May 13, 1930. H. M. RIDGE 1,758,805

APPARATUS FOR SUBJECTING A MASS OF POWDERED OR GRANULAR MATERIAL TO THE ACTION OF GASES, PARTICULARLY APPLICABLE TO THE CALCINING AND ROASTING OF ORES AND SIMILAR MATERIALS

Filed May 9, 1928 2 Sheets-Sheet 1

FIG. 1.

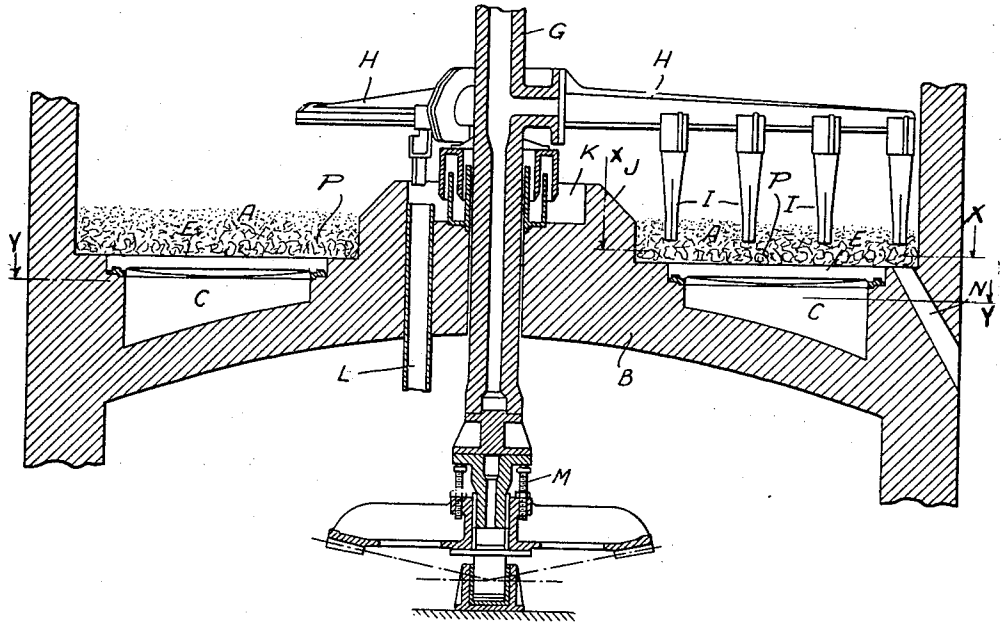
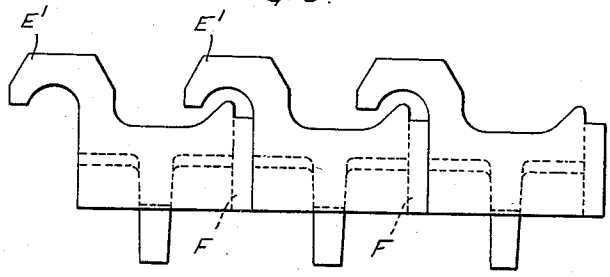


FIG. 3.



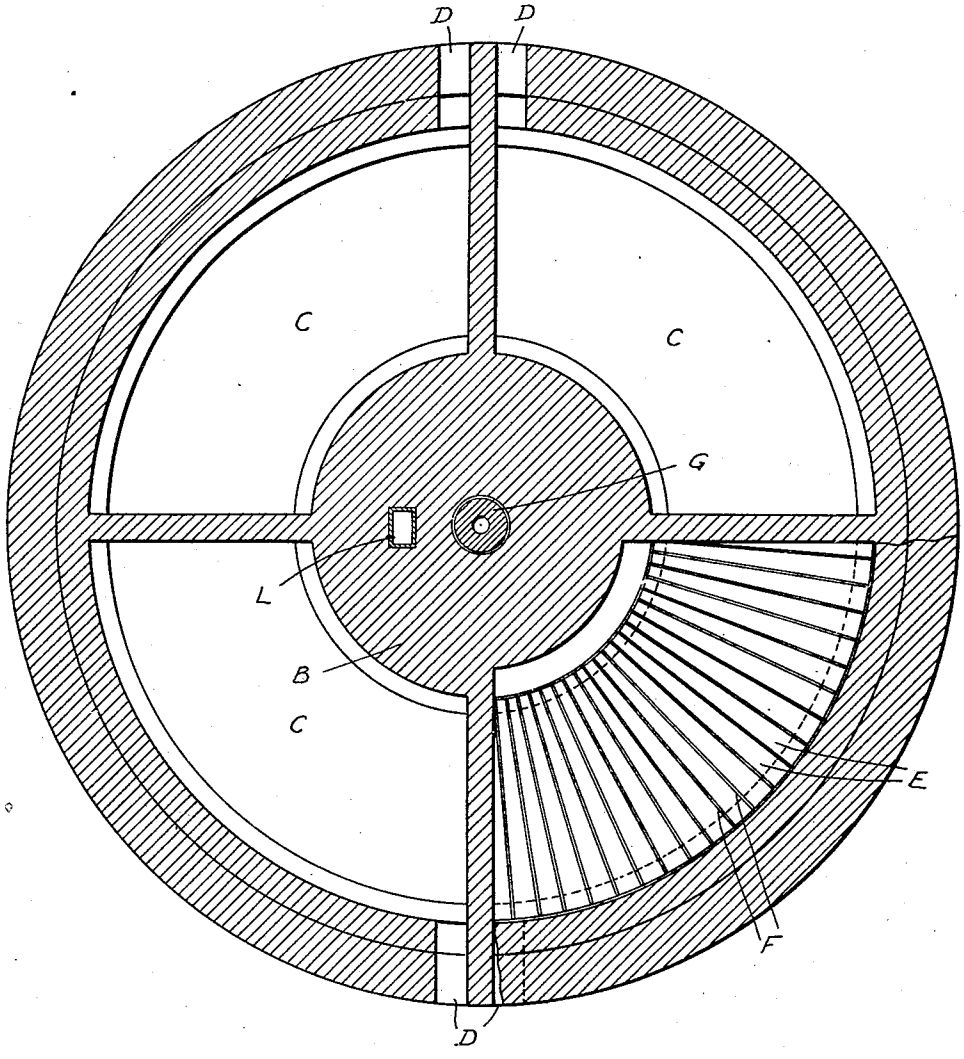
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FIG. 2



