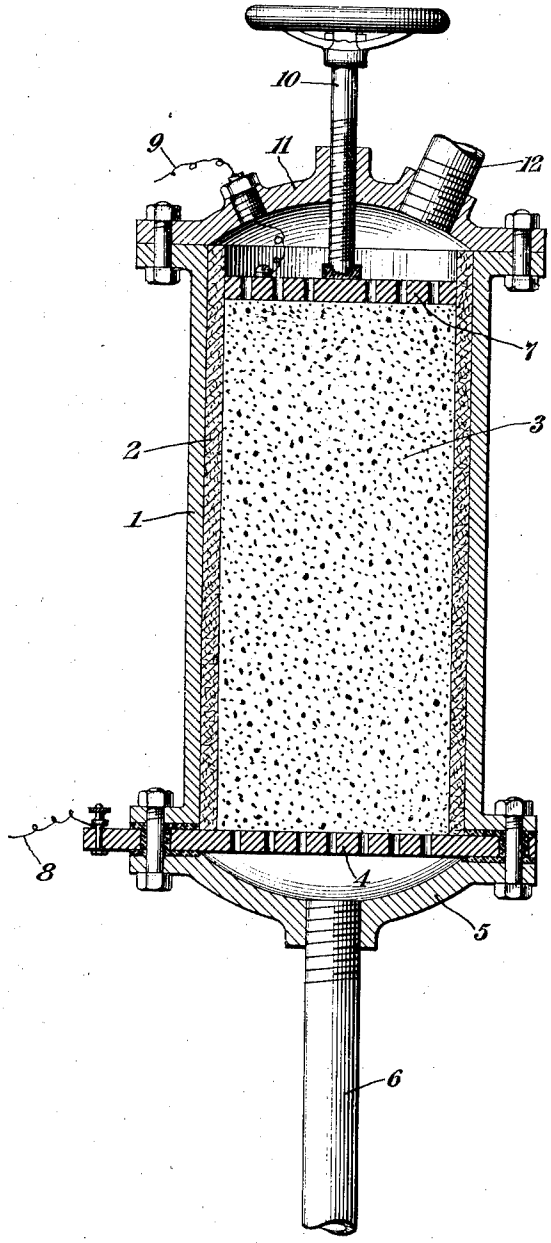
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APPARATUS FOR CATALYSIS.

APPLICATION FILED JUNE 24, 1918. RENEWED JUNE 5, 1919.

1,396,718. Patented Nov. 8, 1921.



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APPARATUS FOR CATALYSIS.

1,396,718. Specification of Letters Patent. Patented Nov. 8, 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 Apparatus for Catalysis, and do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates particularly to an apparatus for use in the production of aldehydes from alcohols.

The object of my invention is to provide a catalyzer apparatus of an advantageous character, by means of which a catalytic agent, as for example finely divided copper, may be effectively applied to alcohols to produce aldehydes, as for example in the production of acetaldehyde from ethyl alcohol, and in such a manner that the necessary temperature may be effectively maintained throughout all portions of the catalyzer.

A further object is to provide an apparatus of this character which is so arranged that the necessary temperature will be applied throughout all portions of the catalyzer, while at the same time the capacity of the apparatus is made sufficiently large to treat large quantities of the alcohol. By means of my invention I am able, therefore, to avoid the disadvantages of other types of catalyzer apparatus in which the catalyzer was ineffectively or unevenly heated when large quantities of the catalyzer were being used to treat correspondingly large quantities of the alcohol, or in which it was necessary to provide the apparatus with only a small capacity if the catalyzer was effectively and uniformly heated.

