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MINERAL RESOURCE SURVEY
Circular No. 40

The information contained in this circular was gathered by a unit of the WPA State-wide Geological Investigation Survey of Texas, a project sponsored by The University of Texas Bureau of Economic Geology. The purpose of this survey is to assemble information concerning mineral products and to gather other geological data and make them available to the public. With this information in the hands of the public, it is reasonable to suppose that industries of value to the State may be developed. The following report is based on work done in Llano County by Work Project No. 18509.

MAGNESITE MINING IN LLANO COUNTY, TEXAS*
by Carl Chelf, Supervisor

As an outcome of a paper[1] published by The University of Texas in 1938 calling attention to the high magnesia marbles of the Sharp Mountain area of Llano County, magnesite is mined at the present by two companies, the Meramec Minerals, Inc., and the Texas Mines. The Sharp Mountain area is a part of the metamorphic series, probably Algonkian in age, composed mainly of mica and graphitic schists, diorites, granite, dolomite, magnesite, magnesitic limestone, and calcium carbonate marble. The calcium carbonate marbles and dolomites, like other members of the series, are highly metamorphosed irregular bands and include such typical accessory minerals as tremolite, tourmaline, diopside, serpentine, talc, and wollastonite. The entire series has been intruded by granites, pegmatite, and aplite dikes. In part, this folded and tilted series is overlain by Cambrian and Ordovician strata where erosion has failed to remove it.

MERAMEC MINE

Following an extensive drilling program in Llano County, Meramec Minerals, Inc. opened a magnesite mine on the Gray Fowler tract, 3 miles southeast of Llano and approximately west of Sharp Mountain. Core testing at this locality revealed an irregular, vertical, lenticular mass of magnesite approximately 50 by 75 feet at the surface, gradually mushrooming toward the base, and ending at a depth of about 105 feet. The high magnesia area is bounded on the north, east, and south by a siliceous dolomite and on the west by a weathered or altered diorite which has overthrust the magnesite. At present, mining is by open pit or quarry and the ore is removed with a stiff-leg derrick hoist. The mine workings are approximately 25 feet in depth, and water and caving problems are becoming increasingly difficult. The present plan is to sink a shaft near the west side of the mass in order to mine with regular underground methods.

The ore is high in magnesium content and has few accessories or inclusions within the lenticular mass proper. It is bluish white to gray with brown mottled areas when fresh. Individual crystals are difficult to see with the naked eye, but a hidden saccharoidal texture develops upon exposure, and it has a decided tendency to pulverize into normal crystal size. Upon partial disintegration, lumps are sugary white and very friable. The most obvious accessories are chlorite, serpentine, pyrite, and possibly tourmaline.

TEXAS MINES MINE

The Texas Mines mine, located 6 miles southeast of Llano and approximately 0.1 mile south of Sharp Mountain, was opened in April, 1941, by C. E. Heinz of Joplin, Missouri. At the present time the open pit mine has an exposed working face of approximately 175 feet, and workings are from 12 to 18 feet in depth in a mass of high grade magnesite. The ore lies between steeply dipping beds of white and cream-colored, large crystal dolomites. The line of demarcation between magnesite and the surrounding dolomites in the mine is well defined and separated by sharp joint planes. Workings have proceeded along the strike of the magnesite stratum for 105 feet but have not extended laterally to the point of defining the total length of the deposit.

The ore is a somewhat translucent crystalline magnesite with colors ranging from bluish white to pale green. There is no tendency to disintegrate upon exposure. A possible clue to the origin of this ore through the loss of calcium from a dolomite may be indicated by a fracture pattern which has healed and left old breaks as harder material than the surrounding matrix. Random samples of this ore assayed by the operator are reported to contain as much as 97 per cent magnesium carbonate with accessory minerals such as chlorite, pyrite, pyrrhotite, serpentine, and calcite. Spectographic analyses by Dr. Gabriel[2] of the U. S. Bureau of Mines gave the following results: Mg, principal; Fe, ½%; Mn, 1/10% to 5/10%; Si, ½%; Ca, 1%; Cr, Ti, Ni, not detected.

Strata bordering the northwest edge of the mine were exposed in excavating an ore ramp. These beds, mainly graphitic schists, dip steeply to the southeast. The present workings indicate that the magnesite bed follows the same general dip of surrounding beds and

*Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Project No. 165-1-66-695.

