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GRANULAR CARBON AND PROCESS OF MAKING THE SAME

Filed April 29, 1925

Fig. 1

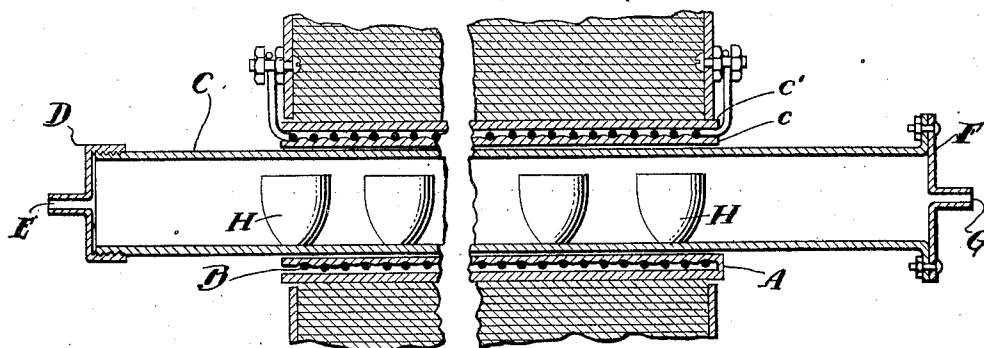
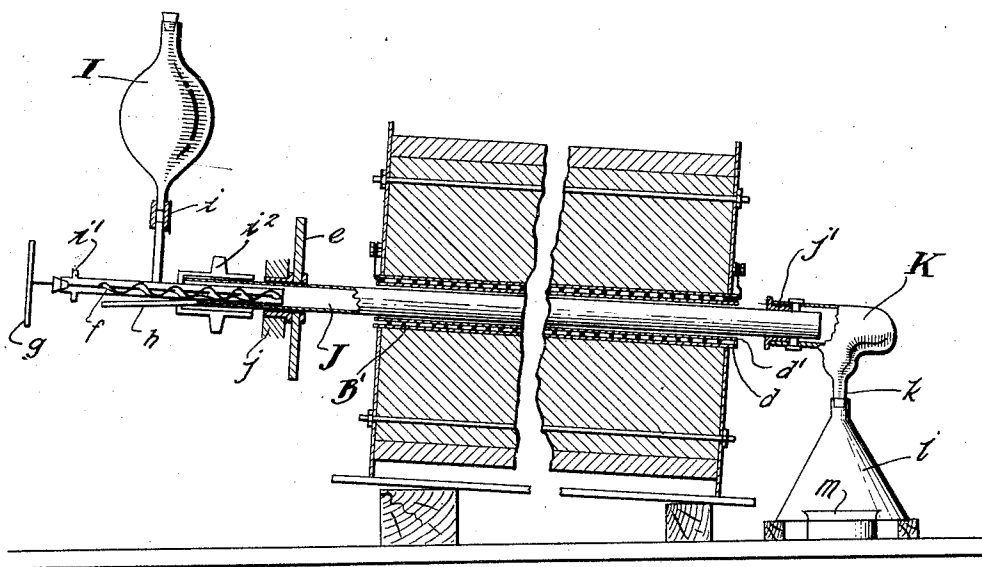


Fig. 2

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GRANULAR CARBON AND PROCESS OF MAKING THE SAME.

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The object of the invention is to produce granular carbon, particularly for use in telephone and radio transmitters, which carbon has pronounced scientific and practical advantages over the carbon or carbonaceous material now employed in microphonic transmission.

It is well known to those having a technical knowledge of the art that the carbon element of microphone transmitters occasions undue hissing or "burning," that it is not as sensitive as might be desired, and, moreover, that its resistance so increases with use that the usability of the transmitters may be greatly impaired.

The present invention overcomes the disadvantages specified, and others, and results in a granular carbon which is highly efficient for its intended purpose in that, inter alia, it minimizes hissing, is highly sensitive, electrically, and maintains the desired resistance without material impairment by even long use.

Speaking generally, the invention, in its preferred form, embodies a process wherein suitable carbonaceous material, such as coal, cocoanut shells, etc., in a ground condition, is subjected to a preliminary heating or preliminary roast at a gradually increasing temperature and for a somewhat protracted period, in the presence of a non-oxidizing, i. e., reducing atmosphere. The resulting material is heated, preferably at a higher temperature, either in a non-oxidizing atmosphere, or one containing a comparatively small quantity of an oxidizing gas or gases, such as air in limited quantity. However, I prefer, when the two operations specified are employed, to use a non-oxidizing atmosphere in both instances.

The accompanying drawing shows, more or less, diagrammatically, one form of apparatus which I have found useful in practicing the invention, though other types or forms of apparatus which may be used will readily suggest themselves to those skilled in the art.

Figure 1 is a longitudinal medial section of that portion of the apparatus wherein the pre-treatment adverted to is carried out; and,

Figure 2 is that portion of the apparatus, partly in longitudinal section and partly in elevation, wherein the second and final treatment of the material is completed.

