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L. HONIGMANN ET AL

FURNACE FOR THE HEAT TREATMENT OF PULVERULENT, GRANULAR, OR PULPY MATERIAL

Filed Oct. 16, 1925

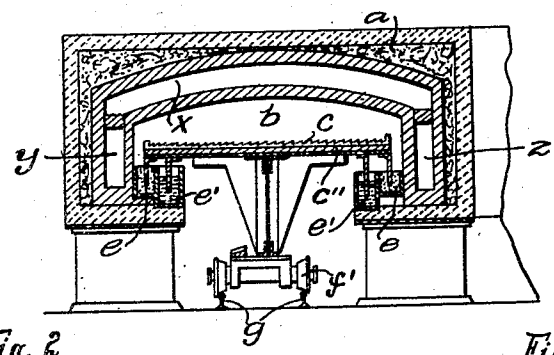
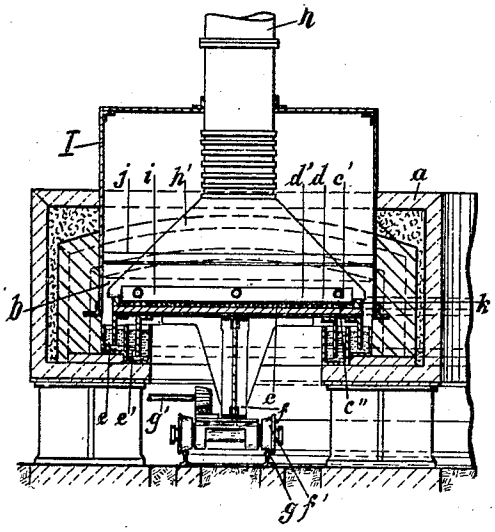
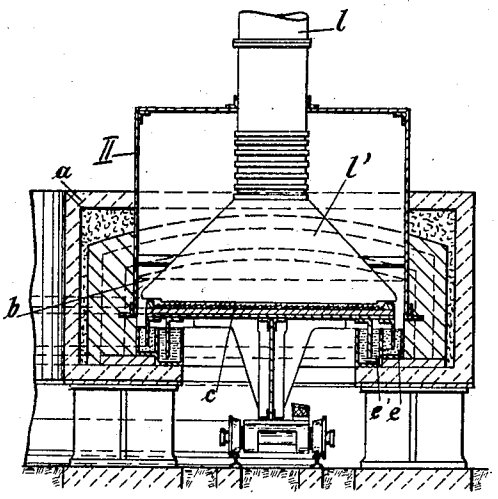


Fig. 2

Fig. 3





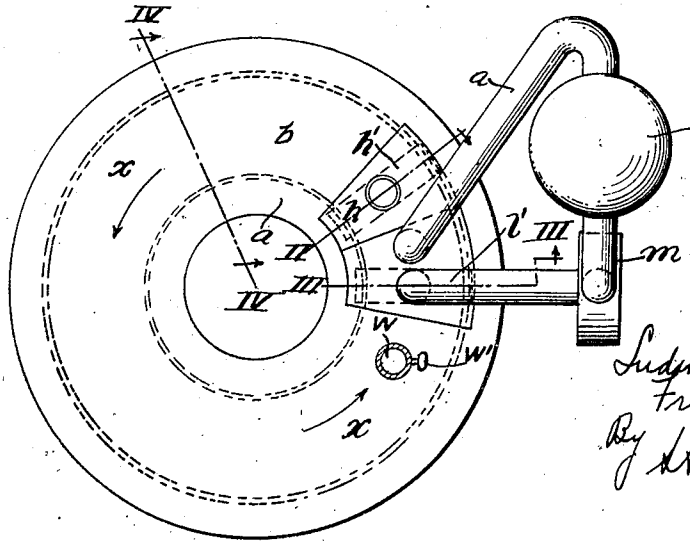


Fig. 1.

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UNITED STATES PATENT OFFICE.

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FURNACE FOR THE HEAT TREATMENT OF PULVERULENT, GRANULAR, OR PULPY MATERIAL.

