May 24, 1932. A. E. MARSHALL 1,859,450

ART OF ACTIVATING CARBON

Filed Aug. 20, 1930

Fig. 1.

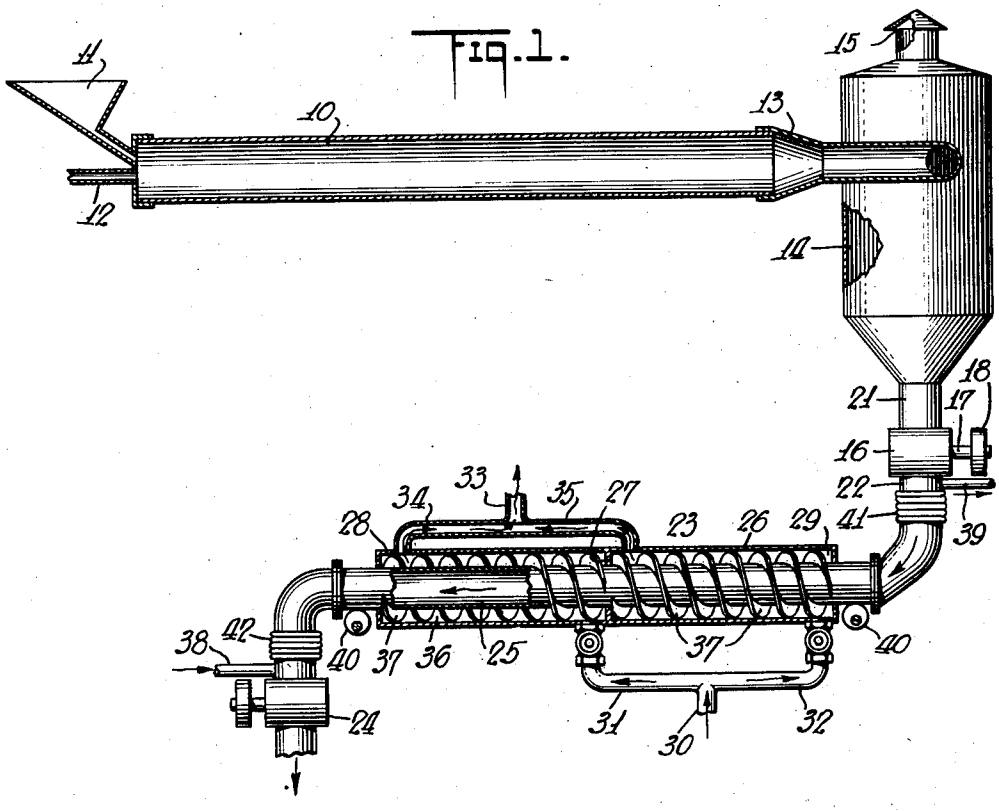


Fig. 2.

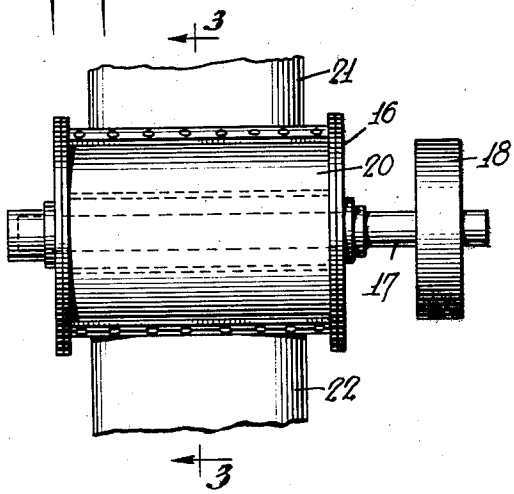
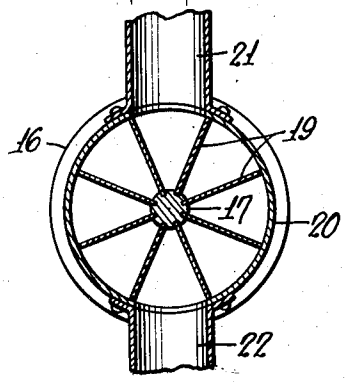


Fig. 3.



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UNITED STATES PATENT OFFICE

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ART OF ACTIVATING CARBON

Application filed August 20, 1930. Serial No. 476,472.

In the activation and reactivation of carbon intended for use as an adsorbent, decolorizer, deodorizer, and the like, it is customary to raise the temperature of the carbon either by contact with heated surfaces or by the passage through a heated zone of carbon in the form of a fine powder suspended in a gas.

The temperatures attained are usually above the ignition point of carbon in air or gases containing or capable of supplying oxygen. The discharge of carbon from a high temperature activating device without loss through oxidation presents difficulties, particularly when the product is required in dry form.

One of the usual procedures is to discharge the carbon into containers capable of being completely closed by a lid, or similar device, and allowing the closed container and its contents to gradually cool below the ignition point. Losses occur while the containers are being filled, and the prolonged cooling cycle is not well suited to continuous operation.

Another procedure giving a wet product, is based on the passage of the activated carbon from the heated zone through a water cooler and collector which usually takes the form of a water spray tower.

I have devised a continuous discharge equipment which permits cooling below the ignition point without access of air or, if necessary, in an inert atmosphere, and is characterized by an absence of dust, thus permitting the use of complete carbon activating, or reactivating equipment designed to produce dry activated carbons, within a building where other operations are performed.

