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METHOD FOR BURNING CLAY SLATE OR CLAY

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FIG. 2.

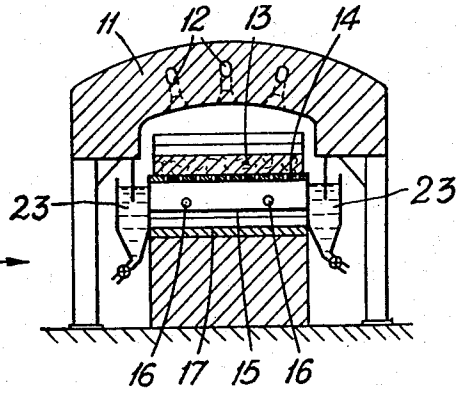
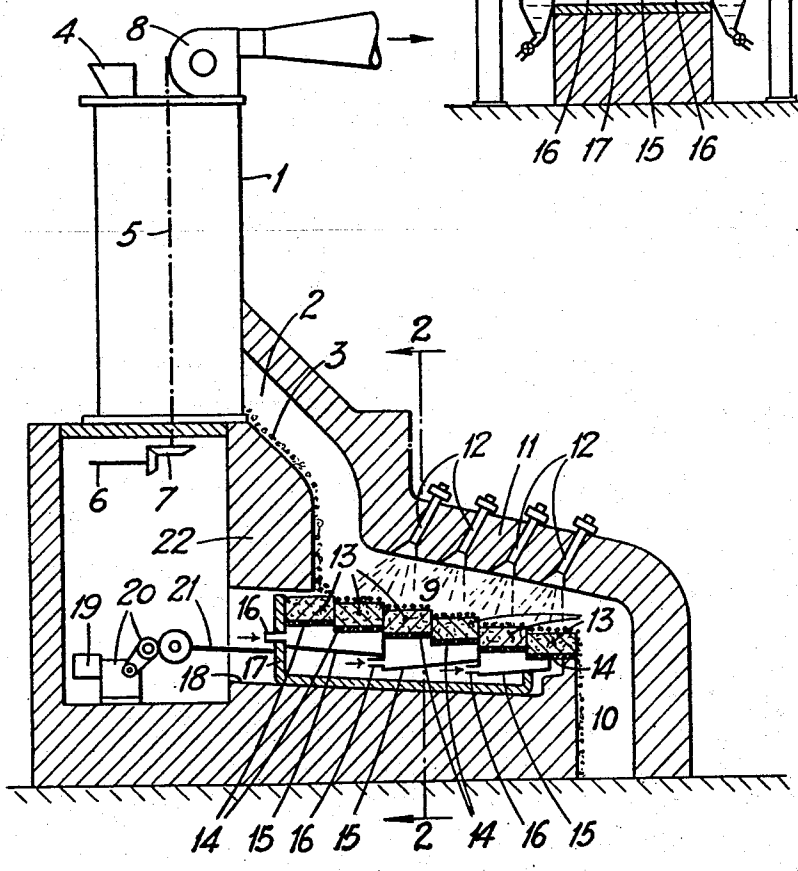


FIG. 1.



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METHOD FOR BURNING CLAY SLATE OR CLAY

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1 Claim. (Cl. 106—40)

The present invention refers to a method and an oven for the burning of clay slate, clay and similar materials. The invention is primarily intended to be made use of for the production of such porous clinker which is used as a filling material in the manufacture of light concrete, but it may also be employed for other purposes, for instance for the production of basic materials for the manufacture of porous concrete. In the production of porous clinker, raw material in the form of clay slate or clay of that kind is made use of, which is able when heated to develop gas at sintering, the material, crushed into pieces or grains of a suitable size, being then spread out over the bottom hearth of the oven, where it is subjected to the influence of hot gases. It is known for this purpose to employ an oven with a rotating bottom hearth, on which the material is spread out in a thin layer, which is caused by the rotation of the bottom hearth to pass through a heating zone, wherein the material is subjected to so high a temperature that an enamel layer is formed on the surface of the grains and the grains are enlarged by the development of gas. This method and this oven type have the disadvantage that the granular material tends, by reason of the sintering, to stick to the bottom hearth, the material thus adhering to the hearth being lost for the production. The method also has the drawback that the adhering material will by degrees form a cake of sintered material on the bottom hearth, such cake having to be removed from time to time. Furthermore, difficulties are met with in effecting a uniform spreading of the material grains on the rotating bottom hearth, which results in that the grains will partly sinter together into larger pieces that will then have to be crushed.

