[Second Edition.]

PATENT SPECIFICATION

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3446

COMPLETE SPECIFICATION.

A Process for Transforming Methane into a Carburetting Agent similar to Petroleum.

I, HENRY SPINDLER, of 24, bis, Avenue de la Gare, Saint-Leu, Seine-&-Oise, France, a citizen of the French Republic (the Assignee of ACHILLE GOUDET, of 27, Avenue de Grenoble, Gap, Hautes Aples, France, a citizen of the French Republic), 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:—

This invention relates to a process for transforming methane into a mixture of hydrocarbons similar to the crude petroleum extracted from oil-containing deposits, and consists in subjecting methane either alone or with the addition of gases capable of combining with hydrogen—to a temperature of 500—950° C., in order to detach some of its atoms of hydrogen, cooling it to maintain this condition of dissociation, and afterwards subjecting it to the action of a catalyst hereinafter specified so as to furnish hydrocarbons of a higher order, the entire operation being conducted under heavy pressure and in three successive stages.

The accompanying drawing illustrates, by way of example in a vertical section, an apparatus for carrying out the process.

A tube *a*, capable of standing a high pressure up to 200 atmospheres, encloses a collection of tubes, the first of which, *b*, is provided with a tube *c* for the admission of methane (which may be in admixture with gases capable of combining with hydrogen) under pressure, and contains an electrical resistance *d* for heating said gas. This tube *b* may be surrounded by a jacket *l* containing a heat insulating material. The tube *b* is connected with another tube *e*, cooled by water circulating in a coil *f*. Finally, a third tube *g*, connected with the others, contains catalysing agents and is terminated by perforated sheet metal *h*, the purpose of which is to allow the gases to escape. In the space enclosed between the tube *g* and the outer tube *a* is arranged a cooling coil *i*, traversed by a current of water or other cooling medium and a discharge outlet for the gases is provided at *k*.

The methane, derived from any source whatsoever (natural gas, gas prepared from coal by way of water gas, or from any other source), is submitted to a suitable process of purification and is passed through the tube *c* into the tube *b* under a minimum pressure of 70 atmospheres. It is heated by the electrical resistance *d* to a temperature which may range from 500° to 950° C., according to the quality of the liquid products to be obtained. The action of the temperature is to effect a partial separation of atoms of hydrogen.

The gas thus treated is then subjected to sudden cooling in the tube *e*, by means of the coil *f*, which lowers the temperature to about 250°—350° C., which temperature prevents the upsetting of the conditions of equilibrium established by the previous pyrogenation, and constitutes the optimum temperature for the subsequent action of the catalyser contained in the tube *f*. Gases capable of combining with hydrogen (such as acetylene or carbon monoxide), and which can be introduced, along with the methane, through the tube *c*, combine with the hydrogen liberated from the methane. The catalyser in the tube *g* consists of a mixture of zinc chloride,

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active carbon obtained by the action of heat on oleaginous seeds, aluminium powder, magnesium powder, and finally of iron scale previously treated with alkali hydroxides. This powder effects the combination of the hydrocarbon groups in such a way as to produce hydrocarbons of a higher order. The pressure of 70 atmospheres, which may be increased up to 200 atmospheres, is maintained throughout the apparatus. It is important that the three stages of the process should take place in succession and not simultaneously.

On issuing from the catalyser, the gas ascends through the annular space containing the coil *i*, which lowers the temperature and effects the condensation of the liquefiable products. These collect in the bottom of the tube *a*, and are removed through a discharge tap. According to the above indicated variations in temperature and pressure, which latter may be increased progressively beyond 70 atmospheres as desired, the resulting product may exhibit the characteristics of petroleums of different origin. This product may be used particularly for explosion- or internal-combustion engines.

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

A process for transforming methane into a carburetting agent similar to petroleum, consisting in subjecting the methane either alone or with the addition of gases capable of combining with hydrogen, to a temperature of 500°—950° C., in order to detach some of its hydrogen atoms; then cooling it to maintain this condition of dissociation, and afterwards subjecting it to the action of the catalyser hereinbefore specified to produce hydrocarbons of a higher order than methane, the entire operation being conducted under heavy pressure and in three successive phases.

Dated the 19th day of July, 1926.

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1 SHEET

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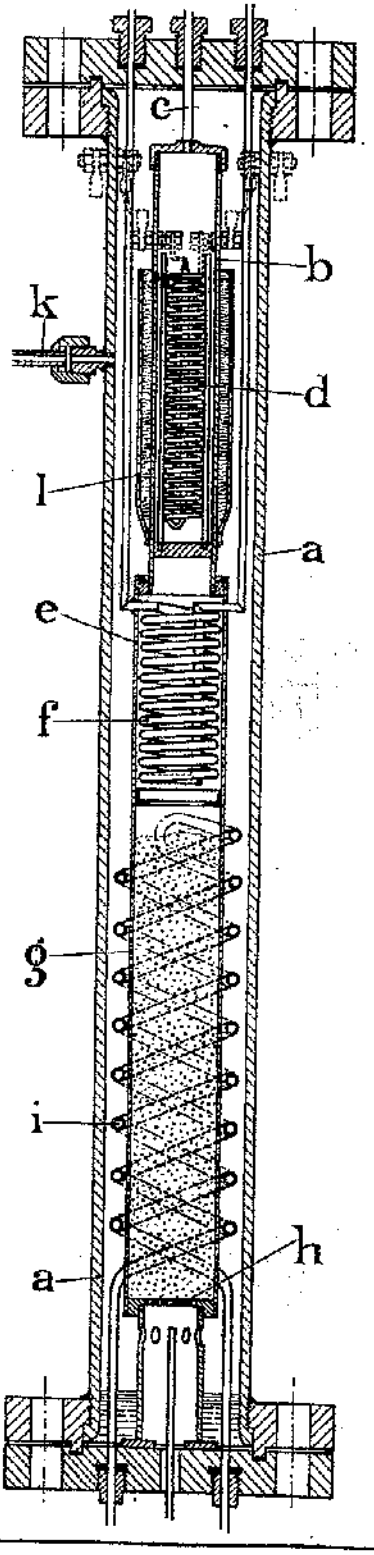

[This Drawing is a reproduction of the Original on a reduced scale.]

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