Application filed October 16, 1925, Serial No. 62,832, and in Germany October 8, 1924.

The invention relates to a furnace for the heat treatment of pulverulent, granular or pulpy material, for example, for the drying, low-temperature distillation and gasification of peat, lignite or the like. In particular it relates to a furnace of such type with an annular furnace chamber, a rotary hearth inside the same for continuously transporting the material of the charge from a charging point to a discharging point, and means for supporting and transmitting motion to said hearth.

The purpose of the invention is to provide such a furnace in which the material can be subjected to effective heat treatment in a simple and inexpensive manner at small expense and in a short time. In particular it is intended to enable the charge material to be spread on the hearth, at the charging point, in a very thin and very uniform layer, and to remove it from the furnace in a simple manner at the point of discharge.

According to the invention, a furnace of the type in question is characterized in that the upper side of the rotary hearth is provided with projections, ledges or ribs, with grooves, channels or recesses, for the accommodation of the charge material, hollowed out between them. This assures a particularly favorable distribution of the material on the surface of the hearth, the heating surface of the bed of the hearth is considerably increased, and the transmission of heat to the charge is improved. In order to enable the material to be distributed in a perfectly uniform thin layer, the lower edge of the charging hopper at the charging point is arranged, according to the invention, so as to come into sliding contact with the projections, ledges or ribs of the rotary hearth, so as to sweep off the surplus material in the grooves, channels or hollows of the rotary hearth.

In this arrangement, the material is carried through the furnace chamber, from the charging point to the discharging point, in the recesses in the hearth plate, and is thus dried to a loose powder. This material cannot be removed at the point of discharge by ordinary scrapers, and therefore, according to the invention, means are provided for drawing the treated material out of the recesses in the rotary hearth by the suction effect of a current of gas. This can be effected by drawing off the furnace gas conjointly with the treated material at the point of discharge, passing the gas and material through a separator and then returning the gas to the furnace. This method prevents any admission into the furnace of fresh air, the oxygen of which might, for example, set up combustion in the material of the charge when fuels are being treated. In this manner, the major portion of the treated material is continuously removed.

An embodiment of the subject of the invention is illustrated in the drawing.

Fig. 1 represents an embodiment of the new furnace in plan,

Fig. 2 a section along the line II—II of Fig. 1 of one part of the annular furnace, and

Fig. 3 a similar section along the line III—III of Fig. 1.

Fig. 4 is a similar section along the line IV—IV of Fig. 1.

In the embodiment shown, a furnace according to the invention consists of an annular furnace arch *a*, enclosing an annular furnace chamber *b*, which is open at the bottom. This furnace chamber is closed on the under side by an annular rotary hearth *c*, consisting, for example, of a metal plate *c'* and an underlying body *c''* of firebrick. The hearth plate *c'* is provided, over its entire surface, with ribs or projections *d*, between which corresponding recesses *d'* are hollowed out. The furnace chamber *b* is shut off against the outer air by sand gutters *e* and water seals or the like *e'*. The rotary hearth *c* is carried by a supporting ring *f* which by trolleys *f'* is supported on a trolley track *g* on which it is rotated by a driving gear *g'*.

At the charging point (section line II) is arranged a charging pipe *h*, on which is elastically suspended a charging hopper *h'*. The lower edge of the charging hopper is in sliding contact with projecting ledges *k* on the plate *c*. A cross beam *j* prevents the charging hopper from being carried away by the rotary hearth plate. Between the ledges *k* an adjustable scraper *i* may be arranged on the charging hopper, said scraper sweeping directly over the ribs *d* of the hearth *c* and thereby removing any surplus of the material running out of the hopper.

At the point of discharge (section line

III) is arranged a second hopper l', which is suspended from a suction pipe l. This pipe l leads to the intake of a blower m, the delivery side of which is connected to a dust separator n, from which a return pipe o leads back into the furnace.