The present invention has for its object to prevent the material from sticking to the bottom hearth. To this end the material is subjected during its passage through the heating zone to cooling from below to such an extent that adhering sintering to the bottom hearth is prevented, whereas the material is otherwise heated in the requisite degree to permit gas development to take place at a simultaneous formation of an enamel layer on the surface of the grains. According to the invention this treatment with cooling from below simultaneous heating by means of hot gases from above takes place, while the material performs a progressive movement over the bottom hearth, which is effected by vibrating or oscillating the bottom hearth in the horizontal plane or in a plane sloping toward the outlet. The reciprocating movement of the bottom hearth has the advantage that the incoming material is distributed uniformly over the surface of the bottom hearth, so that the material forms a single layer of grains separated from one another. The cooling is effected by cooling of the bottom hearth, preferably by means of air or gases which are pressed through the bottom hearth, which latter preferably consists of a material pervious to air, such as chamotte. Burning of the material may in this way take place in continuous operation at a con-
-ly progressive movement of the material over the
om hearth.

As a raw material for the production of porous clinker, dried clay or clay slate is preferably made use of, said material having been crushed to pieces or grains of suitable sizes of 8–20 millimeters, for example. In the crushing operation, a certain quantity of finely crushed material below said size is obtained, which material would hitherto be conceived of as constituting a loss of material amounting as far as up to about 30%. According to the present invention, said finely crushed material may be utilized by grinding, silting and forming the material into granules, which are dried so as to attain the requisite strength. The material consisting of granules may be used either alone or preferably together with crushed material of a larger grain size as a basic material for the production of porous clinker. At the production of material in the form of granules, a material such as iron may be added, which is adapted to bring about an increased formation of pores during the heating operation. Furthermore, a cement may be added to impart to the granules the requisite strength for transport.

In the manufacture of porous concrete, oil-bearing clay slate in the form of pieces or grains is preferably used as raw material, such pieces of grains having dimensions of 20–3 millimeters, the clay slate being then preferably mixed with crushed limestone. A mixture of materials of this kind may be advantageously burned according to the present invention. In this case the raw material may also be worked into granules consisting of a mixture of ground clay slate and limestone powder. Obviously, the material may also be constituted by a mixture of crushed clay slate and granules. The reciprocating movement of the bottom hearth has the advantage that the burning may take place in continuous operation.

The invention will be described more closely with reference to the accompanying drawing, which illustrates an oven construction according to the invention. Fig. 1 is a vertical section through the oven and Fig. 2 a section on line 2—2 in Fig. 1.

Combined with the burning oven is a preheater in the form of a vertical oven 1, which is placed on the main oven and which communicates at the bottom with a channel 2 serving at the same time as an inlet for the material 3 coming from the preheater and as an outlet for the hot combustion gases. The material in the form of pieces or grains to be burned is introduced into the upper part of the preheater through a filling funnel 4, and is advanced downwardly through the preheater by means of a suitable contrivance which is in the drawing only indicated by a chain-dotted line 5 and which may consist of a worm, for example, which is driven from a shaft 6 through a bevel gearing 7. The gases escaping from the oven are sucked out by means of a fan 8 arranged at the top on the preheater, the gases then serving to preheat the material to a suitable temperature such as approximately 500° C. The channel 2 continues downwardly through the heating zone 9 to a channel 10, through which the completely treated material escapes to a conveyer or the like, not shown. The heating is effected by means of a number of oil-burners 12 arranged in the oven roof 11, said burners being supplied with primary air for the combustion.

