

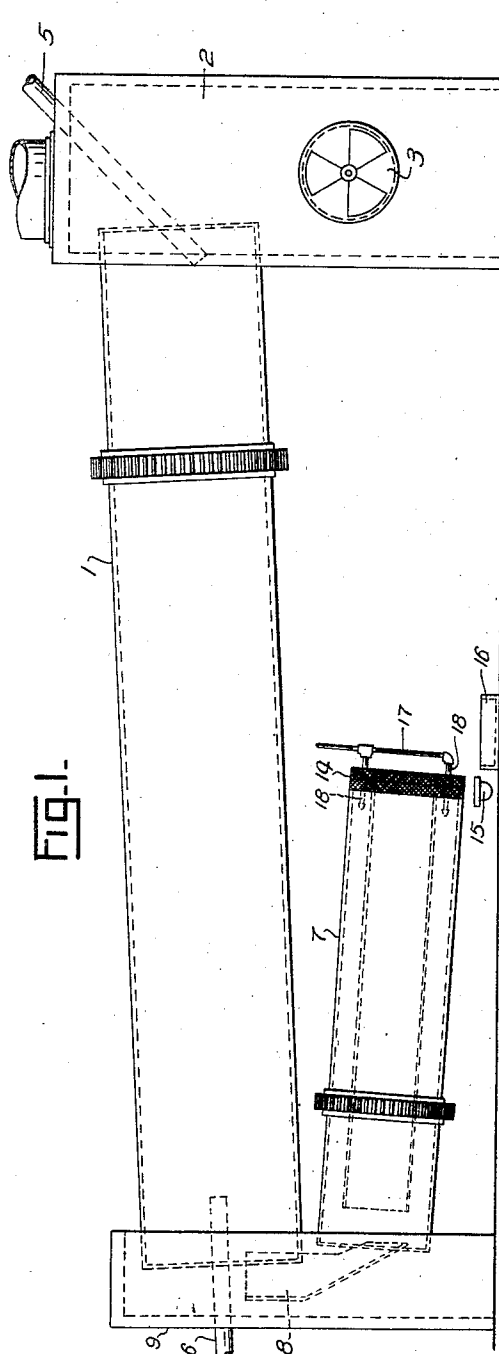
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**J. P. DICK**

**2,435,495**

# PROCESS FOR PRODUCING MAGNESIUM ORE BRIQUETTES

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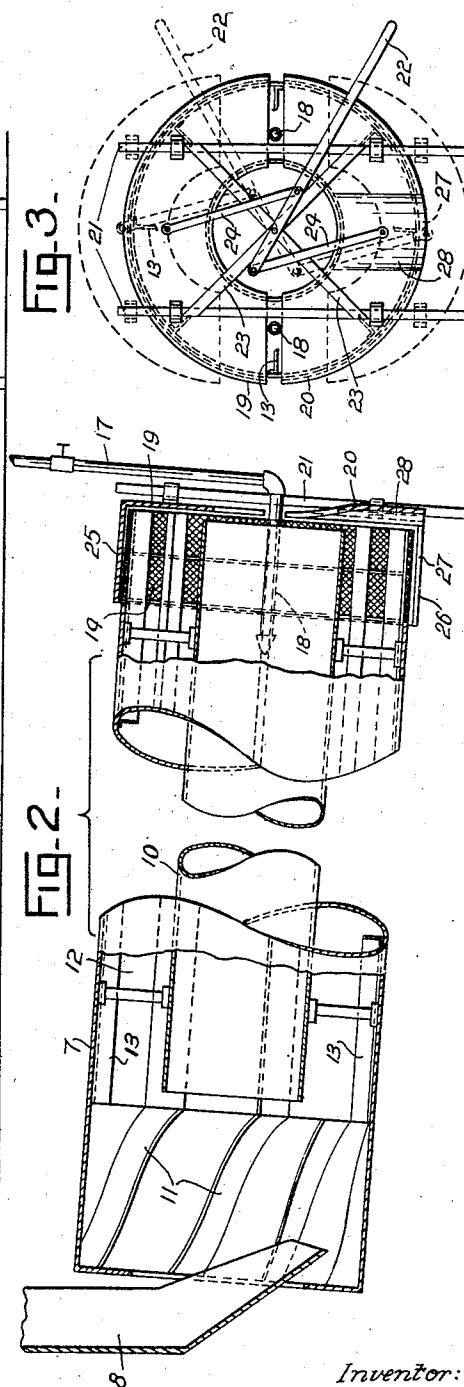


