MAGNESITE.

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The production of magnesite in the United States in 1916 far exceeded that of any preceding year. The increase was due to the larger demand for refractory magnesite products and to the decline in imports. Though more magnesite was used in the United States in 1916 than in 1915, the consumption was less than that of any of the three years preceding 1915, and the use of the mineral has now been greatly curtailed by its relative scarcity and high cost.

It is estimated that normally about 6 pounds of magnesite was formerly used for every ton of steel made by the basic open-hearth process, but not more than half a pound for every ton is now being used, and at some steel plants cheaper and less satisfactory refractories have been substituted for magnesite. Owing to its use in the steel and copper industries magnesite is an important though a minor war commodity, and the need for it in these industries is so great that its lack has at times been viewed with serious apprehension.

Magnesite produced in and imported into the United States, 1912-1916, in short tons.

Year.	Domestic production, raw.	Imports "for consumption."		Total consumption calculated as calcined.
		Raw.	Calcined.	
1912	10,512	17,905	125,252	139,460
1913	9,632	13,240	167,094	178,530
1914	11,293	13,354	121,817	134,140
1915	30,499	49,765	26,574	66,706
1916	158,759	75,345	9,270	126,322

The properties that made the largest production in 1916 are in Tulare County, Cal., though considerable quantities were produced also in Santa Clara, Sonoma, Napa, Kern, and Fresno counties, Cal., and from deposits recently opened in Stevens County, in eastern Washington.

The data given above show that 1914 was the last year in which the imports were approximately normal. About 90 per cent of these imports were received from Austria and Hungary, and almost

all the rest came directly or indirectly from Greece. The European war at first cut off the shipments from the Austrian and Hungarian deposits, so that for a time the imports of the purer Grecian magnesite greatly increased. Later the lack of boats and the dangers of navigation cut off a large part of the Grecian supplies and stimulated the development of the domestic deposits. In 1915 only 11,000 tons of Austrian magnesite was imported, but the shortage of the supply from Austria was in part replaced by Grecian material and by 2,500 tons of calcined magnesite obtained from Canada. In 1916 the larger part of the imported calcined magnesite came from Greece, although about 2,000 tons was received from Canada. Most of the imported magnesite has come through the port of Philadelphia, but some has come by way of New York and New Orleans.

The most important development of the year 1916 is the opening in eastern Washington of large deposits of a coarsely crystalline magnesite that is like marble or dolomite in texture but is essentially magnesite in composition. This material is now being shipped at the rate of several hundred tons a day, and calcining furnaces are in course of erection to prepare magnesia for use in making refractory material and, it is said, also for use in cement mixtures. Coming at a time when the sources of supplies abroad are cut off, the discovery of these deposits appears to be most fortunate. Apparently authentic reports indicate that the deposits are large and that they will afford a supply of uniform character by relatively cheap methods of mining. It is perhaps too soon to say just how well the material is suited for refractory or other uses, but the present indications are that it may be adapted to some of these uses.

The other large deposits in this country are in California, and the material is of the purer type, like the Grecian, which has ordinarily not been favored for use in furnaces. The cost of mining and of transportation from the Western States to the East, where most of the refractory materials are handled and used, is greater than the cost of mining and of shipping by water from abroad, and this has been the principal fact prohibiting the production of domestic magnesite other than the small quantity used on the west coast, chiefly in the manufacture of paper. Now the higher price offered for magnesite has induced the development of many properties that have hitherto been little worked.

The prices paid in California for the raw ore at the mine or shipping point ranged from $8 to $10 a ton, but though much was shipped raw, a part of the product was calcined at the mine. The eastern users had to pay, in addition to the original price, the relatively heavy charges for transportation, amounting to about $10 a ton. Thus raw magnesite cost the eastern users not less than $18 to $20 a ton, and the added expense of calcining and the resulting loss of weight made the minimum cost, even to large users, very much

higher than formerly. However, even at these high prices the demand for magnesite is very great.

Most of the refractory magnesite that has been in general use has peculiar and distinctive properties that are not found in the magnesite deposits of the common type. The value of this refractory material depends not only on its resistance to the corrosive action of heat and metallic slags, but also on the permanence of the forms in which it is put into the furnace. This permanence is due to a natural bonding which tends to make the loose crushed material cling together under furnace heat and thus makes brick forms molded from it more durable. Bricks and granular furnace bottoms made of magnesite that lacks this bond break, and the magnesite floats off on the fluid molten metal and is lost in the slag. Thus, though magnesite that contains a small percentage of iron may be somewhat less resistant to extreme heat than a purer form, the slight fusibility given to the material by the iron tends to hold it in place. For this reason, in part, a type of magnesite so far found only in Austria and Hungary has been the principal source of the refractory magnesia used in this country. The purer magnesite from Greece, California, and elsewhere is used in making plaster or cement or material for other relatively minor uses.

Magnesite is reduced to magnesia either in "dead-burned" or sintered form, or in what is known as "caustic calcined" form, Dead-burned or sintered magnesite has been so strongly heated that essentially all its carbon dioxide and moisture have been driven off and most of the shrinkage taken up. In this condition it is chemically very inert—that is, it is not subject to attack or disintegration even under extreme heat. The caustic form is not so thoroughly calcined; it still retains 1 or 2 per cent of carbon dioxide and is thus a product more like ordinary caustic lime in its properties. although not quite so active chemically. Caustic magnesite "slacks" when exposed to the air, recombining with moisture and carbon dioxide. Combined with calcium chloride it forms a distinctive cement known as Sorel or oxychloride cement, which is much favored by builders for floors and other places where tile or special finish is desired. This is probably the most important use to which pure caustic calcined magnesite is put, although it is used also for making liquors in which wood pulp is digested to make paper, as well as for other purposes.

It is difficult to determine just how much magnesite was formerly used in laying cement flooring, in making paper, and for other purposes. The magnesite-cement flooring trade in the United States, however, is now very large, though the high price of caustic calcined magnesite and the uncertain quality of the material supplied from some sources have undoubtedly greatly restricted its use in cements.