UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING MAGNESIA.

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To all whom it may concern:

Be it known that I, LEOPOLD JESSER, a subject of the Emperor of Austria, residing at Vienna, XIII, Hermesstrasse 5, Austria, have invented certain new and useful Improvements in Processes of Making Magnesia, of which the following is a specification.

This invention relates to the calcining of magnesium carbonate material in such a way as to produce a highly reactive magnesia and to prevent the formation of a magnesia which is partly inert as regards its ability to react with water or magnesium chlorid solutions.

For the production of Sorel-cement, it is essential that the reactive calcined magnesia bind up quickly with the solution of chlorid of magnesium, and that, at the latest 24–36 hours after the mixing, it becomes possible to treat the hardened mass with planes. But the fact is that the magnesia is very liable to change during the calcination into an inert form (slowly reacting with chlorid of magnesium) and even to become inactive, and this may happen even if it is exposed to relatively low temperatures of burning. The cause of this peculiarity has been found in the circumstance that with the usual burning-conditions in shaft- or blast-furnaces the speed of decomposition of the carbonate of magnesium is such a slow one that during the time while the carbon dioxid is driven out of the inner parts of the pieces the already burned outer parts pass into a form less active or altogether inactive.

In order to insure the immediate production of a reactive magnesia of high and uniform activity, it has been proposed, in order to prevent the already burned parts from being injured, to heat the material to a temperature approaching the lowest temperature necessary for the calcining of the magnesite, and to use additional means to accelerate the speed of decomposition of the carbonate. As an appropriate means for the acceleration of the speed of reaction it has been especially recommended to increase the quantity of steam contained in the gases of the burning zone.

When the magnesite is burned in revolving furnaces the danger of the magnesite leaving the furnace with a much reduced activity is increased to a serious degree. It has been found that in the revolving furnace as well as with all systems of furnaces in which the material to be burned is conducted in form of powder with or against the gases of the furnace, the regular production of highly active products is not secured, even though the temperature of the material approaches the lowest degree of heat required for the burning of the original material and although at the same time the speed of reaction is accelerated.

After careful consideration of, and experiments with, the reactions occurring during the transfer of the heat from the flame to the material to be burned in revolving-furnaces, the inventor now has found that it is not the temperature acquired by the material to be burned during the heating-procedure which is decisive of the quality of the activity of the product, but that, the final result is decided by the temperature of the flame. When using indirect heating, *e. g.* in retorts, the transfer of the heat is essentially effected by conduction from the exterior wall of the furnace, and even the temperature of the furnace, which of course is always inferior to the temperature of the flame, is only transferred to these parts of the contents of the furnace which are in immediate contact with the walls of the furnace. In the revolving-furnace, on the contrary, the superior layer of the material, being in immediate contact with the flame, is heated approximately to the temperature of the flame. This superior layer being regularly overthrown with inferior colder layers owing to the revolving of the furnace and, therefore, communicating heat to them, new layers are continually coming to the surface, and, thereby, during the treatment in the revolving furnace, almost all parts of the material are exposed successively, although only for a short time, to temperatures exceeding the average final temperature to which the material is heated, whereas with the indirect heating such an overheating of the material is not effected.

These circumstances account for the fact that in the revolving-furnace the highest average temperature which the material is allowed to reach when leaving the zone of decomposition must be much lower than the maximum of temperature of the material which is allowed with the indirect heating. As the short time during which magnesia, already completely burnt and easily affected by high temperature on the surface of the layer, is in immediate contact with

the flame is sufficient to decrease the activity, and as even a small rise in the temperature of the flame is followed by a serious loss of activity, it is necessary, when using the revolving-furnace, in order to obtain the magnesia sufficiently active, to limit the temperature of the burning-gases to such a low degree, that the amount of carbonic-acid remaining in the burnt material is apt to surpass the utmost allowable limit. There exists, therefore, the danger of the magnesia leaving the furnace insufficiently calcined.

According to the present invention magnesia highly reactive, especially with a solution of chlorid of magnesium, is produced from magnesite by bringing the temperature of the burning-gases to the lowest temperature necessary for the calcination of the raw materials, and by extending the period of influence of the burning gases in the zone of calcination. As a large part of the length of the furnace is used up for the purpose of preheating the materials to the temperature of decomposition, and as only a small part of the total heating period is available for the calcination, the extension of the period of calcination, for example, for crystalline magnesite of a size of grain 5 mm. in diameter, may be obtained according to the present invention by using a revolving-furnace of over 40 meters, and advantageously of 45–50 meters' length and more; that is to say, by increasing the length of the calcining zone. The same result is attained by shortening the heating-zone by feeding in materials already preheated or partly deacidified. The calcination also may be influenced in the desired direction by reducing the number of the revolutions of the revolving furnace or by diminishing the charge of the furnace. Finally the furnace may be provided inwardly with appliances to shift the material, *e. g.* with winnowing-shovels et cet., in order to bring larger quantities of the material in immediate contact with the flames. Such shovels might also be used in the preheating zone alone.