FIG-3.

FIG. 2.

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## UNITED STATES PATENT OFFICE

2,435,495

PROCESS FOR PRODUCING MAGNESIUM  
ORE BRIQUETTES

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4 Claims. (Cl. 75-67)

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This invention relates to the production of metallic magnesium by thermal reduction of magnesia containing material, and is particularly concerned with the treatment of calcined dolomite and the like in the briquetting of the material with a reducing agent, such as ferrosilicon.

The invention is particularly useful in the treatment of calcined dolomite and the like for the production of briquettes to be used in the procedure disclosed in United States Patents 2,330,142 and 2,330,143 but may be employed elsewhere in the production of dense briquettes.

Much difficulty has been experienced in producing satisfactory briquettes from the calcined magnesia containing material. Briquettes which are not sufficiently dense and strong permit the formation of much fine material before they are charged into a thermal reduction chamber, which prevents the efficient transfer of heat through the charge. Removal of such fine material before it is charged, is an expensive procedure, and necessitates recirculation of the fine material back to the briquetting circuit and requires extra briquetting capacity to handle same. Various methods have been proposed and tried for rendering the calcined material more dense and the briquettes more durable.

It has now been found that greatly improved results accrue from the provision of a closely controlled and uniform moisture content in the calcined material to be briquetted.

The primary object of the present invention is to provide a method of treating the calcined material whereby a desired moisture content may be provided therein, so that more dense and durable briquettes may be produced therefrom.

Other objects of the invention will appear from the following description taken in conjunction with the accompanying drawing which shows a form of apparatus for carrying out the invention and in which

Figure 1 is a diagrammatic longitudinal elevation of the apparatus,

Figure 2 is a broken longitudinal elevation, partially in section, of a rotary cooling device in which the moisture content of the calcine is controlled, and

Figure 3 is an end elevation of the cooling device.

In the drawing 1 is a rotary calcining kiln connected to a stack 2 which is provided with a draft control vent 3. The rock is fed to the kiln by the pipe 5 and 6 is a fuel burner. 7 is a rotary cooling device which receives the calcine from the kiln through the chute 8 within the hood 9

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which encloses the discharge end of the kiln and the charging end of the cooler. The kiln and cooler are mounted for rotation in any desired known manner. A pipe 10 is centrally located along the longitudinal axis of the cooler 7 and preferably terminates a short distance from the charging end of the cooler, where spirally arranged vanes 11 are secured to the drum to feed the calcine into the space 12 between the pipe and the wall of the drum. In this space are located angle irons 13 to lift and agitate the calcine as the drum rotates. At its discharge end a section of the cooler drum is in the form of a screen 14 through which the fine materials pass to a conveyor 15 or the like, while oversize particles are discharged at the end of the drum and removed by any suitable means 16. A pipe 17 is arranged at the discharge end of the cooler for the delivery thereto of steam or water vapour. It may have two branches 18 for uniform distribution of the steam.