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 have shown only one form of the same in the accompanying drawing, in which—

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

In the drawing, I have shown a cylindrical casing 1, having an asbestos lining 2 for insulation, provided with a body of catalytic material 3. The body of catalytic material 3 may be comprised of granular carbon, as for example charcoal, treated so as to carry throughout the body thereof finely divided reduced copper. This catalytic material may be treated to form the finely divided reduced catalytic metal, such for example, as copper, nickel, chromium or iron, thereon. As an example of this treatment, the carrier such as charcoal may be impregnated with the nitrate of the metal, the metal precipitated with ammonia, and the mass dried and ignited and then reduced with hydrogen at about 300 degrees C. for several hours. As a result of this process a finely divided catalytic metal is produced on the carrier and the metal is in highly porous condition due to the volatilization of the ammonium nitrate. The reduction takes place preferably in a copper tube. In order to retain the body of catalytic material 3 in place, an insulated perforated copper plate 4 is as shown provided at the lower end of the container 1, below which there is located a cover 5, having an inlet pipe 6 for alcohol vapors. At the upper portion of the container 1, a perforated copper plate 7 preferably retains the body of catalytic material 3 in place. The copper plates 4 and 7 are connected, respectively, to leads 8 and 9, located in an electric heating circuit, and the plate 7 is adapted to be adjusted by means of an insulating screw 10, passing through a cover 11 at the top of the container 1, so as to adjust the resistance to the passage of the electric current through the carbon particles of the catalytic material 3, and so as thus to adjust the temperature within the container 1. The vapors of acetaldehyde are conveyed away by means of a pipe 12 located in the cover 11.

In the operation of my apparatus, the vapors of an alcohol, such for example as ethyl alcohol, are conveyed into the catalyzer apparatus by means of the pipe 6, and said vapors, as well as the catalytic material, are maintained at the desired temperature of between 250° and 350° C. by the passage of the electric current through the carbon particles comprising the catalytic material 3 and the temperature of which is adjusted by adjusting the screw 10 to adjust the pressure exerted between said carbon particles. The acetaldehyde and hydrogen formed from the alcohol will be conveyed away by the pipe 12, and may be separated in any suitable manner.

In this way a large volume of alcohol vapors may be effectively treated in the appa-

ratus, while at the same time the action of the catalytic material will be uniform, inasmuch as said material will be uniformly heated by the resistance to the passage of the electric current offered thereby.

Furthermore, inasmuch as the temperature within the container 1 may be at all times accurately adjusted by the movement of the screw 10, the temperature within the said container will be maintained at the desired point.

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 the invention.

I claim:

1. In combination, a body of catalytic material in the form of a granular conductor of electricity, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and means for varying the resistance of the granular material to the passage of the electric current.

2. In combination, a body of catalytic material comprising granular carbon, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and means for varying the resistance of the granular material to the passage of the electric current.

3. In combination, a body of catalytic material in the form of granular carbon carrying finely divided reduced copper, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and means for varying the resistance of the granular material to the passage of the electric current.

4. In combination, a body of catalytic material in the form of a granular conductor of electricity, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable pressure plate in contact with said body of catalytic material.

5. In combination, a body of catalytic material comprising granular carbon, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable pressure plate in contact with said body of catalytic material.

6. In combination, a body of catalytic material in the form of granular carbon carrying finely divided reduced copper, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable pressure plate in contact with said body of catalytic material.

7. In combination, a body of catalytic material in the form of a granular conductor of electricity, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable perforated pressure plate in contact with said body of catalytic material.

8. In combination, a body of catalytic material comprising granular carbon, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable perforated pressure plate in contact with said body of catalytic material.

9. In combination, a body of catalytic material in the form of granular carbon carrying finely divided reduced copper, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable perforated pressure plate in contact with said body of catalytic material.

10. In combination, a body of catalytic material in the form of a granular conductor of electricity, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable perforated pressure plate constituting also a perforated supporting plate for the granular material.

11. In combination, a body of catalytic material comprising granular carbon, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable perforated pressure plate constituting also a perforated supporting plate for the granular material.

12. In combination, a body of catalytic material in the from of granular carbon carrying finely divided reduced copper, means for passing a current of electricity through the same to maintain the catalyzer at an elevated temperature, and an adjustable perforated pressure plate constituting also a perforated supporting plate for the granular material.

13. In combination, a chamber provided with insulated means for the carrying of an electric current to the interior thereof, a body of granular catalytic material therein and in the path of said current but insulated from said chamber, and means, extending into said chamber, for varying the heating effect of said body of granular material during and suitably to its use as a catalytic.

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

ARTHUR A. BACKHAUS.

Witnesses:
JOHN P. GISCHEL,
ARTHUR WRIGHT.