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UNITED STATES PATENT OFFICE

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APPARATUS FOR SUBJECTING A MASS OF POWDERED OR GRANULAR MATERIAL TO THE ACTION OF GASES, PARTICULARLY APPLICABLE TO THE CALCINING AND ROASTING OF ORES AND SIMILAR MATERIALS

Application filed May 9, 1928. Serial No. 276,487.

The chief object of this invention is the provision of improved means for disseminating air or other gas or gases throughout a mass of pulverulent granular or lumpy material disposed in a bed of substantially uniform depth. The invention is applicable to apparatus designed for widely different purposes, such as gas producers, ore calcining and roasting furnaces, apparatus for the production of bleaching powder, etc.

According to the invention the gas, which is introduced from below into the body of material which is being treated is substantially uniformly disseminated by subdividing the area underlying the bed of material in successive stages of increasing numbers of units or divisions through which the gas or gases pass in succession to the body of material under treatment, the final subdivision being effected by means of a layer of granular material of an inert character supporting the bed of material to be treated, which is continuously stirred or rabbled during the dissemination of the air or gas.

The essential parts of an apparatus embodying one form of the invention are illustrated in Figs. 1 and 2 of the accompanying drawings, the former being a central vertical section and the latter a sectional plan view, the lower right hand quadrant of Fig. 2 being a section on line X—X of Fig. 1, and the remainder of the figure being a section on line Y—Y; Fig. 3 is an elevation on an enlarged scale of a detail.

In this apparatus the pulverulent or granular material to be treated occupies an annular space or hearth A formed or carried upon a floor B. In the floor B there are four quadrantal chambers C each having a gas inlet D. These chambers C are roofed in by radially arranged fire bars E having narrow interspaces F through which the air or gas passes from the gas chambers. Above the fire bars E and occupying a suitable depth of the annular space or hearth A is placed a layer of granular material which is inert with respect to any reactions which may take place upon the hearth between the air or gas and the material under treatment, and above this layer of granular material is fed the raw material in a powdered or suitably subdivided condition. This raw material is stirred continuously for which purpose, in the apparatus shown, there is provided a rabble shaft G carrying three rabble arms H which are preferably made hollow for the introduction or circulation of a cooling fluid, and carried by the rabble arms are suitably spaced rabbles I which extend into the material under treatment, but terminate just above the layer of inert granular material upon the hearth.

It will be seen that, by such means, the air or other gas or gases supplied to the chambers C will be very evenly distributed, first to the layer of inert granular material, then be distributed still more uniformly through the interstices in this layer over the lower surface of the material under treatment and then be uniformly disseminated through the latter material by the continuous rabbling or stirring of the material.

In the apparatus shown the roof of the gas chambers C is constituted by iron fire bars and these may, with advantage, be of the form shown in end elevation in Fig. 3, each fire bar being formed with a lip or hood E′ which straddles the interspace between such fire bar and that next to it on one side, and thus prevents choking of the interspace F with dust or small particles from the layer P of granular material. Alternatively, or in addition to this special construction of fire bar, the layer of inert granular material may be graded in size and its lower portion formed of particles of greater diameter than the width of the interspaces F between the fire bars.

The material to be treated would be fed to the hearth through an inlet opening (not shown in the drawing) at or near the outer edge of the latter and the rabbles so constructed as to cause this material to move inwardly towards the inner wall J of the hearth, over which it is forced by the rabbles into a space K provided with one or more discharge outlets L through which it drops to a suitable gastight discharging apparatus.

The rabble shaft is preferably so arranged that it can be raised or lowered to a limited extent, as for example by means of the screws

M. This enables the rabbles I to be lowered, for example to the extent required to remove the top portion of the layer of granular material, should any sintering occur between it and the material under treatment; or the rabbles may be lowered to bring their lower ends into close proximity to the upper surface of the grate for the purpose of removing the entire layer of granular material and replacing it with a fresh layer. For this purpose an outlet indicated at N, which is normally closed by a shutter not shown in the drawings, is provided at or near the outer edge of the hearth and the granular material may be fed at or near the centre of the stirred area.

The single hearth apparatus shown in the drawings may be a unit of a multiple-hearth apparatus having several zones arranged in one horizontal plane, or with small steps from the zone of one rabble shaft to the zone of the next rabble shaft, or there may be two or more zones superposed one on the other, or there may be a combination of both these arrangements, the material under treatment passing from one stirring hearth or zone to the other in succession until it is discharged from the final zone.

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. Apparatus for disseminating air or other gas or gases through a mass of pulverulent, granular or lumpy material disposed in a bed of substantially uniform depth, comprising a floor; means forming an annular space above said floor; radial partitions dividing said space into gas chambers; means for admitting gas to said chambers; and roofs for said chambers comprising radially arranged grate bars.

2. Apparatus according to claim 1 wherein the radial grate bars are formed with lips which straddle the space between adjacent grate bars.

In testimony whereof I have signed my name to this specification.

HARRY MACKENZIE RIDGE.