The measures mentioned above may be applied either alone or in combination, but always in such a way that the temperature of the burning gases is kept as low as possible for obtaining a product of sufficient activity while taking into consideration the amount of carbon dioxid remaining in said product.

In case of using fuels requiring higher burning temperatures or where especially low temperatures of burning gases have to be used, for example, when amorphous magnesite is to be calcined, it is advisable to produce the flame in a space in front of the furnace and to bring the gases to the required temperature by introducing additional air with or without steam. Instead of fire-gases there may be used hot gases of any composition coming from other processes, *e. g.* gas-products from revolving-furnaces for sintering magnesite, the temperature of which gases, if required, can be brought to the necessary temperature by the addition of air, or the like.

The above mentioned methods of extending the period of the influence of the burning gases in the calcining zone are not only practicable for revolving-furnaces but they are also equally suitable with all systems of furnaces in which pulverized materials are maintained in movement and in contact with the flame. The dissociation may be accelerated by increasing the content of water in the burning gases by introducing steam, by the use of water-gas or of hydrocarbons as fuels.

In case amorphous magnesites have to be calcined, proportionally smaller sizes of burning-apparatus are needed than for the crystalline magnesites, for the reason that the amorphous magnesites yield their carbon dioxid much more easily than the crystalline magnesites. By using very low temperatures of heating-gases, 650° C. and less, together with a sufficiently long calcining-zone, there may be obtained from amorphous magnesites a reactive magnesia capable of combining with water alone, or with a very watery solution of magnesium chlorid (for instance of 1 to 5 degrees Bé.) and this within a few hours. Instead of magnesium chlorid solutions of magnesium sulfates or solutions of alum may be used, or generally, solutions of such salts in very weak concentrations which tend to dissociate strongly in dilute water solutions with production of free hydrogen ions. Such a highly active magnesia is a watermortar; it binds materials consisting of ligneous fiber, such as saw-dust or wood-meal, just like Sorel-cement, to wooden masses, and the mortar sticks firmly to wood also. The mortars made from these products with wood-meal or saw-dust and water, or with very highly diluted solutions of salts, are especially useful for the plastering of wooden walls. They may, of course, be used everywhere, where xylolith may be employed. With the above described process there can be produced, from amorphous magnesite, a magnesia of high activity depending upon the temperature of the burning gases used in the calcination.

I claim:

1. A process of making magnesia from magnesium carbonate material which comprises subjecting the material to the direct action of burning gases having a temperature not higher than that necessary for the effective removal of the carbon dioxid therefrom.

2. A process of making magnesia from magnesium carbonate material which com-

prises partly decarbonating the material and then subjecting it to the direct action of burning gases having a temperature not higher than that necessary for the effective removal of the carbon dioxid therefrom.

3. A process of making magnesia in revolving furnaces which comprises subjecting magnesium carbonate material to burning gases having a temperature not higher than that necessary for the effective removal of the carbon dioxid therefrom and producing in said material agitation in addition to that caused by the movement of the furnace.

4. A process of making magnesia in revolving-furnaces and the like which comprises subjecting magnesium carbonate material to burning gases the temperature of which is not higher than that necessary for the effective removal of carbon dioxid from said material and is obtained by introducing air into said gases, and extending the period of influence of the burning gases in the calcining zone sufficiently to yield a magnesia of high and uniform activity.

5. A process of making magnesia in revolving-furnaces and the like which comprises subjecting magnesium carbonate material to burning gases the temperature of which is not higher than that necessary for the effective removal of carbon dioxid from said material and is obtained by introducing air and steam into said gases, and extending the period of influence of the burning gases in the calcining zone sufficiently to yield a magnesia of high and uniform activity.

6. A process of making magnesia in a revolving furnace which comprises subjecting magnesium carbonate material to burning gases having a temperature not higher than that necessary for the effective removal of carbon dioxid from said material, the heating flame being produced in a chamber in front of the furnace and the required temperature being obtained by supplying additional air to the gases.

7. A process of making magnesia in a revolving furnace which comprises subjecting magnesium carbonate material to burning gases having a temperature not higher than that necessary for the effective removal of carbon dioxid from said material, the heating flame being produced in a chamber in front of the furnace and the required temperature obtained by supplying additional air and steam to the gases.

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