Jan. 11, 1927. 1,614,220

E. WENDEL

TUBULAR ROTARY RETORT FLUID DISTRIBUTOR AND SUPPORT

Filed Jan. 5, 1922

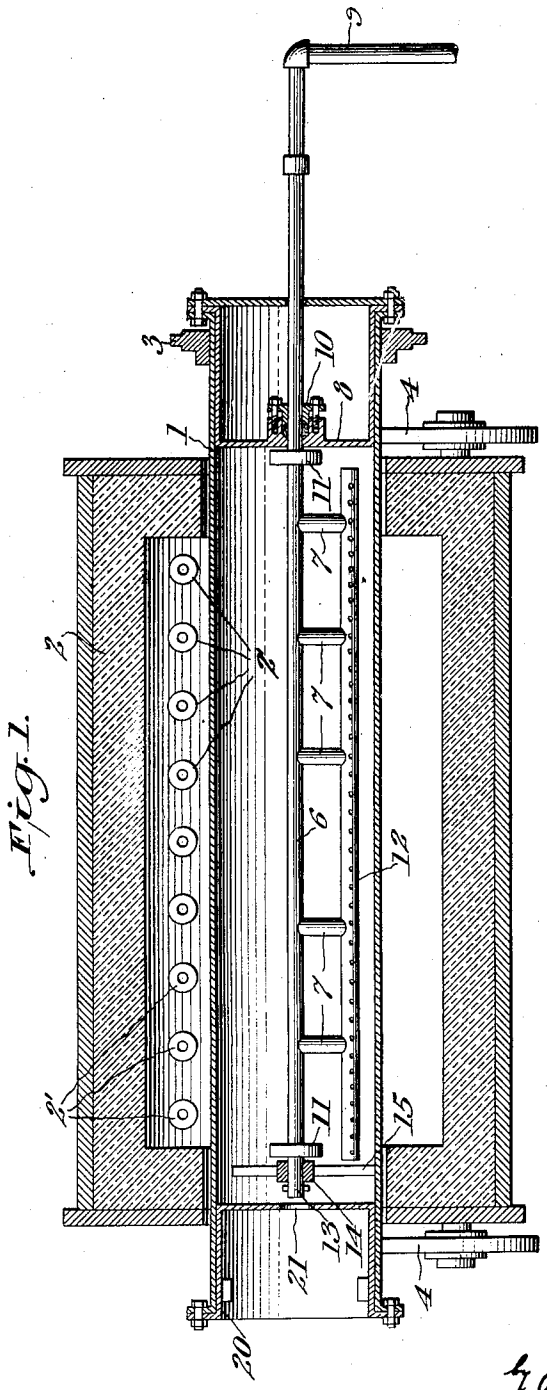


Fig. 1.

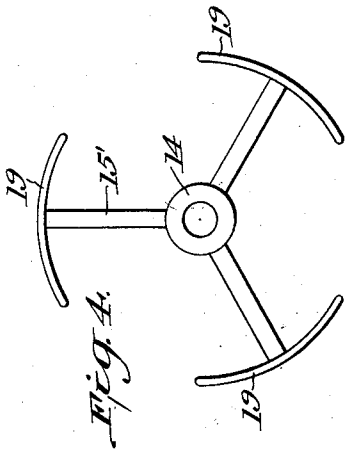


Fig. 4.

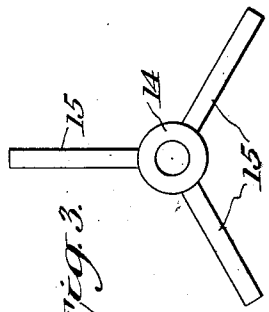


Fig. 3.

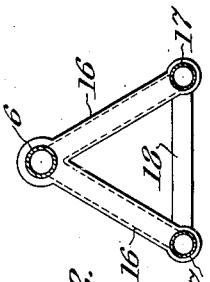


Fig. 2.

Inventor:
Edmund Wendel,
by Byrnes, Townsend & Brickenstein,
Attorneys.

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UNITED STATES PATENT OFFICE.

EDMUND WENDEL, OF CLEVELAND, OHIO, ASSIGNOR TO NATIONAL CARBON COMPANY, INC., A CORPORATION OF NEW YORK.

TUBULAR ROTARY RETORT FLUID DISTRIBUTOR AND SUPPORT.

Application filed January 5, 1922. Serial No. 527,107.

This invention relates to rotary tube furnaces of the type in which a fluid is introduced for the purpose of treating the charge. The invention more particularly resides in the provision of an improved fluid distributor and support therefor.

