Oct. 10, 1944. C. R. REX 2,359,792

PROCESS FOR CONVERTING THE MAGNESIUM CARBONATE CONTENT OF DOLOMITE TO MAGNESIUM OXIDE

Filed Sept. 22, 1941

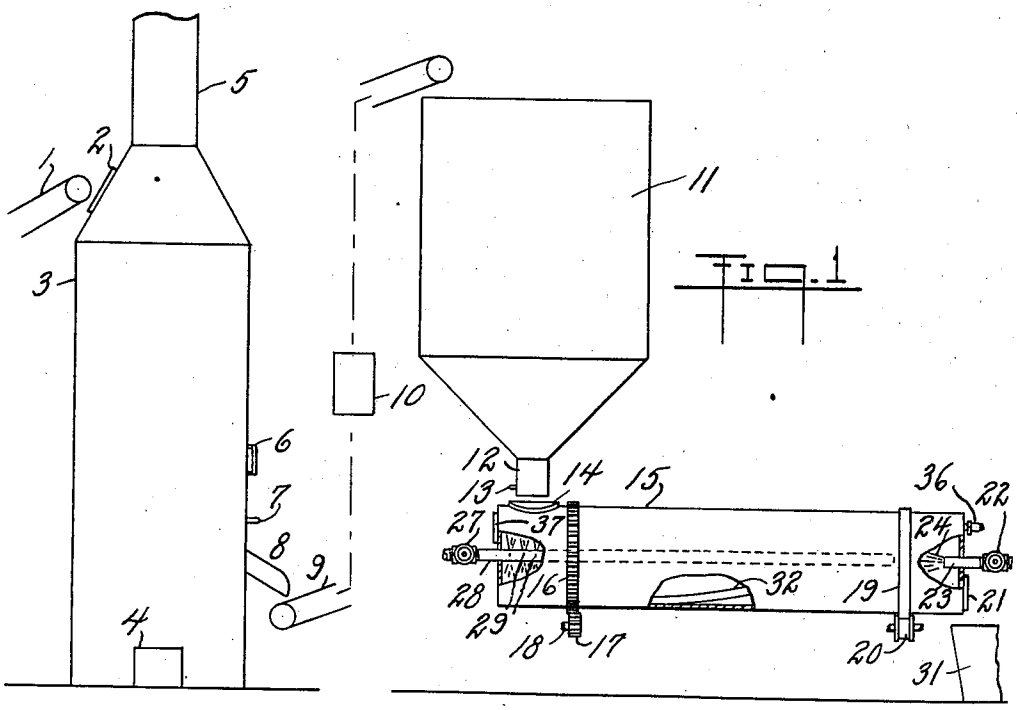


FIG. 1

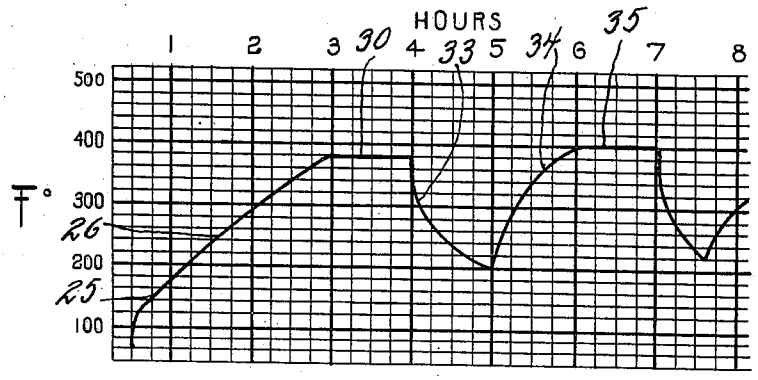


FIG. 2

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Patented Oct. 10, 1944

2,359,792

UNITED STATES PATENT OFFICE

2,359,792

PROCESS FOR CONVERTING THE MAGNESIUM CARBONATE CONTENT OF DOLOMITE TO MAGNESIUM OXIDE

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Application September 22, 1941, Serial No. 411,923

2 Claims. (Cl. 23—201)

This invention relates to magnesium containing product, wherein the magnesium has special reaction properties.

This invention has utility in the treatment and production, primarily from dolomitic limestone subjected to heat treatment in adapting for controls in solubility and absorption, the reaction factors including precipitation. These factors are variously available as attributes of value which include functioning for acid soil correction, with avoidance of toxicity, and also traits in water purification, as well as speed for hydration.

