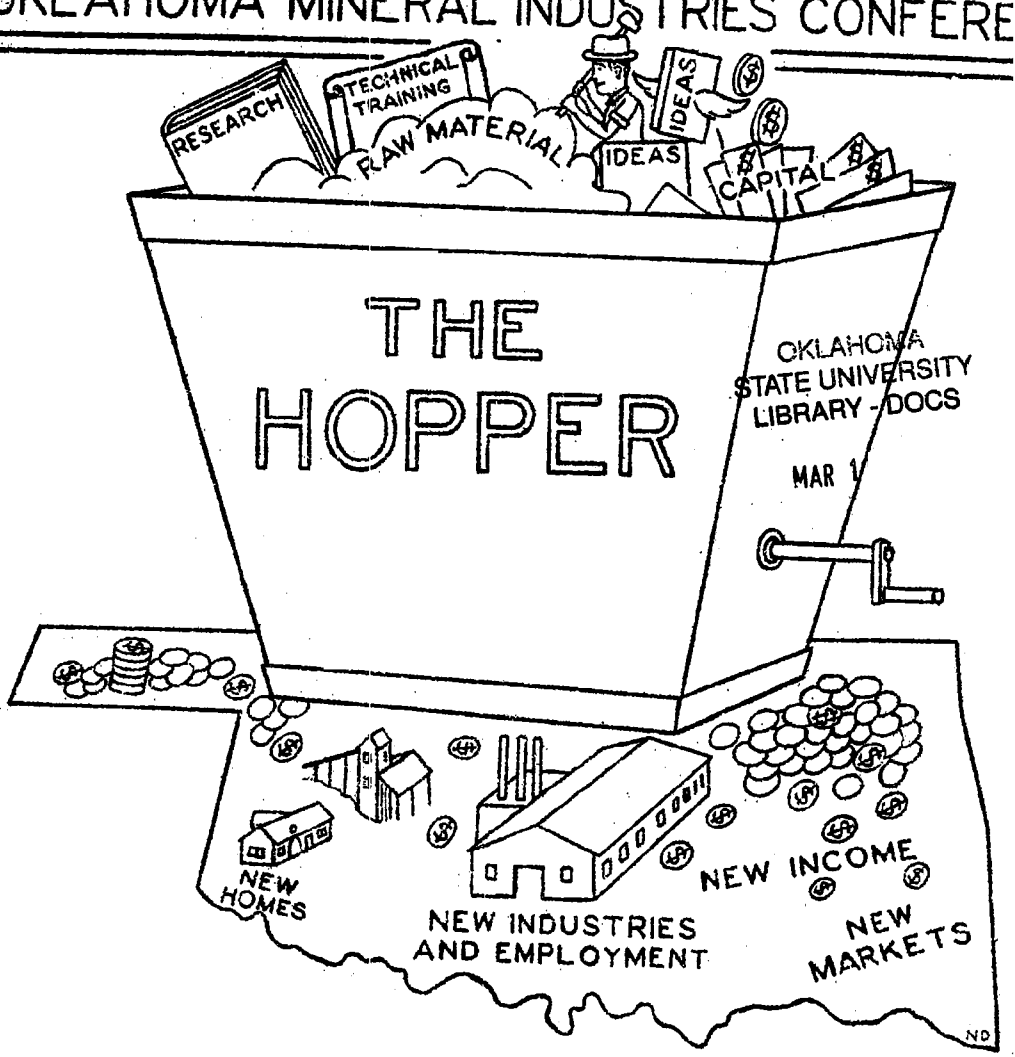
OKLAHOMA MINERAL INDUSTRIES CONFERE



PUBLISHED IN THE OFFICE OF THE
OKLAHOMA GEOLOGICAL SURVEY
NORMAN, OKLA.

Vol. VIII, No. 3 March, 1948

DOLOMITE--ANOTHER NEW DEVELOPMENT IN OKLAHOMA MINERALS

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(Address before Oklahoma Industrial and Mineral Industries Conference, Nov. 17, 1947, Tulsa, Okla.)

Oklahoma dolomite of high quality will be available to industry in the near future. A crushing plant is under construction at Troy and a narrow gauge spur line is being built from Troy to the quarry site on the outcrops of Royer dolomite west of Troy. We are hoping to be in production before the end of this year (1947). Crushers and screening equipment of the plant are being installed that will permit us to prepare and ship dolomite that will meet the size specifications of the various industries that use this stone.