[1]Schoch, E. P., Barnes, V. E., and Parkinson, G. A., High magnesia marble from Sharp Mountain area of Llano County, Texas: Univ. Texas, Div. Nat. Res., Bureaus of Economic Geology, Engineering Research, Industrial Chemistry, Mineral Resource Circular, 5 pp., May 10, 1938.

[2]Personal communication to C. E. Heinz.

therefore may contain a rather large tonnage. About 100 yards south of the magnesite mine a bed of white dolomite has been opened, and several carloads have been shipped. This dolomite is rather pure, contains a small percentage of silica, and is composed of medium-sized interlocking subhedrally developed crystals. The silica occurs as tremolite spangles or radiating crystal growths. An estimated 5000 tons of low grade magnesite lies slightly northeast of the magnesite mine, and another area approximately 100 yards southeast of the mine has an unknown quantity of high grade magnesite. Magnesite was mined for terrazzo chips from a quarry on the north side of the main Sharp Mountain road about 150 yards from the point where Texas Mines road leads to the primary magnesite mine. This magnesite is also being utilized. Although this quarry is in the same trend as the original Texas Mines mine, the magnesite tends to grade from relatively pure magnesite at the surface to a higher calcium content material as depth increases. In general, the reverse has been true of Texas Mines mine.

According to the U. S. Bureau of Mines Minerals Yearbook for 1940, the consumption of caustic calcined magnesite was about 17,000 tons and the consumption of dead burned about 172,000 tons. This is a record high for both classes of material, and it can be expected to go even higher in the coming years as a result of new uses and current needs.

Dead-burned magnesite and synthetic:periclase, the refractory grade magnesias, are employed in the construction of hearths of the basic open-hearth furnace, for refractory brick, and as a chemical reagent. The caustic calcined, a low temperature burned magnesite, is used in the manufacture of oxychloride cements, the unusual property of these cements being their ability to bond organic materials such as cork, sawdust, or other fibrous substances. Such cements are light weight, act as good insulators, "give" without fracture. The so-called chemically reactive grades are used in a variety of ways, the most common being in the production of epsom salts, pigment, rubber, and glue.

High purity magnesium oxides are now made from specially high grade ore and from the precipitate of bittern. By far the most important trend in the entire magnesia field today is the use of the magnesium compounds from the known economic sources as a raw material for the production of metallic magnesium. Of the 12 million pounds of metallic magnesium produced in 1940, the raw material came from one source, the brines of the Midland, Michigan, district. Possible magnesia sources are magnesite, brucite, dolomite, bittern, and sea water. Other materials such as olivine and serpentine can and probably will be used extensively in the near future. Magnesium can be obtained rather easily from olivine in solution either with sulfuric or hydrochloric acid, but serpentine yields its magnesium content with more difficulty. A small plant near Sylva, North Carolina, is manufacturing epsom salts from olivine. Although olivine is as yet unknown in the pre-Cambrian area of Llano County, large deposits of serpentine are present.

Good dolomites are known principally in the Sharp Mountain area but are also present in other parts of the county. Reserves of magnesite are still unknown in the Sharp Mountain area, but a sufficient tonnage is in sight for operations to continue at their present production for several years. The area is apparently particularly well located for the utilization of its dolomites as well as the magnesite.

Following is a selected bibliography of the more recent literature pertaining to magnesite, its production and uses.

