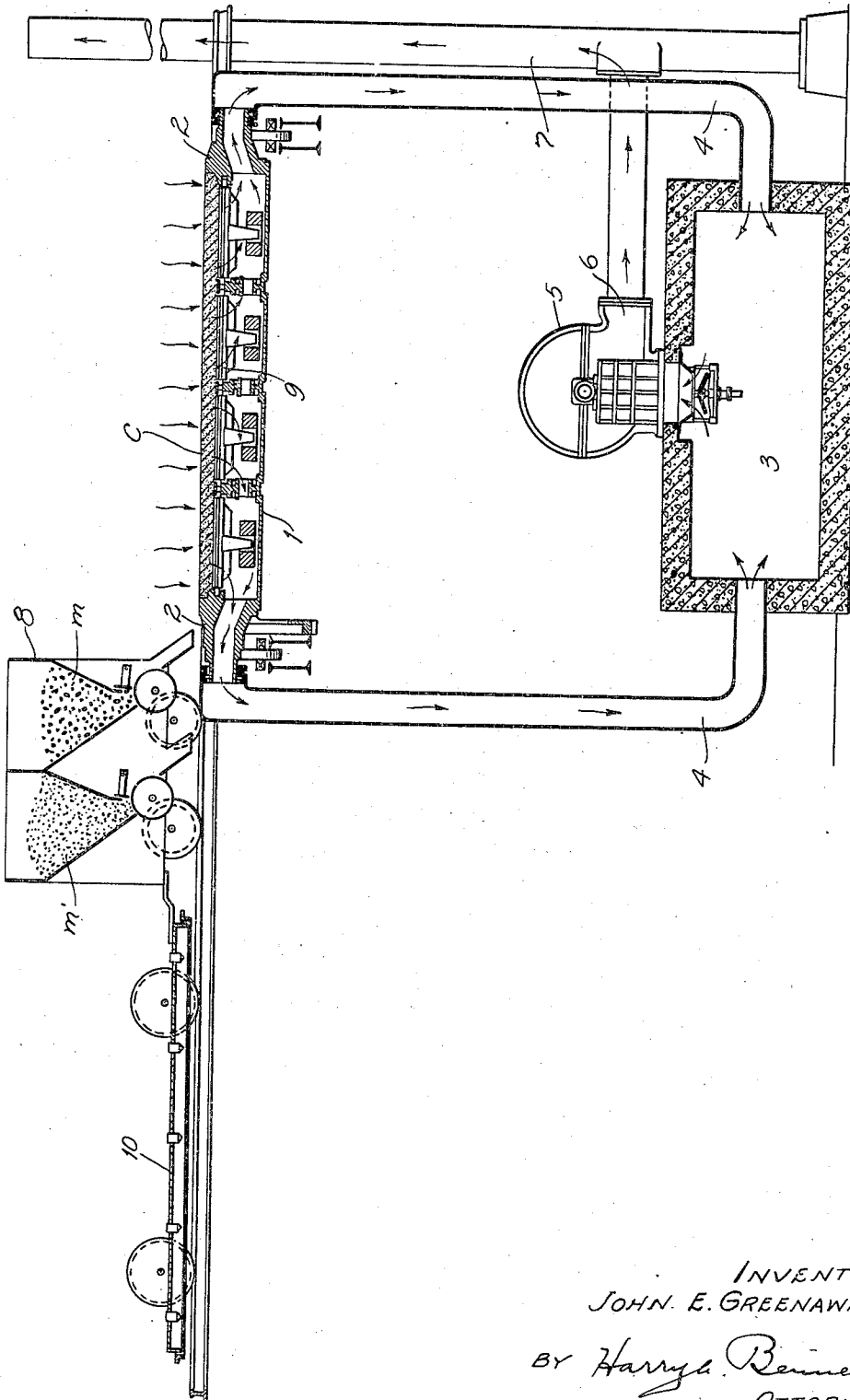


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J. E. GREENAWALT
METHOD OF SINTERING CLAY

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METHOD OF SINTERING CLAY

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My invention relates to an improved process of sintering argillaceous material to produce an artificial concrete or mortar material in place of crushed stone, gravel and sand.