Referring to the drawing:

Fig. 1 is a fragmentary showing diagrammatically of an installation adapted to carry out features of the invention herein; and

Fig. 2 is a showing of indicator card performance as in the hydration stage.

Installation

Elevator 1 may discharge the dolomitic rock into opening 2 at the charging deck of shaft kiln 3 having firing region or furnace 4 and take-off stack 5 for products of combustion and volatilized material, such as moisture from the rock and carbon dioxid as driven off. The charges may be in sections or batches. Temperature indicator 6 may be used in connection with the control or dump 7.

The calcining therein conducted results in quick temperature rise or marked rise after maintenance of uniform firing or heat supply. This is the occcasion for freeing the lower portion of the charged rock from the kiln 3. In practice, the indicator 6 may have its maintained showing in the region of 925° to 950° C. At once rise develops especially above 970° C., then the control 7 is operated to dump or drop a portion of the partially calcined dolomitic rock to pass by chute 8 to conveyor 9. Showing of fines, indicates burning to calcium oxid. These fines may be rumbled off at device 10. Alternatively, there may be hydrating and screening or rumbling off of the calcium hydroxid. The partially calcined material is delivered into storage bin 11. Therein seasoning occurs throughout the mass for the magnesium carbonate to be converted to magnesium oxid. Preferably there is no calcium oxid. In practice there may be present up to as much as 3 per cent of magnesium carbonate.

The somewhat cooled, partially calcined dolomitic rock passes from the digesting chamber 11 by way of spout 12 and control valve 13. With closure 14 removed, this discharge may be into rotary hydrator 15, herein shown as having toothed ring 16 cradled on toothed gear 17, driven by shaft 18. Remotely there may be bearing ring 19 with supporting rollers 20.

After four tons of the rock are charged into the hydrator 15 the closures 14, 21 are shut so that this rotary hydrator is a sealed container. Valve 22 may be opened for pipe 23 to discharge steam 24 of say 40 to 45# pressure into the hydrator 15. It is thereby effective, when started in a cold hydrator to build up a temperature. Temperature-time curve portion 25 (Fig. 2) shows warming for the first 45 minutes or 1 hour, with the next 1½ hours to 1¾ hours by curve portion 26 initiating exothermic reaction of the hydration. The steam valve 22 may be closed. Valve 27 may then be opened for water discharge line 28 to openings 29 for jetting water into this closed rotary hydrator 15 at say a gallon per continuing minute. Exothermic reaction tends to build up pressure toward 200# per square inch, with the temperature say 390° F. or in the range of 200° C. for the initial charge at curve 30. As there is tendency for the exothermic reaction not to maintain the temperature, discharge from the kiln may be effected by discontinuing the driving operation through the shaft 18. The outlet 21 is opened for discharge into receiver 31. Discharge is promoted by scroll 32 in the rotary hydrator 15. Curve 33 shows the temperature drop for the discharge. However, with the warmed hydrator, in recharging there is response from steam action at curve 34 in initiating the hydration and curve 35 say at 400° F. for the exothermic reaction from the jets of water.

There may be pressure relief valve 36 and temperature disclosing means 37. The curves as disclosed in showing the exothermic hydration constant temperature period running approximately 1 hour, are with the relief valve 36 set at 100 pounds. In this hydration, say on the four ton charge of this Northwestern Ohio limestone, the water supply of say 50 gallons is an excess for some of the steam to be blown off and still retain sufficient for the hydration completion as to the magnesium oxid to magnesium hydrate. In the supplemental check-up beyond the initiation of the temperature drop at the closed hydration chamber, specimens may be taken off and magnesium tests run. In practice, for efficient product, these have run as weight reduction, that is, of the taking off the CO_2 from the calcium and the H_2O from the magnesium to leave calcium oxid-magnesium oxid product, and the ignition loss desirably averages high at 26 per cent. The experience has been that it is run 23.4 per cent

even up to 26.72 per cent. When the pressure for this valve 36 is set up, say into the region of 175 pounds, there is in practice a speed-up in the rate of water supply and the completion of the hydration has been effected in as brief a period as 15 minutes. Intervals vary due to departures in the calcining. The temperature rate in the calcining speeds such up for the major use of the equipment of the installation, and with care that even such excess temperature does not get into the calcium carbonate to convert such to the oxid, there is an efficient operation hereunder.