The bottom hearth located between the inlet 2 and the outlet 10 is of a height diminishing in a stepwise fashion toward the outlet, and consists of fire bricks forming a number of stair blocks 13, preferably with upper sides sloping slightly toward the outlet. The blocks are carried by perforated plates 14 covering the lower sides of the blocks. The blocks 13 are built groupwise into the chamber 15, which is supplied with secondary air through pipes 16 for the cooling of the bottom hearth. The whole of the bottom hearth with its associated equalizing chambers is built into a framework 17, which in the example shown

is formed into a saddle adapted to slide back and forth on a substructure 18 sloping downwardly toward the outlet. The framework may instead be adapted to run on wheels or roller bearings. The frame is connected to a motor 19 through the intermediary of a gearing 20 and a transmission device 21 shown diagrammatically in the drawing, through which the rotary movement is transformed into a reciprocating movement of the frame 17, whereby a vibrating or oscillatory movement is imparted to the bottom hearth in a plane sloping toward the outlet. However, the frame 17 and the bottom hearth may also be movable in a horizontal plane. The heating zone 9 is delimited inwardly by brick wall 22, below which the inner portion of the bottom hearth is movable in the closest possible proximity to the wall. As will be seen from Fig. 2, the oven chamber is delimited outwardly by means of water seals 23.

The raw material pretreated and dried in the manner above described is introduced into the preheater 1, where it meets warmer and warmer gases, and from which it is slowly discharged into the channel 2 at a temperature of approximately 500° C., the material then sliding along the sloping upper side of the wall 22 and falling down onto the bottom hearth beside said wall. Through the oscillatory movement of the bottom hearth the material is spread uniformly over the surface of the hearth, while a progressive movement is at the same time imparted to the material over the hearth in the direction of movement of the latter toward the outlet 10. The individual grains of the material then perform a sliding movement over the various steps 13 as well as a rolling movement when passing from one step to the next following step. Through the secondary air supplied from below and pressed through the porous blocks 13, the grains of the material moving on the hearth are cooled from below while being simultaneously heated successively to the sintering temperature (about 1200° C.) during the passage through the zone 9, the grains then expanding by reason of the gas development, and an enamel layer forming on the surface of the grains. When the completely treated material falls down into the outlet 10, it is cooled very rapidly, so that the surface of the grains will not have time to crystallize but becomes amorphous, whereby the material will be able readily to form chemical compounds with the material, into which the clinker material is mixed.

The rate of movement of the material over the bottom hearth may be adapted to the nature of the material by varying the length of stroke and the number of strokes per minute of the bottom hearth at a control of the temperature by means of the burners and the cooling air. To provide for a longer burning time, a plurality of ovens may be coupled in series, so that the same material will be heated successively in the various ovens under the same or varying temperature conditions, the ovens being then preferably located at different levels above one another, so that the material may be fed directly from one oven into the next following oven. The total burning time per oven may then amount to approximately 8 minutes.

What is claimed is:

A method of producing porous clinker from granules of a material selected from the group consisting of clay and clay slate, comprising discharging the material into a gas-filled heating chamber of an oven, depositing the material onto a bottom hearth of the oven so as to form a single layer of the granules thereon, vibrating the bottom hearth so as to cause the granules to be spread apart and to advance in direct contact with an upper surface of the hearth, the granules being separated from one another only by the gases of the heating chamber, heating the layer of granules from above so as to cause expansion and sintering of the granules, and cooling the bottom hearth so as to prevent the sintered granules from sticking to the hearth, thereby allowing the granules to move freely along the surface of the hearth and apart from one another.

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