Heretofore, clay, slate, shale and other argillaceous materials have been calcined in kilns or furnaces heated in the usual manner to produce a light weight aggregate. It has also been proposed to heat treat a finely crushed charge of mixed clay and fuel on a sintering apparatus in the same manner that ores are sintered.

However, owing to the plasticity of the clay and the tendency of the particles to adhere, the free passage of air through the charge is obstructed, rendering it impossible to maintain the sintering action throughout the charge, unless special precautions are taken to preserve the voids in the charge. I have found that these voids, so essential to either downdraft or updraft sintering, may be preserved by treating the material with a view to improving its physical condition as follows:

The clay, or similar material, is first crushed by any suitable device to a fineness, that on mixing the material with water will produce a slurry. I do not wish to be restricted to a process in which the water is added to the material after the same is crushed, as my invention may be practised with equal facility by adding the water either before or during the crushing operation. The slurry is then subjected to head while being mechanically agitated so that it will dry in the condition of small bodies approximately the size of a pea. These small bodies may then be stored (if desired) until it is convenient to charge them into a sintering apparatus. This drying operation need not be continued until all moisture is expelled, but merely to the point where the balls will not stick together.

In treating some clays it may not be necessary to produce a slurry, but the formation of the small bodies, or balls, may be effected by forcing the clay, in the condition of soft mud through a suitable screening device. However, the balls should be dried, preferably by the application of heat before they

are stored. If the sintering of the clay is to be effected immediately as a part of a continuous operation, the moist balls may be dusted with pulverized fuel, which will form a coating about them. The fuel coated clay balls, in a moist condition, may now be charged into a sintering pan and the sintering operation performed in the usual way; that is, by passing a blast of air through the charge and igniting the fuel constituent thereof at its surface.

In the drawing I show a Greenawalt apparatus, comprising a sintering pan 1 and connected through its hollow trunnions 2, 2 and conduits 4, 4 to a dust chamber 3, through which air is drawn by means of an exhaustor 5, having its outlet 6 connected to a stack 7. The usual charge car 8 is provided for feeding the material constituting the charge onto the grate 9 of the sintering pan 1, after which the igniter 10 is brought into position over the charge for the purpose of effecting ignition at its surface. After ignition of the charge the igniter is either removed or the flame extinguished as combustion is continued internally of the charge under the influence of the air blast. The small bodies, or balls, that are formed by the above described operation obviously will not be of a uniform size and they may be separated, if desired, into two or more components m and m' ; the larger balls m being fed directly onto the grate 9, and the smaller balls m' being charged on top of the larger ones. However, the manner of arranging the charge is optional with the operator who will perform the operation as experience teaches him, with the view of obtaining the most satisfactory results.

The physical condition of the charge, made up as it is of a mass of small bodies, insures the presence of voids throughout, so that the air may pass freely through it to sustain combustion of the fuel. As the combustion of the fuel propagates itself through the charge, the small clay bodies are subjected to intense heat and are burnt hard. The escape of occluded gases in the bodies is readily accomplished because of their small mass, so that the burnt clay bodies become highly

porous. At the same time fusion occurs at the surfaces of the bodies causing them to be cemented together into a hard, lightweight porous mass of clay sinter. This mass or cake of clay sinter may then be pressed to any size required by the ultimate use that is to be made of it. In making concrete blocks, both the finely and the coarsely crushed particles of sinter are mixed with the desired amount of Portland cement and water, and molded to shape. If the clay sinter is to be used merely as a mortar material it may be mixed with cement or lime in any proportion selected by the builder, according to his purpose.