In the carrying out of this invention, a product, first stage magnesium oxid, may be from the curing or digesting chamber 11, and such is hereinafter referred to as magnesium oxid A. The pressure hydration achieves activation with improved stability in the magnesium containing portion. However, further stabilization is achieved in heating this pressure hydrated magnesium oxid with the relatively unchanged calcium carbonate up to 500° or 550° C. for 15 minutes. With water of hydration loss of 10 to 12 per cent the resulting calcium carbonate, magnesium oxid is a dry, stable, activated agent. This agent may be associated with soil correction ingredients or elements, and, with such dehydrated say even as to the ammonium phosphates, there is a stability for storage and a reacting product for the soil of citrate solubility greatly enhanced properties. This does not have the delayed action of the product from the curing chamber 11 but is almost immediately reactive with soil agents or water and has markedly characteristic properties of absorption. This dry mixture, besides soil corrective agents, has properties of value as a filler or carrier with corrective attributes as insecticides, such as arsenic, copper sulphate, as well as in Bordeaux mixture. There are thus characteristics in this compounding for fungicides and insecticides, and fertilizer or soil corrective uses.

Absorptive properties of this dehydrated material are greatly increased over the product from the chamber 11. The water absorption may be as much as twenty-five times the weight of the material.

The supplemental characteristics achieved by this drying from the hydrate to the oxid has meant that this drying following hydration has an efficient product in chemical reactions.

Raw material

In carrying out the invention herein, dolomite or magnesian limestone may be quarried or mined and handled in the treatment and for products hereunder. In the event the treatment is to be heat treatment in the shaft type of kiln, the stone may be in size under 10 and over 6 inches. In shaft kilns, the run may even be from 4½ to 6 inch stone. However, for rotary or tunnel type kilns, stone may more desirably run from 2 to 4 inches or even down from ¾ inch to 2 inches; while for a Herreshoff furnace, the size is desirably ¾ inch and under, even to dust. This calcining is conducted with open discharge flue or means for the CO_2 to pass off as fast as it is formed. Accordingly, due to the temperature and draft, there is a sub-atmospheric pressure prevailing for the stone.

Heat treating

The fuel may be solid, liquid, or gaseous. In shaft kiln operations, say with coal, firebox temperature may approach uniformity in the range of 1000° C. to 1150° C. In carrying out the invention herein, importance resides in the character and extent of the burning. With the dolomitic stone such as found in the Northwestern Ohio fields, it is desirable to effect the change in the region of approximately 850° C. to 970° C. The efficient practice is in the range above 900° C.

While this temperature to which the dolomitic rock, say as in appreciably sized fragments, is exposed, is a temperature at which the calcium carbonate would tend to give up the carbon dioxid, special handling hereunder is to defeat such course. The temperature as run herein is one conducted against rise from the point established. By holding it to such a range in giving up heat for this reaction, the carbon dioxid gas as more readily given up by the magnesium carbonate to leave magnesium oxid carries heat units from the kiln. This giving off of heat units freely by the carbon dioxid from the magnesium carbonate is at such a rate, when there is avoidance in rise of temperature in the kiln, that even though the temperature of exposure is in the range of affecting the calcium carbonate, such in the practical experience hereunder does not occur. There is attained without application of pressure in a usual type of shaft kiln a speed of calcining not only efficient in producing this magnesium oxid and allowing the calcium carbonate to retain its CO_2, but special activation is achieved for the resulting product. Advantages also are present in the commercial operation or the speed at which efficient handling may be adopted and reactions achieved. This accuracy for converting the magnesium carbonate to magnesium oxid, even the rapid functioning with rocks as much as 6 to 10 inches in diameter and approximating uniformity, pulls the CO_2 from magnesium to such an extent that this calcining may leave rarely as much as 8 per cent and frequently as little as 5 per cent or less of the magnesium carbonate at the time it is removed from the treating zone of the kiln.

For 6 to 10 inch stone, this heat treating closely controlled interval may run 1½ to 2 hours; while for the 4½ to 6 inch stone, 1 hour should suffice. In the smaller sizes, less time interval is required. Forestalling of temperature rise in the stone is by at once dropping or transferring the stone from the heat treating zone. This step is toward normal atmospheric condition for the stone to be lodged in a storage chamber. There may then be slight further elimination of carbon dioxid from the magnesium carbonate. In conducting this calcining and curing or digesting operation, it has been found that, at the temperatures herein disclosed, there is such a release of carbon doxid from the magnesium carbonate that this emanation of carbon dioxid gas serves, in passing off, as a heat dissipation means effective against material rise in temperature of the stone undergoing the treatment. During this appreciable rate of carbon dioxid removal, there does not seem to be any tendency for the temperature of the stone to build up or more nearly approximate the range for removal of the carbon dioxid from the calcium carbonate.

