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COMPLETE SPECIFICATION

Process for producing Synthetic Gas

We, STUDIEN- UND VERWERTUNGS-GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG, of Mülheim-Ruhr, Germany, a body corporate organised and existing according to 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 from "Brennstoff-Chemie," 1932, Volume 13, page 425, that a synthetic gas containing a small proportion of nitrogen—one, for example, which at ordinary pressure is suitable for the synthesis of benzine from carbon monoxide and hydrogen in the proportion of 1 part CO to 2 parts H_2—can be produced if hot air is first blown into a gas producer charged with coke, and then, instead of water vapour alone, as ordinarily done, a mixture of water vapour and a coal distillation gas, such as coke-oven gas, is introduced during the whole or a part of the gasifying period into the hot blown gas producer.

Conversion of water vapour with coke produces a watergas containing CO and H_2 in equal proportions, while conversion of water vapour with the hydrocarbons of coke-oven gas (for example, methane) produces a gas which contains CO and H_2 in the proportion of from 1 : 3 to 1 : 4. By accurately measuring the proportion of coke-oven gas to water vapour a gas mixture is obtained containing, for example, 1 part CO to 2 parts H_2.

However valuable this process may be —as it does not require a special methane decomposing agent—it nevertheless is not thermally efficient, which is the case with all gasifying processes producing large quantities of hot blast gases having a large proportion of nitrogen, as the hot blowing is effected with air.

It has been found that a gas for synthesis purposes of suitable composition can be obtained, without producing waste hot blast gases, by injecting a hot mixture of oxygen and water vapour into the gas producer. The previously described gas of the gasifying period, which is rich in hydrogen, is subsequently added to the resulting hot blast gas, which is rich in carbon monoxide, whereupon the synthetic gas is available.

When injecting the hot mixture of oxygen and water vapour, however, there should not be so much water vapour that there is a maximum yield of gas, as has been customary when gasifying with oxygen, but actually less water vapour must be used in order to reach a high temperature in the gas producer and secure the storage of sufficient heat, so that in the next gasifying period, which occurs with a mixture of water vapour and coke-oven gas, the necessary energy is available for converting the water vapour with methane and coke.

By combining the exothermically maintained gasification with oxygen and water vapour, which also serves for hot-blowing, with the succeeding endothermic gasification with coke-oven gas and water vapour, a gas mixture very poor in nitrogen and containing for example CO and H_2 in the proportion of 1 : 2, is thus produced without producing a hot blast gas which cannot be used for the synthesis. It is, however, important, as already stated, that the two gasification stages be carried out with suitable proportions in the mixtures employed, so that after the first stage there is sufficient energy available for the second stage.

A suitable solid fuel for use in the gas producer is coke or semi-coke derived from coal, peat or wood, as well as the latter substances themselves. The oxygen used is as pure as possible, but air containing a large proportion of oxygen may also be used. Instead of coke-oven gas, gases from low-temperature distillation as well as pure hydrocarbons such as methane may be used.

Neither the mixture of water vapour and oxygen nor water vapour and gas containing hydrocarbons need have a constant composition during the period. Thus for example water vapour may be used at the beginning, after which the second component is admixed or used alone, and finally water vapour may be reverted to.

The present process thus produces a synthetic gas poor in nitrogen and which

is composed of a hot blast gas rich in carbon monoxide and a gasification gas rich in hydrogen. The sensible heat of the two gases may be used in any suitable manner for heating purposes or for producing steam. The process may be carried out at ordinary pressure and it may also be carried out at raised pressure.

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 synthetic gas consisting principally of hydrogen and carbon monoxide, by the use of solid fuels, gases containing hydrocarbons, water vapour and oxygen, as initial substances, characterised in that in a gas producer charged with solid fuels a synthetic gas is produced from the mixture of gases obtained by alternately blowing in mixtures of steam and oxygen and steam and coal distillation gas, which synthetic gas contains the products of gasified solid fuel and the conversion products of gaseous hydrocarbons.

2. A process according to Claim 1, characterised in that in the hot blast operation only so much water vapour is mixed with the oxygen as will ensure that sufficient heat is stored in the gas producer.

3. A process according to Claim 1 or Claim 2, characterised in that a synthetic gas is produced which contains approximately twice as much hydrogen as carbon monoxide.

Dated this 16th day of July, 1936.

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