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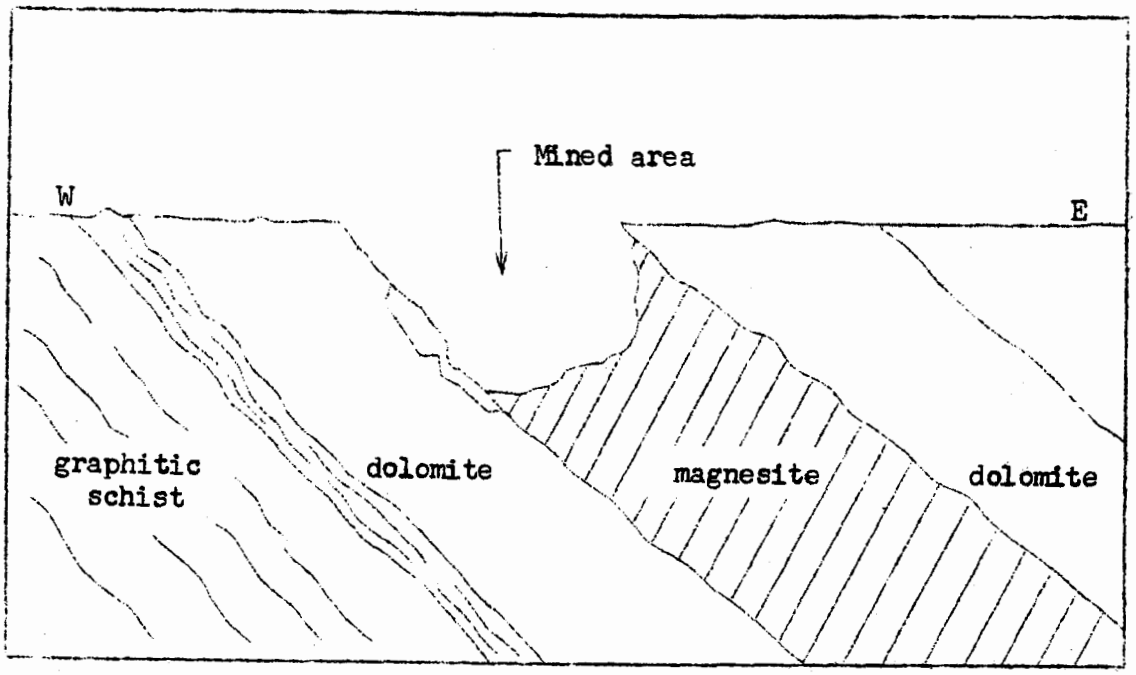
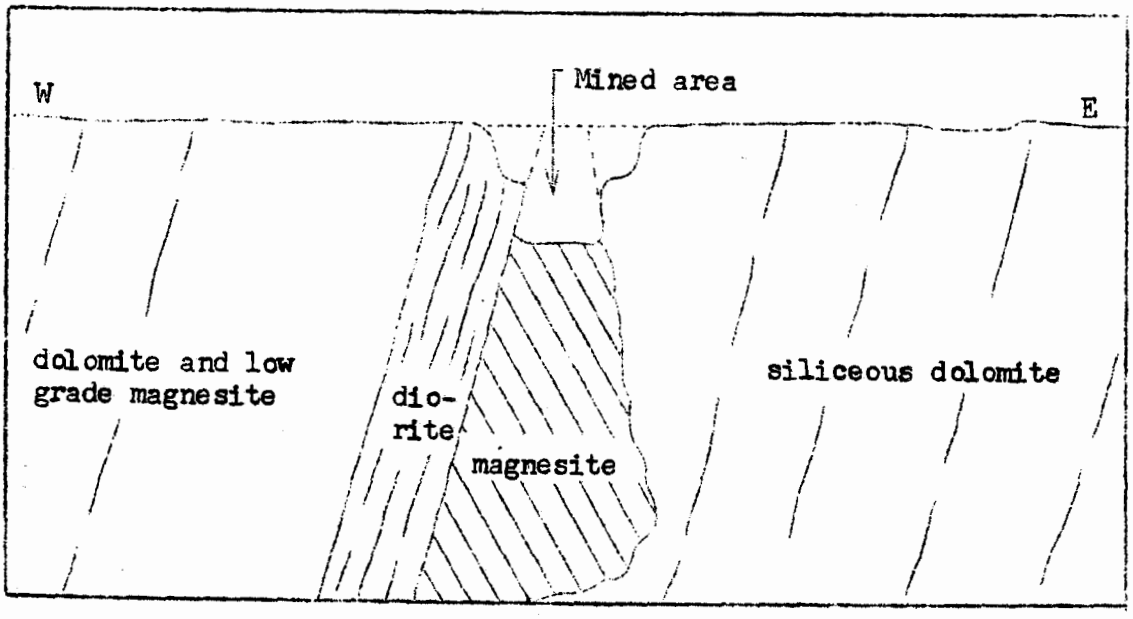


Generalized cross section of Texas Mines mine.



Generalized cross section of Meramec mine.