When the rate of carbon dioxid removal from the magnesium carbonate decreases or slows down, there is the tendency for the stone to absorb the maintained supply of heat, and such is the approach to critical condition, wherein it

is desirable to act hereunder in removing the stone from the heat treating zone or from a tendency further to increase its temperature. In the event some of the stone should have acquired excess temperature, due to lack of removal rate from the heat, there is approach to the condition favorable for conversion of the calcium from the carbonate to the oxid. In the preferred practice hereunder, this calcium oxid production condition is sought to be avoided.

However, should some of such calcium oxid be produced, it may be separated from the mass of the stone by rumbling or tumbling, say in the rotation of a perforate drum, for it readily crumbles off with a freedom not characteristic of the magnesium oxid, magnesium carbonate, nor calcium carbonate. Furthermore, as this excess temperature is superficial, this rumbling removal is a quite ready and efficient means for mechanical separation. Instead of rumbling, a spray may be applied to the heat-treated stone while hot—100° C. to 400° C.—and the calcium oxid be converted into calcium hydrate, readily crumbling off. Such crumbly material may be readily screened or air separated from the stone.

Subdividing

Notwithstanding the heat-treated stone be of the coarse sizes as hereinbefore discussed, crushing may be readily adopted when required before storage or digesting, as it is only necessary to subject to hammer mill and subsequent ball mill operation, and the product is thereby readily reduced for 100 per cent to pass through a 30 mesh to the inch sieve; 99.1 per cent through a 50 mesh per inch; 92 per cent through a 100 mesh per inch; 71.5 per cent through a 200 mesh per inch; and 67 per cent through a 300 mesh per inch. These sizes have been checked in practice for many car loads of material, the material averaging twenty tons to the car.

Pressure hydrating

This activated product of calcium carbonate and magnesium oxid A, in its ratio, is of stability against toxic reaction from the magnesia in the soil and food occasions for use. This characteristic of reaction, stabilized and improved by the calcium carbonate, is speeded up with absence of detrimental rebound therefrom by pressure hydration. This exothermic reaction is initiated by steam and controlled against producing a soggy product. This calcium carbonate magnesium hydrate is directly available as a dry powder for compounding, say in fertilizers or soil correction, as well as other uses.

Drying

This hydrate may be dried and the magnesium oxid thereby given a reserve reacting value for speed beyond that of the product from the conditioning chamber 11. In fact, it would respond in the course of a few minutes to water reaction. It has the property of jelling as the excess of water is built up. This dehydration is desirably in a hydrator at say between 500° to 550° C. and for say a 15 minute interval.

Physical properties

It is thus seen that such product hereunder is approximately calcium carbonate and magnesium oxid, with possibly a very minor quantity of magnesium carbonate. This heat treatment has produced a product having markedly different physical properties from the raw stone. After this digesting its specific gravity is lowered. In the stone of Northwestern Ohio, 4.1 specific gravity is changed to apparent specific gravity 2.65. From a raw stone hardness of 3½ to 4, such is reduced to 1.6 to 2. Resistance to crushing: the raw stone, 17,000 to 19,000 pounds per square inch; for the treated stone, 6,000 to 9,000 pounds per square inch.

Freeze and thaw tests show the raw stone holds up for 155 cycles in a 24 hour interval. The treated stone shatters in 16 cycles of freeze and thaw in an interval of 24 hours. The absorption rate for the raw stone averages 1.8 per cent in a six day soaking test. The treated stone averages 13.85 per cent in taken-up moisture while submerged in water for six days.

Chemical properties

The calcium carbonate is adjusted in some manner and is also a stabilizing factor against soil toxicity from the activated magnesium. It has been applicant's experience that when this magnesium oxid A from the digesting has had water added thereto and is placed in soil, there results a hydrated hydrous oxid gel. Magnesium oxid, as not so specially treated, is herein referred to as magnesium oxid B, and is identified as that produced at other or different temperatures and handling than herein. Magnesium oxid B fails to form this hydrated hydrous oxid gel. This hydrous oxid gel of magnesium oxid A is a factor of importance to the absorption and solubility in the functioning hereunder. Exceptional values follow for plant and animal food purposes. Applicant has further found that magnesium oxid A in its hydrated hydrous oxid has a more rapid rate of reaction with CO_2 and other weak organic acids from soil content.