The activating equipment or furnace may be of any usual type, and while I do not limit myself to a specific form, I have used as an illustration, a gas swept tubular activator.

The invention also consists in certain new and important features of construction and combination of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof.

In these drawings,

Fig. 1 is a side elevation, partly in section, of the apparatus embodying the present invention.

Fig. 2 is a side elevation showing the details of the rotary lock disposed at the inlet and outlet of the carbon cooler, and

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

In the specific form of the invention illustrated, a tubular furnace 10 is provided, having at one end thereof a hopper 11 for feeding fine carbon particles into said furnace, and a pipe 12 for admitting inert hot gases in contact with said carbon. The other end of the furnace 10 is provided with a connector pipe 13 leading into a cyclone collector 14 having an outlet opening 15 at the top thereof. The carbon particles travel through the furnace suspended in the inert hot gases, and then enter the cyclone collector 14 where the gases pass out through the outlet 15, and the hot carbon particles gravitate to the bottom. The bottom of the cyclone collector is preferably provided with an inlet rotary lock 16 which may include a rotatable shaft 17 carrying a pulley 18 at one end thereof, and having radially mounted thereon a plurality of blade elements 19, the outer ends of which travel in close proximity to the inner surface of a rotary lock casing 20. This casing has an inlet conduit 21 connected to the bottom of the collector 14 and an outlet conduit 22 leading into a carbon cooler 23. The hot carbon particles fall into the pockets formed by adjacent blade elements 19, and are rotatably carried to the outlet conduit 22. In

this manner the passage of gases between the collector 14 and the cooler 23 is minimized. The outlet of the cooler 23 is similarly provided with a rotary lock 24 so that said cooler is entirely enclosed.

The cooler 23 includes a tubular member 25 having portions thereof enclosed in a cylindrical jacket 26. This jacket 26 has a partition 27 serving to divide it into two compartments 28 and 29. An inlet water conduit 30 may be provided having two branches 31 and 32, each of which leads into the corresponding ends of compartments 28 and 29 respectively. An outlet water conduit 33 is also provided having branches 34 and 35 leading into opposite corresponding ends of the compartments 28 and 29 respectively. In order to sustain the contact of the cooling water with the outside of the tubular member 25, the jacket space 36 is preferably provided with helical fins 37 which serve to direct the flow of water through said jacket space.

The cooling of the carbon particles may be further induced by passing inert gases through the cooler in opposite directions from the direction of travel of the carbon. For this purpose the outlet of the cooler 23 has connected thereto a conduit 38 for introducing the inert gases in said cooler and the inlet of the cooler is similarly provided with a conduit 39 to permit the gases to pass out.

The travel of the carbon particles through the cooler 23 is maintained by a vibration of small but variable amplitude communicated to the cooler 23 by suitable electrical or mechanical means, such as cams 40. Vibrations of the cooler may be isolated from the rigidly fixed rotary locks 16 and 24 by means of flexible metallic bellows 41 and 42. The inlet and outlet conduits 30 and 33 can also be similarly isolated from the vibration of the cooler through the agency of flexible bellows connections, rubber hose connections, or the like.

It should be noted that through the instrumentality of the present invention an apparatus has been provided which effects a continuous discharge, and which permits cooling of the activated carbon below the ignition point without access of air.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A cooling device for oxidizable substances, such as activated carbon, including an enclosed tubular member, means for cooling the outside of said member, means for vibrating said member to effect the travel of carbon particles therethrough, a supply conduit, a delivery conduit, and flexible gas tight connections between said conduits and said member for preventing the transmission of the vibrations to said conduits.

2. A cooling device for oxidizable substances, such as activated carbon, including an enclosed tubular member disposed substantially horizontally, means for delivering said substances to one end of said member, means for delivering said substances from the opposite end of said member, means for introducing cool inert gases in said member, means for vibrating said member to induce the travel of carbon particles therethrough, and flexible connection means between said delivery means and said member for preventing the transmission of vibration to said delivery means.

3. A cooling device for oxidizable substances, such as activated carbon, including a water cooled tubular member, rotary locks adjacent to the inlet and outlet thereof, means for vibrating said member to induce the travel of carbon particles therethrough, and flexible connection means between the locks and the tubular member to isolate the vibrations from said rotary locks.

4. A cooling device for oxidizable substances, such as activated carbon, including an enclosed tubular member, means for vibrating said member to induce the travel of carbon particles therethrough, and means for passing an inert gas through said member countercurrent to the direction of flow of the carbon particles for cooling the carbon in a substantially dry state while passing through said tubular member.

5. In combination, a container for heated carbon particles, a substantially tubular member, a lock for controlling the delivery of particles from said container to one end of said member, gastight flexible connections between said lock and said member, means adjacent to one end of said member for vibrating the latter to effect movement of the particles lengthwise of the member, and means for cooling said particles during transit through said member.

6. In combination, a substantially horizontal tubular member, a supply conduit at one end of said member, a rotary feeding device for controlling the delivery of material from said conduit to said member, a delivery conduit at the opposite end of said member, a rotary lock for permitting discharge through said delivery conduit and preventing admission of air to said member, means for vibrating said member to effect travel of material therethrough, yielding connections between said member and said lock and between said member and

said feeding device for preventing transmission of vibration to said lock and feeding device, and means for cooling the material in transit through said member.

Signed at New York in the county of New York and State of New York this 18th day of August A. D. 1930.

ALBERT EDWARD MARSHALL.