In sintering some clays it may be desirable to mix powdered fuel with the clay before it is balled. Then again certain conditions may require that the clay balls and the fuel be independently charged into the sintering pan in such a manner that the voids between the balls be filled with fuel. In fact, I do not wish to be restricted in any respect as concerns the fuel, as the essence of this invention is the treatment of the clay to produce small bodies, or balls, which are massed in a holder to constitute a charge to be sintered.

The invention may be modified to the extent that only sufficient clay be used in the charge to render it plastic. The balance of the charge (aside from the fuel) may be non-plastic argillaceous matter, such as slate or shale, or even other substances such as ashes, crushed brick, or any mixture of substances provided plastic clay is present in sufficient amount to render the mixture susceptible to the balling operation. From 10% to 15% of plastic clay is sufficient for this purpose.

Aside from the excellence of the sintered clay product, there are two other very important advantages in sintering argillaceous material. One of them is the speed of the operation (but a few minutes being required to sinter a charge weighing several tons), and the other is the economy of the use of the fuel, the amount of which can be quite accurately determined for the best results. With combustion taking place within the charge very little heat is wasted.

Having described my invention, I claim:

1. The process of manufacturing an aggregate for mortars or concretes, which comprises reducing argillaceous material to a finely divided condition, adding water thereto to form an agglutinated mixture, converting said mixture into a homogeneous mass of small bodies, and arranging said bodies on a permeable hearth to form a charge, effecting a distribution of fuel throughout said charge, igniting the fuel at one surface of the charge, causing a supporter of combustion to pass through the charge away from said ignited surface, whereupon combustion of the fuel

will proceed through the charge and produce a hard, porous, burnt product.

2. The process of manufacturing an aggregate for mortars or concretes, which comprises reducing argillaceous material to a finely divided state, adding water to the finely divided material to form a slurry, subjecting the slurry to mechanical action and heat to form small bodies, arranging a mass of said bodies and finely divided fuel on a suitable support to constitute a charge, maintaining the particles of the charge in a quiescent condition and subjecting said mass to heat and a blast of air to form a hard, porous product.

3. The process of manufacturing an aggregate for mortars and concretes, which comprises reducing argillaceous material to a finely divided condition, mixing finely divided fuel therewith, adding water to said mixture to agglutinate the same, converting said mixture into a homogeneous mass of small bodies, arranging said bodies in a layer, igniting the exposed surface of said layer, passing air through the layer away from said surface to cause combustion of the fuel throughout the layer to form a hard porous product.

4. The process of manufacturing an aggregate for mortars or concretes, which comprises reducing argillaceous material to a finely divided condition, converting said mixture into a homogeneous mass of small bodies, and arranging said bodies on a permeable hearth to form a charge, effecting a distribution of fuel throughout said charge, igniting the fuel at one surface of the charge, causing a supporter of combustion to pass through the charge away from said ignited surface, whereupon combustion of the fuel will proceed through the charge and convert the same into a hard, porous product.

5. The process of manufacturing an aggregate for mortars or concretes which comprises reducing argillaceous material to a homogeneous mass of small bodies, arranging said bodies on a permeable hearth to form a charge, subjecting said charge to heat and simultaneously therewith causing a supporter of combustion to pass through said charge, whereupon the said bodies become fused and agglomerated to form a hard, porous cake.

6. The process of manufacturing an aggregate for mortars or concretes which comprises mixing finely divided argillaceous material with fuel, converting said mixture into an agglutinated mass, forming a multitude of small bodies from said mass, arranging said bodies in a layer to form a charge, igniting said charge at one surface and causing a supporter of combustion to traverse the charge to propagate combustion throughout the mass to form a hard, porous, agglomerated product.

7. The process of manufacturing an aggregate for mortars or concretes which comprises forming a multitude of small bodies from

finely divided argillaceous material, arranging a mixture of said small bodies and fuel in a layer to form a charge, igniting the charge at its exposed surface, passing air through the charge away from the ignited surface to propagate combustion throughout the charge and produce a hard, porous agglomerated product.

In testimony whereof I hereunto affix my signature.

JOHN E. GREENAWALT.

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