An adjustable closure is provided for the discharge end of the cooler to regulate the amount of air admitted to the space 12 and preferably without interfering with the amount of air entering the pipe 10. As shown this closure comprises two arcuate members 19 and 20 slidably mounted on vertical standards 21. A lever 22 pivoted on cross bars 23 fixed to the standards and connected to the arcuate members by links 24 controls the vertical movement of the members. The arcuate members have flange portions 25 and 26 extending rearwardly over the screened section of the drum to prevent undue entry of air through the screen. Flange portion 26 is cut away at 27 to permit discharge of fine material through the screen and the arcuate member 23 has a forwardly spaced portion or bulge 28 to permit discharge of oversize material.

In operation the natural humidity of the atmosphere must be taken into consideration and adjustments must be made in accordance therewith. Efficient operation of the calcining kiln requires the passage through the kiln to the stack of an adequate amount of air. This air is admitted through the cooler 7, in which it cools the calcine, and passes in its preheated condition to the kiln 1. In the cooler the hot calcine naturally absorbs moisture from the air and the amount of moisture absorbed varies with the humidity of the air. Accordingly the invention provides for the control of the amount of moisture actually taken up by the calcine.

In the production of dense, durable briquettes it has been found that the moisture content of

the calcine to be briquetted should be within the range of 0.6 to 0.8%, when the briquettes are to be used in the production of magnesium as previously indicated. When the briquettes are used for further treatment where the loss on ignition is not of so much concern the upper limit of the moisture content is not so critical. Briquettes having this moisture content are hard and have a density of from 1.9 to 2.2. The addition of steam to provide the specified moisture content in the calcine has the effect of increasing the density of the briquettes by substantially 8% and at the same time they are much harder. Fewer fines are thus formed in handling the briquettes. In one installation the amount of fines to be returned to the presses for rebriquetting was reduced by about 25%.

The moisture content of the calcine is controlled by admitting steam to the cooler, by the pipe 17, to insure a substantially constant humidity level in the air within the cooler and which contacts the calcine as the latter is agitated by the rotation of the cooler. In wet weather the natural humidity of the air may provide enough moisture to raise the moisture content of the calcine to the desired level but such conditions vary greatly from day to day and with the seasons. Thus the adjustable closure permits control of the amount of air which is admitted to the cooler to contact the calcine, while the central pipe 10, permits passage of air to the calcining kiln in the required amount. The latter may be varied by the draft control vent 3 in the stack. The calcine being hot readily absorbs the moisture from the air and the amount of steam or water vapour admitted to the calcine is under direct control.

In addition to the increased hardness and density of the briquettes other advantages accrue from the use of the invention. It substantially increases the effective capacity of the briquetting processes, an increase of 16.7% having been obtained. The power consumption of the presses is more constant and there is less danger of breaking the briquetting roll shells. More finely divided material may be briquetted satisfactorily. For example, it has been found that the proportion of -200 mesh calcined material may be increased from 30% to 65% and still produce improved briquettes.

In recovering magnesium from calcined dolomite briquettes as described, the magnesium production was increased by 4 or 5% and required

less ferrosilicon to reduce the magnesia. Furthermore, the reduction in fines appearing in the retorts results in a decrease in the tendency for the residue to fuse and form scale on the wall of the retorts.

While the method of briquetting has been particularly described with reference to the production of magnesium this invention is intended to be restricted only by the appended claims. It will be apparent that various changes may be made without departing from the spirit or scope of the invention as defined.

I claim:

1. In the production of briquettes from finely divided material consisting essentially of magnesia, the improvement of which comprises incorporating substantially 0.6 to 0.8% by weight of moisture in the material and pressing the material into briquette form.
2. A method as defined in claim 1 in which the material hot pursuant to calcination is cooled in a humid atmosphere from which it absorbs moisture.
3. A method as defined in claim 1 in which the material hot pursuant to calcination is cooled in the presence of air and water vapour is admitted to the air to be absorbed by the material.
4. A method as defined in claim 1 in which the material hot pursuant to calcination is cooled in a counter-current of moist air and the counter-current flow of air is controlled to regulate the amount of moisture absorbed by the material.

JOHN PARSONS DICK.

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