M. C. WHITAKER.

CATALYZER APPARATUS.

APPLICATION FILED JUNE 28, 1918.

1,396,389.

Patented Nov. 8, 1921.

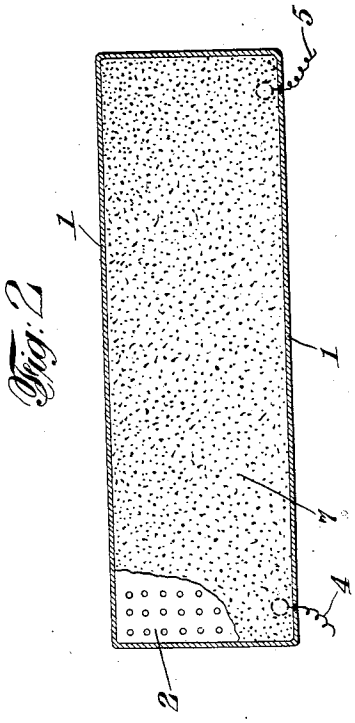


Fig. 2

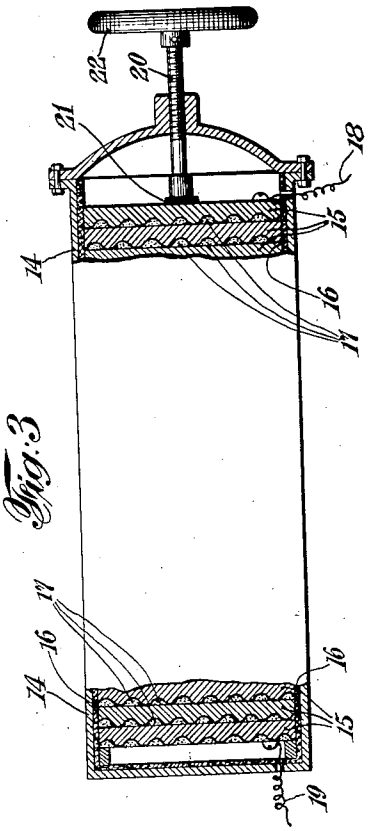


Fig. 3

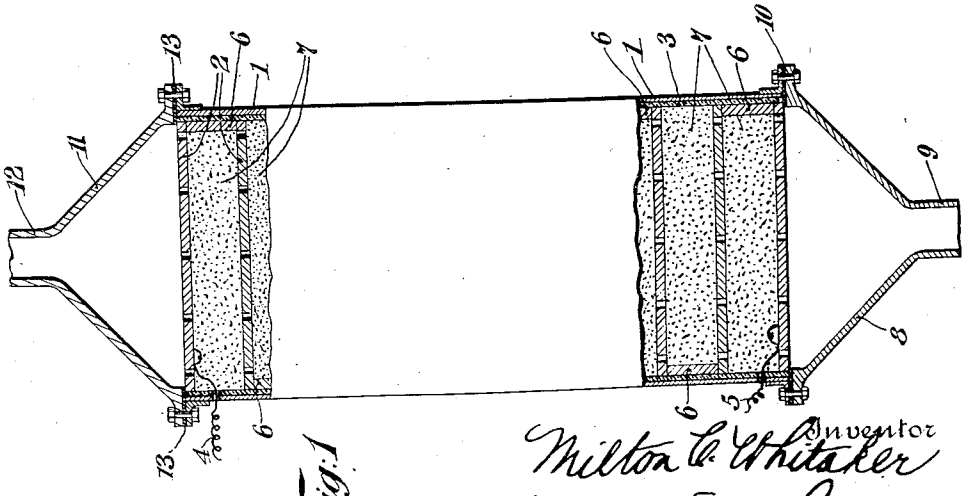


Fig. 1

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UNITED STATES PATENT OFFICE.

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CATALYZER APPARATUS.

1,396,389. Specification of Letters Patent. Patented Nov. 8, 1921.

Application filed June 28, 1918. Serial No. 242,443.

To all whom it may concern:

Be it known that I, MILTON C. WHITAKER, of New York, in the county of New York and in the State of New York, have invented a certain new and useful Improvement in Catalyzer Apparatus; 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 drawings, in which—

Figure 1 is a vertical section of a catalyzer apparatus made in accordance with my invention;

Fig. 2 is a horizontal section of the same; and

Fig. 3 is a horizontal section of a modified form of catalyzer apparatus.

In the drawings, referring especially to Figs. 1 and 2, I have shown a catalyzer apparatus comprising an elongated container or casing 1, which is provided at intervals therein with perforated carbon plates 2 in an insulating lining 3, adapted to be heated electrically in any suitable way, as for example by the passage through the same of an electric current by means of wires 4 and 5, the electric circuit between the several plates being made by carbon plates 6 located alternately at different sides of the container 1. Between the perforated carbon plates 2, there are located bodies of catalyzer material 7, which material may be either pumice stone or some other inert porous medium, carrying a finely divided reduced metal, such for example as copper, nickel, chromium or iron, or plates of wire gauze carrying a finely divided reduced metal of this character, and which may be made according to any of the processes set forth in the applications of Arthur A. Backhaus upon Process of Making Catalyzers, Serial Number 240,221, filed June 15, 1918, in which a process was described for making a catalytic material by impregnating an inert carrier like pumice stone with a nitrate of a catalytic metal, precipitating the salt with ammonia, drying and igniting, and reducing with hydrogen at a temperature of about 300° C. with a result that a highly porous catalytic metal was formed, of Arthur A. Backhaus and Fred B. Arentz upon process of making catalyzers, Patent Number 1,376,665, patented May 3, 1921, and of Arthur A. Backhaus upon method of producing catalyzers, Patent Number 1,375,345, patented April 19, 1921. An end closure 8 is provided, having an inlet opening 9 and separated from the container 1 by an insulating gasket 10 to conduct alcohol vapors into the catalyzer apparatus. Another end closure 11 is provided, having an outlet opening 12 and separated from the container 1 by an insulating gasket 13 to convey away from the same the acetaldehyde and hydrogen for separation in any suitable manner.