Rotary tube furnaces have heretofore been provided with an axial pipe carrying a row of parallel hollow arms having open lower ends terminating beneath or adjacent the surface of the material to be treated. Fluid forced into the axial pipe is discharged from the arms and is thus distributed in a plurality of jets upon the material. The degree of subdivision of the fluid obtainable by such construction is limited, however, because the number of depending arms must be restricted so as not to impose too great a weight upon the axial pipe. When in heated condition, this pipe is caused to sag by the weight of the arms, interfering with the operation of the furnace and necessitating frequent repairs. This defect may be in part avoided by the use of costly heat resistant alloys in making the supporting parts, but even in this case the number of depending arms can not be much increased without causing distortion. Also, the presence of a large number of arms prevents the proper movement of the material being treated in the rotating tube.

It is an object of my invention to provide a distributor which will not sag, although made of wrought iron or other metal not characterized by high resistance to mechanical stresses when in heated condition. A further object is to more thoroughly disseminate the fluid than is possible with the prior type of distributor.

In some rotary tube furnaces, a distributor of the kind above referred to may be journalled in the end closures of the furnace. In others, it is customary to make one end closure bodily removable to facilitate charging, discharging, and repairs. When this latter construction is adopted, means must be provided adjacent the removable end for the support of the distributor. I have devised an improved skeleton supporting device, or spider, comprising a bearing carried by radial arms, adapted for use in connection with the distributor. The axial pipe is journalled in the bearing and the radial arms serve to center the pipe in the furnace tube.

In distinction to prior devices of this type, I do not secure the support to the furnace tube, thus avoiding damage by rotation of the latter when the axial pipe has become bound in the bearing. This frequently happens owing to the expansion of the pipe or bearing. In the improved construction, the furnace tube will rotate with respect to those parts and no injury will result. Replacement of worn out furnace tubes and other repairs are also greatly facilitated by making the support readily removable.

My invention will be described in detail in connection with the accompanying drawings, in which:

Fig. 1 is a vertical longitudinal section through a rotary tube furnace provided with the improved distributor and support;

Fig. 2 is a transverse section through a modified form of distributor;

Fig. 3 is a front elevation of the supporting member;

Fig. 4 is a front elevation of another form of support.

Referring to the drawings, 1 indicates a tube of wrought iron, or the like, inserted in a furnace chamber 2, having burners or other suitable heating means 2'. The tube is provided with a chain sprocket 3, for purposes of rotation, and is mounted on rollers 4. The particular type of rotary tube, furnace, and driving means form no part of my invention and may be varied as desired.

The distributor constructed according to my invention comprises a pipe 6, extending along the longitudinal axis of the furnace tube and carrying a row of parallel hollow arms 7. The pipe 6 is non-rotatably mounted in the end 8 of the furnace tube 1, and is coupled to a pipe 9 leading from a source of treating fluid. A stuffing gland 10 is provided where the pipe 6 passes through the end of the furnace tube. Shoulders 11 are formed on pipe 6 adjacent its ends.

Instead of discharging the fluid from the ends of arms 7, as in prior practice, I provide a perforated pipe 12 extending parallel to the axial pipe 6 and into which the arms 7 open. Preferably the pipe 12 will be so positioned as to lie slightly below the surface of the material when a normal charge is placed in the furnace tube. The number of perforations in pipe 12 may be large, so as to effect a very thorough distribution of the fluid into intimate contact with the material.

The results secured in this way are greatly superior to those obtained by the use of the relatively limited number of jets to which the separate discharge tube installation is restricted. In addition, the weight which the axial pipe is required to support is much less and the bottom pipe 12 serves as a truss, or bracing member, preventing sagging of the axial pipe.

The end 13 of pipe 6 is journalled in a supporting member or spider, Figs. 1 and 3. The bearing 14, forming the hub of the spider, is carried by radial arms 15 equally spaced upon the circumference of the bearing. Three arms are shown in the drawing, but the number may be varied. Normally the spider will rotate with the furnace tube 1, but in case the rigidly mounted axial pipe 6 becomes bound in the spider by the expansion of metal in the bearing or from other causes, the furnace tube may rotate without carrying the spider with it. In this manner I avoid the torsion of the axial pipe which frequently results in its displacement when the spider is rigidly attached to the rotating tube. The length of the radial arms is adjusted to center the axial pipe properly in the furnace tube, but the arms do not engage the tube so tightly as to produce excessive friction if the bearing becomes bound on the pipe. It is not necessary to shut down the furnace when this happens, as is the case with prior devices having the supporting spider rigidly mounted on the tube.

In Fig. 2 I have illustrated a modified form of distributor, in which two rows of parallel hollow arms 16 extend obliquely downward from the axial tube 6. Perforated horizontal tubes 17 receive the discharge from the lower ends of the arms 16. Transverse rods or pipes 18 join the tubes 17 and brace the sets of depending arms in spaced relation.