This magnesium oxid A, after having been soaked in water for a period of 24 hours, cast into molds, dried, has then been subjected to 125 pounds steam pressure for a duration of 2½ hours. As a result of this test this magnesium oxid A has undergone expansion but this expansion is in the range of from 2 to 1.4 per cent as its increase in volume.

The magnesium oxid A is that from the treatment of dolomitic rock as in Northwestern Ohio fields and wherein there is present initially the calcium carbonate 56 per cent, and thereafter, in lieu of 44 per cent magnesium carbonate, it has controllably calcined activated magnesium oxid A. Otherwise treated or Northwestern Ohio rock, otherwise treated, say in normal attempt for incomplete calcining under different temperature control, has this magnesium oxid B. Such magnesium oxid B, soaked for a period of 24 hours, cast in similar molds, and dried, and then exposed to 125 pounds of steam pressure, has, after a lapse of 2½ hours, expanded in the range of 24 to 29 per cent. This confirms that the water of hydration from the 24 hours soaking was efficient for the magnesium oxid A to approximate close to 100 per cent, but that the magnesium oxid B increased in volume 12 to 20 times over the A oxid.

The magnesium oxid A so combines with the phosphate that the phosphate may not be leached out of the soil but has a combining or holding trait or property with the magnesium oxid A or its gel. It has seemed from the experience of applicant that plants primarily derive their phosphates as required in nourishment from hydrous oxids, which hydrous oxids are adapted to take on or absorb the phosphates, and such is the

property of this magnesium oxid A as herein developed. Additionally, this magnesium oxid A in the production of this hydrated hydrous oxid in the presence of soil moisture has the property of imparting plant food value to phosphates which have combined with iron and aluminum. Such phosphates, heretofore without plant food value, with this magnesium oxid A are released from the aluminum and iron.

This magnesium oxid A is available for soil reaction as it is completely soluble in organic acids. Magnesium oxid A has specific gravity 3.2 and magnesium oxid B has specific gravity 3.7. Magnesium oxid A absorbs moisture more readily to form magnesium hydrate which readily absorbs carbon dioxid. These changes occur with more difficulty in the magnesium oxid B. Magnesium oxid A, uniting slowly with water, forms a gelatinous mass or hydrous oxid gel, which is not true comparatively with magnesium oxid B. Furthermore, this magnesium oxid A, in the reactions hereunder, changes to the magnesium hydrate which permits the formation of magnesium bicarbonate or basic carbonate. These are the more natural stages of change arising in soil as exposed to weathering conditions. The hydrate and this basic magnesium carbonate are active in their relation to soil promotion changes, and are more alkaline and of greater solubility than the normal or full carbonate of magnesium. In fact, in testing with 100 cc. of water, the basic carbonate dissolves .04 gram, while the normal carbonate of magnesia has a solubility of but .0106 for water at 15.5° C.

This magnesium oxid establishes a favorable condition in soil nitrification and is effective for weight to a greater extent than calcium carbonate. In considering neutralizing power of ground high calcium limestone as 100 per cent, this heat-treated magnesian limestone may readily have a neutralizing power of 135 to 145 as to an equal weight of the ground limestone of like mesh screening or like size. It is to be understood that as the particles are reduced in size, there is an increase in the exposed area of the particles per unit weight, and accordingly, an increase in the facility for responding to weathering action and to soil correction.

In the carrying out of growth tests hereunder and soil treated with the product herein disclosed, there is evidenced a definite power for effecting chemical changes as possessed by the product and the magnesia in the product for combinations in the plant growth. A 10 per cent solution of hydrochloric acid dissolves more rapidly in heat-treated magnesian limestone hereunder than dolomitic magnesian limestone, calcite or high calcium ground limestone. The solubility reaction of the oxid in its changes, seems to have a specific power of absorbing ammonia with less tendency to attack or decompose nitrogenous compounds, especially nitrogenous organic compounds, and there is accordingly retained in the soil, even for manures, the nitrogenous values.