The modification of my invention shown in Fig. 3 comprises an elongated container 14, having substantially the same shape as the container 1 hereinabove referred to, and having a plurality of transversely arranged corrugated carbon plates 15 carried within an asbestos insulating lining 16, located adjacent to one another and having interposed between the same bodies of catalytic mate-

rial 17, which may be of the same kind as the catalytic material contained in the apparatus shown in Figs. 1 and 2. At one end of the container 14 an electric heating circuit is connected by a lead 18 to one of said plates 15. The opposed plate 15 at the other end of said container 14 is connected into said circuit by a lead 19. At one end of the container 14 there is, furthermore, provided an adjusting screw 20, having an insulating plate 21 on its end and adapted to be operated by a hand wheel 22, so that by the adjustment of this screw the resistance of the plates 15 to the passage of the current may be varied, in order to vary the temperature maintained within the catalyzer apparatus.

In the operation of the apparatus shown in Figs. 1 and 2, alcohol vapors, as for example the vapors of ethyl alcohol, will be passed into the catalyzer apparatus by means of the pipe 9 and will come into contact with the catalytic material 7, where the finely divided reduced metal will change the ethyl alcohol vapors into acetaldehyde and hydrogen, which may be conducted away from the catalyzer apparatus by means of the pipe 12 and separated in any suitable manner.

Throughout the treatment, furthermore, the catalyzer material and the alcohol vapors will be maintained at the requisite temperature of from 250° to 350° C. by the passage of the electric current through the carbon plates 2, and, inasmuch as these carbon plates are located at frequent intervals throughout the entire body of the catalytic material, all portions of the latter will be maintained heated at the desired temperature in a uniform manner. Nevertheless, because of the numerous openings in the carbon plates 2, the apparatus is capable of handling a large quantity of the alcohol vapors, so that the output of acetaldehyde will be correspondingly large.

The modified form of my invention shown in Fig. 3 operates in the same manner as the form of apparatus shown in Figs. 1 and 2, except that, by making use of the corrugated carbon plates 15 and the means for adjusting the pressure thereon, the temperature within the catalyzer apparatus may be readily changed or regulated at will by adjusting the position of the screw 20, so that the desired temperature will be obtainable at all times.

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. An apparatus comprising, in combination, a body of catalytic material confined between resistance plates and electrical means for heating the same comprising said resistance plates, said plates being pervious to fluid to permit access of fluid to said catalytic material, and said catalytic material being held between a plurality of said plates in conductive relationship therewith.

2. An apparatus comprising, in combination, a casing provided with an inlet and outlet for fluid, a body of catalytic material in said casing, and electrical means for heating the material comprising a plurality of resistance elements adjacent to said material, said catalytic material being held between a plurality of said resistance elements in conductive relationship therewith.

3. An apparatus comprising, in combination, a casing provided with an inlet and outlet for fluid, a body of catalytic material in the casing and electrical means for heating the material comprising carbon resistance plates adjacent to the same, said catalytic body being held between a plurality of plates in conductive relationship therewith.

4. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units, between carbon resistance plates and a container therefor, said apparatus being provided with an inlet and outlet for fluid, said catalytic body being held between a plurality of plates in conductive relationship therewith.

5. An apparatus comprising, in combination, a container, a body of catalytic material and electrical means for heating the same therein, said heating means comprising a corrugated resistance plate adjacent said catalytic material and a contacting opposed plate, and the said apparatus being provided with an inlet and outlet for fluid.

6. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units between contacting corrugated resistance plates adjacent to the same, and a container therefor provided with an inlet and outlet for fluid.

7. An apparatus comprising, in combination, a container, a body of catalytic material and electrical means for heating the same, said apparatus comprising contacting corrugated carbon resistance plates adjacent the catalytic and said apparatus being provided with an inlet and outlet for fluid.

8. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units each associated with a corrugated carbon resistance plate adjacent to the same and with a contacting opposed plate, and a container for said catalytic units provided with an inlet and outlet for fluid.

9. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units each associated with a resistance plate adjacent to the same, a contacting opposed plate, a container therefor provided with an inlet and outlet for fluid, and means for adjusting the pressure between the plates so as to adjust the resistance to regulate the temperature in the catalyzer apparatus.

10. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units each associated with a carbon resistance plate adjacent to the same, a contacting opposed plate, a container therefor provided with an inlet and outlet for fluid, and means for adjusting the pressure between the carbon plates so as to adjust the resistance to regulate the temperature in the catalyzer apparatus.

11. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units each associated with a corrugated resistance plate adjacent to the same, a contacting opposed plate, a container therefor provided with an inlet and outlet for fluid. and means for adjusting the pressure between the plates so as to adjust the resistance to regulate the temperature in the catalyzer apparatus.

12. An apparatus comprising, in combination, a body of catalytic material and electrical means for heating the same, said apparatus comprising a plurality of catalyzer units each associated with a corrugated carbon resistance plate adjacent to the same, a contacting opposed plate, a container therefor provided with an inlet and outlet for fluid, and means for adjusting the pressure between the carbon plates so as to adjust the resistance to regulate the temperature in the catalyzer apparatus.

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

MILTON C. WHITAKER.

Witnesses:
OSCAR WAGNER,
MARGARET HUDAFF.