The new furnace operates in the following manner:

Granular or pulpy material is shot down through the pipe h, and passes by way of the charging hopper h' on to the surface of the hearth plate c'. This plate moves in a circular manner in the direction of the arrows x, and in the course of this movement the charging hopper h' sweeps against the ledge shaped ribs k of the hearth plate. The damp charge material falls into the recesses d' of the hearth plate and is carried round by the rotary movement of same. In this movement the scraper i sweeps off the surplus material so as to leave a thin and very uniform layer. On the way from the charging point II as far as the point of discharge III, the material traverses the furnace chamber IV and is thereby dried, reaching the point of discharge II as a dry powder. At this point the blower m, acting by way of the pipe l draws the furnace gas over the rotary hearth, and carries away the pulverulent product along with the gas. The mixture of gas and charge material reaches the separator n, where the pulverulent product is separated, the dust-free gas being returned to the furnace by way of the pipe o.

As shown in Fig. 4, the annular chamber b is surrounded by the heat passages x, y, z, through which pass the heating gases from a suitable furnace and which, by indirect heating, accomplish the drying or distillation of the material upon the hearth c. This is a well known type of heating apparatus, and forms no part of the present invention.

It will be understood that the general arrangement of the heating chambers for the hearth are by way of example only and are already known in the art. The present invention relates to the provision of the annular ribs upon the top of the hearth, to the means of forming a thin layer of charging material upon the hearth, and to the means for withdrawing the dried material without incurring the introduction of gases in the exterior. Suitable devices, already well known in the art, may be provided to regulate the discharge of furnace and other gases from the hearth chamber itself, such as a draw-off pipe w which may be controlled by a damper having an external handle w'.

Claims:

1. A furnace for the heat treatment of pulverulent, granular or pulpy material comprising an annular furnace chamber, a rotatable hearth in said chamber to continuously transport the charging material from a charging point to a discharging point, and means for supporting and rotating said hearth, said hearth having annular projections on its upper surface to form grooves within which the charging material is placed, and means to remove the dried material from said grooves individually.

2. A furnace for the heat treatment of pulverulent, granular or pulpy material comprising an annular furnace chamber, a rotatable hearth in said chamber to continuously transport the charging material from a charging point to a discharging point, means for supporting and rotating said hearth, said hearth having projections on its upper surface to form grooves within which the charging material is placed, and a charging hopper to place the charging material upon said hearth, said hopper presenting its lower edge into contact with the projections to remove the charging material in excess of that for filling said grooves.

3. A furnace for the heat treatment of pulverulent, granular or pulpy material comprising an annular furnace chamber, an imperforate hearth rotatable about a substantially vertical axis in said chamber to continuously transport the charging material from a charging point to a discharging point, means for supporting and rotating said hearth, means for charging the top of said hearth at the charging point with the charging material, a conduit terminating adjacent said hearth at the discharging point in a hopper extending substantially radially for the width of the layer of charging material and with its opening located immediately above the material, and means to create a suction effect in said conduit to thereby remove said material from said hearth, and means to remove the material from said conduit.

4. A furnace for the heat treatment of pulverulent, granular or pulpy material comprising an annular furnace chamber, a rotatable hearth in said chamber to continuously transport the charging material from a charging point to a discharging point, means for supporting and rotating said hearth, means for delivering the charging material to the hearth at the charging point, a conduit terminating adjacent said hearth at the discharging point in a hopper extending substantially radially for the width of the layer of charging material and with its opening located immediately above the material, a separator, said furnace chamber and hearth being shut off from the atmosphere, means to draw off the furnace gas and the treated material through said conduit from the discharging point and into said separator, and means to return the gas to the furnace.

5. A furnace for the heat treatment of pulverulent, granular or pulpy material comprising an annular furnace chamber, a

rotatable hearth in said chamber to continuously transport the charging material from a charging point to a discharging point, means for supporting and rotating said hearth, said hearth having projections on its upper surface to form grooves within which the charging material is placed and a lateral ledge at the edge thereof, and a charging hopper to place the charging material upon the said hearth, said hopper presenting its lower edge into contact with said ledge whereby to act as a scraper to remove the excess of the charging material and to provide a thin uniform layer upon said hearth.

In testimony whereof we have signed our names to this specification.

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