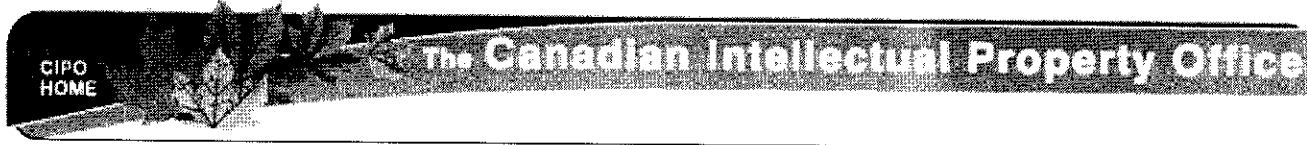




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(12) Patent:

(54) METHOD OF USING CARBON MONOXIDE

(54) METHODE D'USAGE DU PROTOXYDE DE CARBONE

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## S P E C I F I C A T I O N .

TO ALL WHOM IT MAY CONCERN:-

Be it known that We, Mathias Pier and Jehannes Kleine, of Heidelberg and Merseburg, Germany, respectively, having jointly invented certain new and useful improvements in

## PROCESS OF WORKING WITH CARBON MONOXID

UNDER PRESSURE, do hereby declare that the following is a full, clear and exact description of the same. In operations in which carbon monoxid is employed under pressure or under a partial pressure surpassing atmospheric pressure and at an elevated temperature, serious difficulties are sometimes encountered which are due on the one hand to the fact that the carbon monoxid on its way through the apparatus reacts with the iron wall forming iron carbonyls which interfere with the desired operation, and due on the other hand to certain decompositions of the carbon monoxid caused by the contact with the iron walls and consisting for example in a formation of carbon and carbon dioxid, the former of which ultimately choking the pipings or other parts of the apparatus, or in a reaction with hydrogen, if such be present, with the formation of methane which may be an undesirable admixture, all of which reactions also mean a consumption of part of the carbon monoxid introduced into the apparatus. In addition, some of such undesirable reactions are accompanied by great development of heat and once started would proceed very rapidly and to a considerable extent, thereby developing more and more heat and raising the temperature eventually to a dangerous degree. It has been suggested to employ for operations in which carbon monoxid is employed under high pressure and at elevated temperature, reaction vessels inside lined with copper, but this precaution does not exclude the aforementioned troubles when working on a considerable scale. On the other hand it has been suggested to exclude iron surfaces at all from the apparatus serving for the operations with carbon monoxid under elevated pressure in all its parts, whether hot or cold.

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1

We have now found that the latter precaution, though it has a very good practical effect, is not necessary to its full extent when the gases are substantially dry. In such cases, that is when working with substantially dry carbon monoxid under pressure or under a partial pressure materially exceeding atmospheric pressure, it is only necessary to protect the gases from coming into contact with iron walls in such parts of the apparatus as in the course of the operation assume a temperature of 150 degrees Centigrade or more, whereas the parts remaining cooler than 150 degrees Centigrade may be made of iron and left unprotected. The protection of the parts hotter than 150 degrees Centigrade may be effected by making those parts of copper, silver, aluminium, or their alloys, or special steels with a substantial percentage of chromium, manganese, tungsten, molybdenum or vanadium, or making such parts of iron or ordinary steel with a lining or coating of the aforementioned metals, or with chromium, manganese, tungsten, molybdenum or vanadium alone. Different metals or alloys or coatings thereof may be used for different parts of the apparatus and such parts of the apparatus as in the operation reach more than 150 degrees though not a high temperature may also be lined or coated with zinc, tin, lead, or alloys of such metals of low melting point. The gases employed for the operation may be dried in any suitable manner, for example by means of desiccated calcium chlorid. If synthetic methanol is the product made in the operation from a mixture of carbon monoxid and hydrogen under high pressure, the gases which are used in a circular system, are kept sufficiently dry to exclude any reaction with the iron walls up to 150 degrees Centigrade, if the gases are washed with the methanol produced in the process. For the purpose of operations in which iron carbonyl would exert an obnoxious influence, such for example as the synthetic

6

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manufacture of methanol, care must of course be taken that the iron carbonyl contained in the original gas serving as a supply to the circular system for the gas consumed by the reaction, is removed prior to its introduction into the circular system. In other cases, for example when coal or tar or like material is treated with carbon monoxid and steam under a high pressure and at high temperature, the removal of traces of iron carbonyl may be of minor importance.

Our above invention can be employed when carbon monoxid is present as such as well as in the case of gas mixtures which may give rise to a formation of carbon monoxid, especially such as contain hydrocarbons in conjunction with water vapor, carbon dioxid, phenol vapors or with other oxygen compounds, and the specification is to be understood as covering the working with such gas mixtures as well.