products has been described there.

The present invention consists in a process for the production of paraffin hydrocarbons with more than one carbon atom from gases containing oxides of carbon and hydrogen, heated in the presence of methane forming catalysts at substantially ordinary pressure, which process consists in producing the said hydrocarbons containing more than one carbon atom by heating the gases at temperatures which lie between that at which the particular catalytic agent used begins to react and that at which mainly methane is formed with said catalytic agent, whereupon the hydrocarbons with more than one carbon atom thus formed are separated in a known manner from the other constituents of the reaction mixture, the employment as catalyst of pure nickel, which forms methane already at the temperature at which reaction commences, being excluded.

Thus for example with a catalyst consisting of a mixture of zinc oxide and finely divided iron, we obtained at a temperature of 300° C. only 10% of methane and 90% of paraffin hydrocarbons with more than one carbon atom. At 330° C. the proportions of hydrocarbons are 80% of methane and 20% of higher homologues and at 430° C. only methane is obtained as hydrocarbon.

The temperatures employed will naturally vary somewhat according to the catalyst employed, being generally about 80—100° C. below that at which practically only methane is formed.

The technical importance of the present invention consists in that the way has been found to synthesise higher hydrocarbons than methane from the oxides of carbon without the application of such higher pressures as were necessary according to known methods, atmospheric pressure or a pressure slightly above or below atmospheric pressure being employed for the purpose of the present process.

We are aware of Specification No. 2303 of 1914 which describes processes for the hydrogenisation of compounds containing carbon, including the conversion of oxides of carbon into hydrocarbons, in which use is made of a catalytic agent consisting of a mixture of a catalytic metal with a promoter and which processes are carried out at a comparatively low temperature either at ordinary or at increased pressure and we do not claim anything described or claimed therein, the present invention being solely related to the obtention of paraffin hydrocarbons with more than one carbon atom from oxides of carbon and hydrogen, whilst the only specific example mentioned in the prior specification above referred to, in which use is made of a carbon oxide, relates to the obtention of methane.

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 :—

A process for the production of paraffin hydrocarbons with more than one carbon atom from gases containing oxides of carbon and hydrogen heated in the presence of methane forming catalysts excepting pure nickel at a substantially ordinary pressure, consisting in producing the said hydrocarbons containing more than one carbon atom by heating the gases at temperatures which lie between that at which the particular catalytic agent used begins to react and that at which mainly methane is formed with said catalytic agent, whereupon the hydrocarbons with more than one carbon atom thus formed are separated in a known manner from the other constituents of the reaction mixture.

Dated this 26th day of March, 1926.

MARKS & CLERK.

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