Fig. 4 illustrates another form of support. The arms 15′ are provided with arcuate terminal pieces 19 which engage the walls of the furnace tube and diminish the tendency of the arms to breakage. The terminal pieces may be extended to form a complete rim, giving a wheel-like structure.

The furnace tube 1 is provided with a removable end 20 through which the material may be introduced and withdrawn. An opening 21 in end 20 is provided for escape of gases. In the form of the invention illustrated, treatment of batches is contemplated, but obviously the operation of the furnace may be made continuous by inclining the tube and providing suitable means to receive the discharged material. It will be understood in this connection that neither the operation of the furnace, nor its construction aside from the distributor and support, is of the essence of the present invention, and no limitation is to be imposed by the description herein of such operation and construction.

My invention is applicable generally to the distribution of fluids throughout material subjected to treatment in rotary tubes. For the reasons pointed out, it is especially advantageous in those processes in which high temperatures are used, with consequent likelihood of distortion of the weight-supporting parts. The braced pipe system which I have devised may be used with advantage with other supporting means than that herein described; the latter, also, may be used with other types of pipe systems.

As an example of one high temperature process in which my improved apparatus may be used with particular advantage, the activation of carbon will be briefly described. The furnace tube is charged with finely divided carbon of a suitable type, the amount of the charge being preferably sufficient to cover the perforated tube 12 to a depth of an inch or thereabout. An oxidizing and activating agent is then introduced through pipe 9, the furnace tube being rotated, and is disseminated in a large number of finely divided jets throughout the agitated mass of carbon. The preferable activating fluids are steam or carbon dioxid, or mixtures thereof, at temperatures lying between 800°–1000° C. When the treatment is completed and the charge has cooled, end 20 is removed and the activated carbon withdrawn from the furnace. Further details with regard to the activation of carbon are embodied in U. S. Patent to N. K. Chaney, No. 1,497,543, June 10, 1924. The distribution system herein described is well adapted to give the necessary intimate contact between the fluid and carbon and it is not detrimentally affected by the high temperature at which the treatment is carried out.

I claim:—

1. In a tubular rotary retort adapted to be charged and discharged at one end, a removable closure for said charging and discharging end, a system for distributing fluid in contact with fragmentary material therein, comprising a fluid supply pipe axially mounted in the tube and supported adjacent the charging and discharging end by a bearing support positioned loosely within the tube in proximity to, but independent of, the removable closure.

2. In a tubular rotary retort, a system for distributing fluid in contact with fragmentary material therein, comprising a fluid supply pipe, two rows of hollow arms extending downward from said pipe and in angular relation, perforated discharge pipes adapted to receive fluid from said arms, and means for bracing said discharge pipes so as to maintain the angular relation of the arms.

3. In a tubular rotary retort, a fluid sup-

ply pipe provided with discharge means and a support for said pipe comprising a bearing and arms projecting therefrom, said support being loosely mounted within the tube so as to permit of relative movement between the tube and the support.

4. In a tubular retort, a fluid distribution system comprising a pipe mounted in the tube and having a support adjacent one end, hollow arms communicating with said pipe and depending therefrom and a loosely mounted support for the other end of said pipe.

5. In a tubular rotary retort furnace, a fluid distribution system comprising a pipe mounted in the tube and having a support adjacent one end, hollow arms communicating with said pipe and depending therefrom and a loosely mounted support for the other end of the pipe positioned within the tube.

6. In a tubular retort, a fluid distribution system comprising a pipe axially mounted in the tube and having a support adjacent one end, hollow arms communicating with said pipe and depending therefrom, a perforated pipe rigidly connecting said arms, and a loosely mounted support for the other end of the pipe.

7. In a tubular rotary retort, a fluid supply pipe provided with discharge means, a support for said pipe comprising a bearing rotatable with respect to said pipe, and radial arms extending from said bearing and adapted to properly position said pipe, the ends of said arms being capable of sliding movement with respect to the inner surface of the tube.

8. In a tubular rotary retort, a fluid supply pipe provided with discharge means, a support for said pipe comprising a bearing rotatable with respect to said pipe, radial arms extending from said bearing, and arcuate members at the end of said arms conforming to the interior contour of said rotary tube and capable of sliding motion with respect to said tube.

9. A support adapted to sustain a fluid distribution pipe in a tubular rotary furnace, and comprising a bearing, a plurality of arms extending therefrom, and arcuate members at the end of said arms adapted to slide upon the inner surface of the furnace tube.

10. In a tubular rotary furnace, a support adapted to sustain a fluid distribution pipe comprising a bearing and a plurality of arms extending radially therefrom, said support being loosely mounted within the furnace tube so that the furnace tube may rotate relatively to the support.

In testimony whereof, I affix my signature.

EDMUND WENDEL.