Furthermore, this product, although heat-treated, does not have a deleterious action upon seed. In fact, it may be applied to the soil with the seed as at planting, and it does not react in a detrimental way as to manure or soil humus. Calcium carbonate presence seems to contribute these safety traits against toxicity. The handling herein may be effective for prescribed plant requirements, as alone for alkalinity. With dry phosphate, there is not tendency for local reaction, or with ammoniates, including ammonium sulphate, with or without phosphates. Superphosphate fertilizer herewith has no hazard for conversion to triphosphate.

This relatively slow reaction in which this magnesium oxid A retains a degree of control for the soil, has been found to result in an immediate increase in the number of bacteria and the rate of their conversion into organic nitrogenous material of benefit to the soil. This is in excess of that experienced with magnesium oxid B treatment and in excess of raw stone or hydrated lime.

In this connection, the nitrates in parts per million have checked as to the treated material, 54.82, while for dolomite, 44.77. It is thus seen that there is an advantage of nearly 25 per cent for treated material in the effective nitrification action. Crops have shown there is appreciable presence of calcium as well as magnesia in the ash. Clover from untreated soil has shown tops, 1.24 to 1.52 range, while in the roots, 2.60 to 2.86. For clover from soil treated with ground dolomite or raw stone, the tops have been found to run ash 1.54 to 1.96, while for the roots, 2.68 to 3.46. For clover from soil treated with the product herein, the tops have run 2.00 to 2.26, while the roots have run 3.96 to 4.32. These are dry weights and grams of original identical samples as to mass. This averaged as to total ash for the untreated 4.29 as against, for raw or ground dolomite, 4.72, and the treated, ash 5.55 per cent. This shows plant food value in the ash of 30% over untreated soil and 20% over raw dolomite treated soil.

The ash composition of the plant from soil untreated ran 29.10 per cent for calcium oxid as against 8.76 for magnesium oxid. For the plant from soil treated with raw dolomite, calcium oxid was 32.15 as against 9.41 for the magnesium oxid. The dolomite was used in sufficient quantity to neutralize soil acidity as in the product hereunder. The ash of the plant treated with the product hereunder ran 36.44 calcium oxid to 14.70 for the magnesium oxid. Raw dolomite treated soil shows an increase of as much as 10 per cent in the calcium oxid and as much as 7 per cent in the magnesium oxid to the 22 per cent for the calcium oxid is the effectiveness of this magnesium oxid A and its calcium carbonate compound, and as much as 35 per cent as to the magnesium oxid.

The magnesium oxid A, leaves more carbon dioxid of the soil free to react to the phosphates and potassium compounds than is the case with calcium hydrate-containing products. There is no occasion for the formation of hydro-carbonates as distinguished from the basic bicarbonate of magnesium. Calcium carbonate concentration is increased. The weight of the product is reduced as much as 22% from the weight of the raw material.

This calcium carbonate, magnesium oxid is suitable for storage in bags or sacks, whether or not compounded with phosphate, nitrate, potash, or prescribed proportions thereof. It is not subject to disintegration or attack of the container, or by swelling between such ingredients to break the container. A patch treated with ordinary agricultural lime, largely calcium carbonate with a little calcium oxid, as against a patch wherein the soil was treated with this material, each with oats simultaneously planted, had a height of 8 inches in normal agricultural lime patch, and such oats 2 feet high in the patch treated hereunder.

Advantageous results follow from dusting this

product upon cereal foods for poultry and domestic animals. This replenishment for ash in grains has run up to as much as 65 pounds per ton. Stock will lick or gnaw the feed trough. This product provides a ration balance tending to give to livestock a more sleek appearance, and contributes to bone-building. It has been put in wet feed for swine. Identified characteristics or properties of differentiation extend to electrolytic matters of distinction on greater conductivity. A simple test of importance is that the magnesium oxid B with its lime, administered as a tablespoonful to an individual, may have some neutralizing traits, but, if anything, the digestive tract seems to have factors toward constipation. However, a like dose of magnesium oxid A with its calcium carbonate, say a tablespoonful at one administration as dissolved in water, is a responsive laxative comparable with the milk of magnesia traits.

No poisonous traits have developed. For building structure use, water soaking shows stability of the product.

