AMENDED SPECIFICATION.

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PATENT SPECIFICATION

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COMPLETE SPECIFICATION (AMENDED).

Improvements in the Manufacture and Production of Aldehydes.

I, JAMES YATE JOHNSON, a British subject, of 47, Lincoln's Inn Fields, in the County of London, Gentleman, do hereby declare the nature of this invention (which has been communicated to me from abroad by I. G. Farbenindustrie Aktiengesellschaft, of Frankfort-on-Main, Germany, a corporation organized according to German laws), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My foreign correspondents have found that aldehydes may be prepared in a simple manner from mono carboxylic acids by acting on the latter in the vapour state at elevated temperatures and in the presence of hydrogenating catalysts with carbon monoxide or gas mixtures containing carbon monoxide. According to this invention for example benzaldehyde may readily be prepared from benzoic acid and acetaldehyde from acetic acid.

As catalysts suitable for the reaction according to the present invention not only the elements suitable for use as hydrogenating catalysts but also mixtures of such elements may be employed. These catalysts may be activated by an addition of other elements or their compounds.

The temperatures to be employed may vary within rather wide limits. The most suitable temperatures will generally range between about 200° and 550° Centigrade preferably between 250° and 500° Centigrade. The reaction may be carried out under any desired pressure.

The proportions of carboxylic acid and carbon monoxide need not be in the ratio theoretically required, that is in the proportion of one part, by volume, of carboxylic acid to one part, by volume, of carbon monoxide, but may be varied within wide limits. The materials not consumed in the reaction may be reintroduced into the process in a circulatory system. Inert gases or vapours may be present in addition to carbon monoxide.

The following examples will further illustrate how the said invention may be carried out in practice, but the invention is not limited to these examples.

EXAMPLE 1.

Benzoic acid vapour is mixed with carbon monoxide in about the proportion of 2 parts, by volume, of benzoic-acid to 100 parts, by volume, of carbon monoxide, and the mixture passed at 400° Centigrade over an iron catalyst. Benzaldehyde is obtained in a good yield.

EXAMPLE 2.

3 parts, by volume, of acetic acid vapour are passed together with 100 parts, by volume, of carbon monoxide over a catalyst consisting of cobalt and iron and heated to 280° Centigrade. Acetaldehyde is produced which can be recovered from the reaction mixture by cooling or washing.

EXAMPLE 3.

A gas mixture consisting of equal parts, by volume, of carbon monoxide and nitrogen is passed over benzoic acid heated to 180° Centigrade. The resulting gas and vapour mixture containing benzoic acid vapour and carbon monoxide in the proportion of about 5 to 100, is passed at from 360° to 390° Centigrade over a catalyst prepared by reducing an intimate mixture of chromium oxide and iron oxide. On cooling the reaction gases benzaldehyde is separated together with unaltered benzoic acid.

Producer gas or blast furnace gas may also be employed instead of the said gas mixture.

EXAMPLE 4.

A gas mixture consisting, by volume, of 60 per cent. of carbon monoxide, 30 per cent. of nitrogen and 10 per cent. of water vapour is mixed with benzoic acid vapour in such amount that the resulting

mixture contains 8 parts, by volume, of benzoic acid vapour and 100 parts, by volume, of carbon monoxide. The mixture is passed at from 380° to 400° Centigrade over a catalyst containing cerium, chromium and iron. Benzaldehyde together with some unaltered benzoic acid and benzene can be separated from the reaction gases in any suitable manner.

The nitrogen contained in the said gas mixture may be replaced wholly or in part by carbon dioxide.

Other mono carboxylic acids can be converted into aldehydes in a similar manner.

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:—

1. A process for the manufacture and production of aldehydes which consists in acting on a mono carboxylic acid in the vapour state at an elevated temperature and in the presence of a hydrogenating catalyst with carbon monoxide or gas mixtures containing carbon monoxide.

2. The process for the manufacture and production of aldehydes substantially as described in each of the foregoing examples.

3. Aldehydes when prepared in accordance with the preceding claiming clauses.

Dated this 14th day of March, 1927.

JOHNSONS & WILLCOX,
47, Lincoln's Inn Fields, London,
W.C. 2,
Agents.

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