Referring to Figure 1 of the drawings, A

is an electrical heating element or unit of a commonly employed construction embodying an electrical heating element or coil B encased between two insulating tubes or jackets *c, c'*, respectively, of suitable material, such as a vitrified refractory tube. C is the retort or chamber which may be of cylindrical form in which the carbonaceous material is first heated, the inlet end of which retort is provided with a metallic cap or head D, screwed thereon, having a gaseous inlet E, and the outlet end of said tube is provided with a cap or closure F, having a gaseous outlet G. The material to be treated is preferably confined in crucibles H, positioned within retort C, which crucibles may be readily introduced into or withdrawn from said retort by unscrewing closure D.

The material having been subjected to the pre-roast, to be described with more particularity hereinafter, is then introduced, see Figure 2, into a hopper I, preferably of glass, having a joint connection *i*, through which the material is fed to a rotary inclined heating retort or heater J, preferably cylindrical, and provided with an electrical heating element, similar to that previously described, embodying a heating coil B' encased between insulating members or cylinders *d, d'*, respectively. Cylindrical retort J may be rotated in any suitable way, as by a suitable pinion *e* mounted on the cylinder.

The inlet end of retort J is provided with a rotatable feeding element *f*, adapted to be rotated through a gear or pulley, shown diagrammatically at *g*. The feed inlet of tube J is also provided with a gas inlet tube *h*. Cylinder J is preferably provided with two mercury seals indicated at *i', i''*, respectively, whereby the inlet end of the cylinder is rendered gas tight. Cylinder J may be mounted for rotation in bearings *j, j'*, which it will be understood, are provided with suitable supports.

Outlet end of cylinder J is journaled in a discharge head or tube K, preferably of glass, the discharge outlet of which, *k*, discharges into an inverted funnel-shaped member L, in which is positioned a material receiving receptacle or dish *m*. It will be understood that there may be associated with the apparatus such control elements as are commonly used in chemical processes such as thermometers, pressure gages, thermostats, etc.

From the foregoing description of the ap-

paratus and its general manner of operation, the following specific description of applicant's process will be readily understood.

The carbonaceous material to be treated is placed in crucibles which are then introduced into cylinder C and heated therein at a gradually increasing temperature for approximately ten hours, at the end of which time the temperature should have reached a minimum of 500 degrees C., though the material may be allowed to attain a temperature of say from 900 degrees to 1000 degrees C., or even higher. The maximum temperature having been reached, the heating is continued at such temperature for a period of approximately 5 hours. The heating of the material as described is conducted in a non-oxidizing atmosphere, such as that of hydrogen or nitrogen, preferably the former, which may be introduced into retort C through gas inlet E.

The thus treated material, the heating of which may be termed pre-heating or pre-roasting, is introduced into hopper I from which it is fed, as heretofore described, into retort or heater J. In retort J, the material is so thoroughly agitated and mixed that all the particles are thoroughly and completely subjected to the uniform treatment now to be described. The temperature in retort J is maintained usually somewhat higher than that employed in retort C, and may range from approximately 1200 degrees to approximately 1300 degrees C. The feed of the material through retort J is at such speed that the material is treated therein for a period of approximately 2 hours. During this treatment, the retort is supplied through gas inlet h with a non-oxidizing gas such as hydrogen or nitrogen, though I may employ carbon dioxide or air in limited quantity, whereby only a slight oxidation occurs, or I may employ a mixture of the non-oxidizing gases, hydrogen or nitrogen, or both, with carbon dioxide, or air, or both, being careful that, at most, only a partial oxidation occurs.

The resulting granulated carbon is quite dense, i. e., free from substantial porosity, has a glistening surface, and is very uniform in character. The first treatment described apparently results in more or less cracking

of the volatile hydrocarbons present in the raw carbonaceous material treated, with the result, so far as I can best judge, that the carbon set free by such cracking is deposited in the pores of the residuary material, thereby materially diminishing its porosity. The second treatment gives each granule a very uniform heat treatment and uniform surface characteristics, both very important factors in the practical use of the material for its intended purposes.

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

1. The process of making granular carbon particularly adapted for microphonic transmission which consists in heating carbonaceous material over a period of from 10 to 100 hours at a gradually and slowly increasing temperature until it reaches a temperature of not less than 500 degrees centigrade, thereafter continuing the heating at substantially said latter temperature for a 1 to 10 hour period, said latter heating operation being conducted in a substantially non-oxidizing atmosphere, and then further heating the material not exceeding 1400 degrees centigrade for a 1 to 10 hour period at a substantially higher temperature, and in the presence of a substantially non-oxidizing atmosphere.

2. The process of making granular carbon particularly adapted for microphonic transmission which consists in heating carbonaceous material in a non-oxidizing atmosphere, such as hydrogen, for a period of between 10 and 100 hours while gradually increasing the temperature thereof until a temperature of not less than 500 degrees centigrade is attained, maintaining it at substantially said temperature for a period of from 1 to 10 hours, and then further heating the material for a 1 to 10 hour period at a temperature not over 1400 degrees centigrade in a substantially non-oxidizing atmosphere, such as hydrogen, while simultaneously agitating it so as to expose all its particles to treatment.

In testimony whereof I have signed the foregoing specification.

ELMER NEWMAN BUNTING.