Hydrogen ion values are evidenced readily in distinguishing from fully calcine dolomite or even partially calcined, departing from the activated procedure as conducted hereunder and disclosed herein. This peculiar activation check-up or testing value shows up even from the dry toward taking on moisture or absorption to the gel and on through to the solution. The special values are not only from electrical conductivity, but in the tests as color tests with analine, taking up silica, especially as in suspension or solution or precipitation, and the purification of water to have such approach purity as from distillation. The absorption with sulphite pulp and paper manufacture increases the proportion which may be used, or which the pulp may carry of the sulphite.

The microbiological activity in the soil has substantial basis in comparative tests as between the soil with no treatment and the soil as treated at say 600 pounds per acre with the selectively calcined dolomite, herein described as calcium carbonate and magnesium oxid A from the digesting storage chamber 11. Instances herein are taken of five samples, which show, as to Sample No. 1, no treatment, 38 million microbes per gram of the soil, that treated with first activated material, 81 million; soil Sample No. 2, untreated, 15 million, treated, 73 million; soil Sample No. 3, untreated, 2 million, treated, 68 million; soil Sample No. 4, untreated, 7 million, treated, 63 million; soil Sample No. 5, untreated, 50 million, treated, 116 million. There is accordingly shown herein advantages averaging better than double in the bacteria propagation rate due to the treatment of the soil hereunder. This treatment promotes the bacteriological reaction in manure.

For concise reference to the reactions under the chemical formulae, there is set up:

$CaCO_3MgCO_3$+heat=$CaCO_3MgO$+loss of CO_2 first activation from selective calcination

$CaCO_3MgO$ + (steam - water) = $CaCO_3Mg(OH)_2$ pressure hydration

$CaCO_3Mg(OH)_2$+heat 500° to 550° C. for 15 minutes=$CaCO_3MgO$+H_2O lost as steam second activation stage for the magnesium oxid

Reviewing the chemical proportions of this dolomite from Northwestern Ohio, which is normally 56 per cent calcium carbonate and 44 per cent magnesium carbonate, with this selective heat treatment to drive off the CO_2, the resulting product is in practice around 72 per cent calcium carbonate to 27 per cent magnesium oxid. This means that in this activated material of the calcium carbonate and magnesium oxid, the ratio by weight is nearly three calcium carbonate to one magnesium oxid. The non-toxic properties hereunder, notwithstanding the activation or material change in the magnesium to the oxid, in the experience hereunder, has been against hazard arising from toxicity, which seems proper to attribute to the increased relative proportion of the calcium carbonate as well as its stabilizing traits due to this activation.

The first activation hereunder has a response to soil reaction much greater than raw limestone, while the pressure hydrated and then dehydrated product has a still more rapid or almost immediate response in soil treatment. The experience has been that raw limestone is so sluggish as to take in some instances as much as one year and usually as much as six months to react with the soil.

This improved value, notwithstanding its speed-up position, also has a coverage value in that this treated material in the range of 500 to 800 pounds per acre is effective for more advantageous crop yields for alfalfa and clover than a ton per acre of the raw limestone.

This magnesium oxid A and its associated calcium carbonate is a product in development from and a continuation-in-part of the disclosures in Clarence R. Rex patents: No. 1,845,339, Feb. 16, 1932, Coating body; No. 2,048,967, July 28, 1936, Cement improver and method; No. 2,193,842, Mar. 19, 1940, Fertilizer containing selectively calcined Dolomite; and copending application for United States Letters Patent Ser. No. 324,642, filed Mar. 18, 1940, Special magnesium oxid composition.

What is claimed and it is desirous to secure by United States Letters Patent is:

1. The method of producing a magnesium-oxid-calcium-carbonate product by partially calcining dolomitic rock in a heat treating zone at atmospheric pressure and at a substantially uniform temperature of approximately 850° to 970° C., by constantly supplying heat until a decrease in the heat consumed in driving off carbon dioxid causes an abrupt rise in temperature, and at once removing the partially calcined rock from the heat treating zone.

2. The method of producing a magnesium-oxid-calcium-carbonate product by partially calcining dolomitic rock in a heat treating zone at atmospheric pressure and at a substantially uniform temperature of approximately 850° to 970° C. by constantly supplying heat until a decrease in the heat consumed in driving off carbon dioxid causes an abrupt rise in temperature, at once removing the partially calcined rock from the heat treating zone, agitating in a closed chamber in the presence of moisture the product removed from the zone, and further building up the pressure in the range of 200° C. by spraying water thereinto until the temperature decreases.

CLARENCE R. REX.