NOTE.—*The application for a Patent has become void.*
This print shows the Specification as it became open to public inspection.

PATENT SPECIFICATION

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Complete not Accepted.

1318

COMPLETE SPECIFICATION.

An Improved Process for the Production of Valuable Organic Compounds from Gaseous or Vaporous Hydrocarbons.

We, I. G. FARBENINDUSTRIE AKTIENGESELLSCHAFT, of Frankfort-on-Main, Germany, a corporation organised according to German laws, 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 already known that the incomplete combustion of hydrocarbons, especially the compounds of this kind which are contained in coal gas, results in the formation of relatively small quantities of unsaturated hyrdocarbons in particular of acetylene. This incomplete combustion of the gases in question is effected by igniting a mixture composed of these gases and an amount of air which is insufficient for their complete oxidation.

We have now found that the yield of valuable unsaturated hydrocarbons, such as acetylene and its polymerisation products, may be considerably increased if the incomplete combustion of the gaseous or vapourous hydrocarbons especially saturated hydrocarbons or mixtures containing the same, be effected at temperatures above 850° Centigrade with pure oxygen, or with gas mixtures containing at least 50 per cent. of oxygen. The quantity of oxygen employed must be so small that a considerable part of the methane or other hydrocarbon remains unaltered in the said combustion. According to this process, the heating of a very considerable volume of nitrogen, acting as a diluent, which always occurs in the combustion of a mixture of hydrocarbons and air, in the usual manner is completely, or to a large extent, obviated, so that the gases or vapours to be converted attain far higher temperatures, and are heated within a very short time. Owing to this circumstance, the state of the thermal equilibrium is considerably modified in favour of the formation of acetylene. Moreover, in comparison with the employment of air, this process affords the additional advantage that the absence of the nitrogen, or the presence of merely small amounts of that gas completely or almost so avoids the formation of cyanogen, hydrocyanic acid and other nitrogenous compounds which otherwise may be a source of trouble.

The combustion may be carried out in various ways. For example, the flow of the combustible gas may serve to draw in certain quantities of oxygen, or gas rich in oxygen, through lateral orifices, on the principle of the Bunsen burner, the resulting gaseous mixture being then ignited. On the other hand, the oxygen, or gas rich in oxygen, may be introduced into the current of combustible gas through separate tubes, preferably with tapered nozzles, and the resulting mixture may be ignited at the point of this introduction. Again, it may be advantageous to influence the combustion, by the arrangement of refractory, ceramic porous material, in such a way that it more or less completely assumes the form of surface combustion, without the production of any soot.

The effect of the incomplete combustion may also be increased by afterwards raising the gases which have been heated in the zone of combustion, to still higher temperatures by the provision of an electric heating device. In this way, temperatures up to 1300° Centigrade may be easily attained.

The following examples will further illustrate how the said invention may be carried into practical effect but the invention is not limited to these examples.

EXAMPLE 1.

Methane is passed through a quartz tube of 30 millimetres internal diameter at the rate of 264 litres per hour, and is preheated to a temperature of 900° Centigrade on the counterflow principle, by the effluent gases of combustion. The incomplete combustion of the methane is effected in a flame zone fed by four oxygen nozzles, the flow of oxygen being at the rate of 70 litres per hour. The gases of combustion, which have a temperature exceeding 1000° Centigrade, issuing per

hour consist of 189 litres of unaltered methane, 94 litres of water vapour, 42 litres of hydrogen, 47 litres of carbon monoxide and 14 litres of acetylene. The amount of soot formed is small, and, in any event, not a source of trouble. The amount of acetylene produced is thus 1 litre for every 5 litre of oxygen supplied. The acetylene thus obtained may be easily isolated in any known manner, as for example by dissolving it in acetone, or it may be directly transformed, from the gaseous mixture, into other compounds, such as acetaldehyde and acetic acid by suitable chemical treatment.

EXAMPLE 2.

A porcelain tube, 100 centimetres in length and 19 millimetres inside diameter, filled with coarse fragments of pumice, is heated to a temperature of 900° Centigrade in an electric resistance furnace. The external heating is then discontinued, and 300 litres of high-grade ethane, such as may be recovered from low carbonization gas by means of active charcoal or silica, is passed through the reaction tube per hour, with 104 litres of oxygen. No difficulty is experienced in maintaining the temperature of the tube at the most suitable temperature of 840° Centigrade. The resulting gas contains over 25 per cent. of ethylene, which can be further treated without difficulty. The ethane may be replaced by still higher homologues of methane, or mixtures containing them, such as are easily obtainable in the form of, or producible from, distillation gases from coal or tar, or gases from the cracking process.

EXAMPLE 3.

An iron tube, lined with refractory material, of 6 centimetres inside diameter, is filled, in a zone 10 centimetres in length, with lumps of a porous refractory material, such as earthenware sherds. Methane is passed through the tube at the rate of 4 cubic metres per hour. Oxygen, at the rate of about 1 cubic metre per hour is introduced through a number of nozzles, in star arrangement, into the zone charged with the filling material and transversely to the direction of the flow of the methane. The gas mixture being ignited, a cylindrical hot zone, at a temperature of about 1000° Centigrade results in the interior of the tube. The resulting gases contain acetylene at about the rate of 160 litres per hour together with methane, carbon monoxide, hydrogen and water vapour. If, after leaving the zone of combustion, the gases be immediately raised to a temperature of about 1200° Centigrade by an electric furnace arranged therefor, the yield of acetylene is increased to about 180 litres per hour.

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 the production of valuable organic compounds, especially acetylene and its polymerisation products, from gaseous or vapourous hydrocarbons, and in particular saturated hydrocarbons, or mixtures containing the same, which consists in effecting an incomplete combustion of the gases or vapourous hydrocarbons at temperatures above 850° Centigrade with pure oxygen or with gases containing at least 50 per cent. of oxygen.

2. A modification of the process according to Claim 1, which consists in the introduction of refractory ceramic, porous material whereby the combustion proceeds, wholly or partially, in the form of surface combustion.

3. A further modification of the process according to Claims 1 and 2 which consists in raising the gases heated by the incomplete combustion to still higher temperatures by a different method of heating, preferably electrical, previously to the separation or further use of the resulting valuable compounds.

4. The process for the production of valuable organic compounds, substantially as described in each of the foregoing examples.

Dated this 31st day of January, 1927.

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