

PATENT SPECIFICATION



Convention Date (Germany): Aug. 24, 1936.

481.850

Application Date (in United Kingdom): July 2, 1937. No. 18489/37.

Complete Specification Accepted: March 18, 1938.

COMPLETE SPECIFICATION

Process for Extracting Valuable Substances from Synthetic Process Gases

We, CARBO-NORIT-UNION VERWALTUNGS-GESSELLSCHAFT MIT BESCHRÄNKTER HAFTUNG, of 17/19, Gervinustrasse, Frankfurt-on-the-Main, Germany, a Corporation organised under the Laws of 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:—

This invention relates to a process for extracting valuable substances from synthetic process gases, i.e. from gaseous reaction mixtures containing synthetic products such as hydrocarbons, synthetic benzines, aliphatic alcohols and fatty acids. The said synthetic products are obtained by subjecting gaseous mixtures containing hydrogen and oxides of carbon (derived in turn from the gasification of solid carbonaceous fuels in the presence of steam) to elevated temperatures with the optional use of pressure, and in the presence of catalysts. The said gaseous mixtures containing hydrogen and oxides of carbon will hereinafter, for the sake of simplicity, be termed "crude synthesis gas".

In the extraction of valuable substances, such as for example motor fuel, gas oil and the like with the aid of solid adsorbents from the gaseous reaction mixtures resulting from the aforesaid synthetic processes, the procedure is generally to flush the adsorbents charged with said valuable substances with steam, in order to extract the same therefrom and thereupon drying and cooling said adsorbents with the aid of gases from the synthetic process that have not yet been treated or of outgoing gases issuing from the adsorbents, whereupon the latter can be charged afresh. Since, in this method of procedure, only small quantities of gas are usually available for the drying and/or cooling, it is almost always necessary to circulate the gas repeatedly for the purposes of drying and cooling. The simplicity of the plant is thereby naturally impaired, inasmuch as additional apparatus, for example circulating appliances, heating and cooling appliances and the

like must be provided.

It has now been ascertained in accordance with the present invention that it is possible to use with advantage the crude synthesis gas for the purpose of drying and cooling adsorbents which have been used for the extraction of valuable substances from the gases resulting from synthetic processes. In the first place, this gas is available in most cases in an amount adequate for the drying and cooling of the adsorbents, so that a single passage through the adsorbents to be dried and/or cooled will almost always be sufficient in itself to attain adequate drying and/or cooling. In those cases where a single passage is not sufficient for the drying and cooling, however, two passages or at the most three passages will be sufficient in all cases.

The process of the present invention renders the additional apparatus, otherwise required for the circulation of the drying and/or cooling gases, superfluous in almost all cases, and in addition affords considerable advantages in other respects also. Thus the present process also has the advantage, for example, that, apart from the drying and cooling, a fine purification of the crude synthesis gas occurs after its passage through the hydrogen sulphide purification stage, the residues of organic sulphur and other impurities left behind in the hydrogen sulphide purification process being removed. Since these substances represent relatively small quantities of impurities to be absorbed in comparison with the large quantity of adsorbent to be dried and/or cooled, they are separated practically completely, even at the high temperature that usually prevails during the drying. For example, 1000—2000 cubic metres of gas are needed for drying and cooling an adsorber filled with one ton of activated carbon, said quantity of gas still containing about 0.02—0.2 grams of organic sulphur per cubic metre after passing through the hydrogen sulphide purification stage. The quantity of organic sulphur to be absorbed in a ton of activated carbon during the drying

[Price 1/-]

Price 25/-

and cooling therefore amounts to only 0.04—0.4 kilos. This corresponds to a charging of the carbonaceous material to the extent of about 0.004—0.04% by weight. With such small charges experience has shown that the aforesaid substances are practically completely adsorbed. When carrying out the process of the present invention therefore, the special fine purification of the crude synthesis gases, which is otherwise usual, becomes superfluous.

A further substantial advantage of the invention consists in the fact that in the course of the drying and/or cooling of the adsorbents with the aid of the crude synthesis gas a considerable part of the carbon dioxide contained in such gases is removed, so that a gas containing a considerably reduced proportion of inert components is subjected to the synthesis. The process of synthesis is thereby favourably influenced and the number of contact furnaces needed to carry out the synthesis reaction can be reduced.

When the gaseous mixture containing hydrogen and oxides of carbon does not show the requisite ratio of carbon monoxide to hydrogen (1:2) which is necessary before it is suitable for synthesising hydrocarbons, alcohols and acids, a portion of the original water gas is treated together with steam by a catalytic process, whereby carbon dioxide and hydrogen are formed in accordance with the equation:



The thus treated gas is mixed with the non-converted portion of the original water gas in sufficient amount to bring the ratio of carbon monoxide to hydrogen

to the value 1:2 necessary to enable it to be used as crude synthesis gas. In such case, it is advisable also to employ for the drying and/or cooling in accordance with the present invention that portion of the crude synthesis gas coming from the plant for converting the carbon monoxide into carbon dioxide, and which therefore contains a particularly high proportion of carbon dioxide, in order thus to obtain a crude synthesis gas having as low a carbon dioxide content as possible. Special carbon dioxide washing of the crude synthesis gas can, if desired, be completely dispensed with under these conditions.

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 of extracting valuable substances from gases resulting from synthetic processes which comprises treating the gases with solid adsorbents, flushing out such adsorbents with steam for the purpose of extracting the valuable substances and drying and cooling said adsorbents before fresh charging, by means of the crude synthesis gas and/or with the conversion gas intended for the production of the crude synthesis gas.

2. The process for extracting valuable substances from synthetic process gases, substantially as described.

Dated this 2nd day of July, 1937.

ALBERT L. MOND & THIELMANN,
19, Southampton Buildings,
Chancery Lane, London, W.C.2,
Agents for the Applicants.