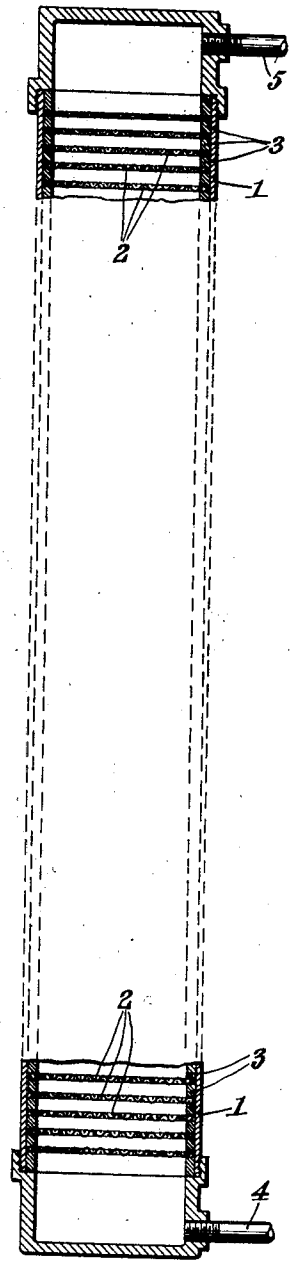
A. A. BACKHAUS.

CATALYZER AND CATALYZER APPARATUS.

APPLICATION FILED JUNE 15, 1918.

1,400,204. Patented Dec. 13, 1921.



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1,400,204. Specification of Letters Patent. Patented Dec. 13, 1921.

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To all whom it may concern:

Be it known that I, ARTHUR A. BACKHAUS, of Baltimore, in the State of Maryland, have invented a certain new and useful Improvement in Catalyzers and Catalyzer Apparatus, and do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates particularly to catalyzers and catalyzer apparatus which are used in the production of aldehydes.

The object of my invention is to provide an apparatus by which catalyzers of the above type may be advantageously made and by which efficient catalyzers may be obtained to bring about the production of aldehydes, as for example, acetaldehyde, by passing alcohol over a catalyzer of this character while heated.

Another object of my invention is to provide a catalyzer containing copper to be used for the production of aldehydes in this way.

Further objects of my invention will appear from the detailed description thereof contained hereinafter.

While my invention is capable of embodiment in many different forms, for the purpose of illustration I shall describe hereinafter only one form thereof, and shall show only one type of apparatus used in connection therewith in the accompanying drawing, in which—

The figure is a vertical section of a catalyzer made in accordance with my invention.

In the operation of my apparatus, I fill a tube 1 with a large number of disks 2 of metal gauze, which may be of copper, nickel, chromium or iron, which may be contiguous with one another or separated by rings 3, as desired.

The metal is a very good conductor of heat, and in this way the reaction temperature may be readily carried to all parts of the catalyzer tube 1.

In order to make the gauze disks 2 active, so as to bring about the change from alcohol to acetaldehyde, the surfaces of the disks 2 are corroded by passing a current of an oxidizing gas, such as air, and vapors such as those of acetic acid through an inlet tube 4 at one end of the catalyzer tube and out through a tube 5 at the other end of said tube.

After the metal in the gauze disks 2 has been corroded by the formation therefrom of a compound, such as an acetate, the latter is decomposed *in situ* into the oxid, for example, by heating the catalyzer tube 1 to a temperature of about 300° C. or higher, in any suitable manner to effect a thermal decomposition and the oxid is reduced *in situ* by passing a current of a reducing gas such as hydrogen into the catalyzer tube 1 while heating the same to a temperature of about 300° C.

In this way a very finely divided, that is to say, voluminous adherent integral deposit of the metal is formed from the decomposed and reduced organic compound on the meshes of the metal disk 2, and thereafter, when a current of vapors of an alcohol, such for example as ethyl alcohol, is passed through the tube 1, while heated to a temperature of approximately 300° C., the finely divided metal causes the alcohol to be broken down into acetaldehyde and hydrogen, which may be conveyed away and separated in any suitable manner.

During the formation of the acetaldehyde the heating of the catalyzer tube 1 may be very effectively carried out by the external application of heat, which is readily conveyed to all portions of the catalytic material by reason of the fact that the latter is carried upon the disks of metal gauze 2, which form very effective conductors of heat. In this way the acetaldehyde will be very uniformly formed from the alcohol vapors.

While I have described my invention above in detail, I wish it to be understood that many changes may be made therein without departing from the spirit of my invention.

I claim:

1. A catalyzer adapted to form an aldehyde and hydrogen from an alcohol, comprising a metal body carrying an adherent integral formation of finely divided, voluminous catalytic metal, obtained from an organic compound by a thermal decomposition and a reduction *in situ*.

2. A catalyzer adapted to form an aldehyde and hydrogen from an alcohol, comprising a body of gauze carrying an integral formation of a finely divided catalytic metal, obtained by way of an acetate and thermally decomposed and reduced *in situ*.

3. A catalyzer adapted to form an aldehyde and hydrogen from an alcohol, comprising a disk of gauze carrying an adherent deposit of finely divided catalytic metal,

formed by a thermal decomposition and a reduction *in situ* of an organic compound.

4. A catalyzer adapted to form an aldehyde and hydrogen from an alcohol, comprising a disk of metal gauze carrying a finely divided reduced catalytic metal, obtained by way of an acetate and thermally decomposed and reduced *in situ*.

5. A catalyzer apparatus adapted to form an aldehyde and hydrogen from an alcohol, comprising a plurality of spaced disks of a conductive and catalytic metal gauze carrying a finely divided voluminous reduced deposit of the same conductive and catalytic metal and confined in a tube of the same metal.

6. A metallic catalyzer comprising a copper deposit formed by the production, thermal decomposition and the subsequent reduction *in situ* of an organic compound of copper upon the surface of a supporting and conductive body of unchanged copper.

7. A catalyzer comprising a metallic deposit formed by the production, thermal decomposition and the subsequent reduction *in situ* of an organic compound of the metal upon the surface of a supporting and conductive body of that metal.

8. A catalyzer consisting of a thin metal body whose outside portions are of the same metal and are voluminous and integral with said body.

9. A catalytic apparatus comprising parallelly arranged metallic gauzes whose edges are connected by heat conducting material the surfaces of the metal of the gauze being voluminous and integral therewith.

10. A catalytic apparatus comprising parallelly arranged metallic gauzes whose edges are connected by metal of the same kind, the surfaces of the metal of the gauze being voluminous, integral therewith, and of the same metal.

In testimony that I claim the foregoing I have hereunto set my hand.

ARTHUR A. BACKHAUS.

Witnesses:
JOHN P. GISCHEL,
ARTHUR WRIGHT.