I want to give due credit to the Oklahoma Geological Survey, and especially to Mr. Robert H. Dott, director, A. L. Burwell, chemist, and W. E. Ham, geologist, for their assistance in finding the types of raw material resources needed for our operations. Among the chief reasons we are in Oklahoma is the fact that members of the Survey were able to supply us with the type of information we needed on the raw materials in which we were interested; and to convince us that the combination of quality raw materials, fuels, and other factors was more attractive in Oklahoma than we were able to find in any other state.

The subject of this discussion is dolomite, a double carbonate of calcium and magnesium. In Oklahoma we have dolomite that compares well in quality with the better known dolomites of other regions. The Royer dolomite west of Troy, from

samples we have had analyzed, averages 30.67 percent lime (CaO) and 21.26 percent magnesia (MgO). Converted to the carbonates this gives 54.75 percent calcium carbonate ($CaCO_3$) and 44.46 percent magnesium carbonate, or a total of 99.51 percent calcium magnesium carbonate.

Following is an average of nine analyses made by the Oklahoma Geological Survey of the Royer dolomite from the Troy area, compared with the average of 25 analyses of high-grade Ohio dolomites:

	Royer Dolomite Average 9 analyses	W. Ohio dolomites Average 25 analyses*
SiO_2	0.41	0.41
Al_2O_3	0.177	0.07
Fe_2O_3		0.057
FeO		0.155
Total Fe as Fe_2O_3	0.157	0.229
CaO	30.71	30.02
MgO	21.18	21.53
K_2O	0.051	low
Na_2O	0.029	low
SO_3	0.031	0.218
P_2O_5	0.004	0.042
H_2O at 105°C	0.11	0.133
Loss on ignition (105°-950°C)	47.26	47.09**
Recalculation, from CaO and MgO		
$CaCO_3$	54.81	53.57
$MgCO_3$	44.29	45.03

* Average of 25 analyses from "Dolomites and Limestones of Western Ohio": Geol. Survey of Ohio, (4th ser.) Bull. 42, 1941, by Wilbur Stout.

** CO_2

A comparison of the analysis of Oklahoma dolomites with analyses of the better grades of dolomites from the present important areas of dolomite production will show that for many industrial and chemical purposes, the Oklahoma dolomite is equal or superior in quality.

Because of its low iron content the Royer dolomite should be highly useful to the glass manufacturers who prefer dolomite to limestone; to the paper manufacturer who uses lime made from dolomite; to other process industries in which high quality dolomite low in iron is important; and for calcining and for making dead-burned dolomite.

Because of its low content of alumina, average .1225%; low silica, average .4075; very low sulphur, .0295; and very low phosphorus, average .0055, this dolomite should be very useful in industries in which those elements are objectionable. This will include the iron and steel smelting where the stone could be used either raw or sintered.

Slaked "soft burned" dolomite has a high plasticity. Because of its high purity this Oklahoma stone should make an excellent "soft burned" dolomite. Such production should find a wide use in the building industry as a finishing lime and as a brick mortar component in lime portland mortars.

Oklahoma sintered dolomite, properly prepared, should find ready use by the refractories industry. It could be used in the manufacture of the various types of high-heat duty brick and other shapes.

For some soils magnesia is as essential as lime for soil improvement. Agricultural lime, therefore, offers a further excellent field for the use of this high-grade dolomite. For neutralizing acid soils, dolomite has a greater value than an equal weight of limestone. A pure dolomite is roughly 109% as effective as a pure limestone.

Basic magnesium carbonate can be obtained here in Oklahoma by hydration and carbonation of Oklahoma dolomite. We anticipate that the production of basic magnesium carbonate will be another Oklahoma industry in the near future. This will make available in Oklahoma a basic material for various industries such as paint manufacturing.

Because of its physical properties, dolomite is useful in many types of construction work. There is an excellent Oklahoma market for crushed dolomite for such things as road work, concrete aggregate, ballast, and other uses.

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CERAMIC INDUSTRIES FOR OKLAHOMA

The success of the glass industry in Oklahoma has focused attention on the possibilities in Oklahoma for other branches of ceramics. The glass industry demands readily available mineral raw materials in close proximity to the plant location. Glass sand, limestone, and dolomite are bulk raw materials which must meet rigid specifications as to purity but are in the low-value class nevertheless. It is not considered economically sound business for a glass plant to be located where high transportation charges must be absorbed on this raw material. In addition to raw materials, and perhaps of greater import, is the availability of low-cost fuel, preferably natural gas.

In the brick and tile industry, the situation as regards raw materials is much the same. Certainly shale for common brick will not stand much, if any, transportation expense. Shale for fancy brick often can stand some such expense if it is not excessive and the market price for the product is sufficiently high. Here again low-cost fuel is essential to the plant's success.

It is obvious that the association of the plant and raw materials need not be so close in an industry where the unit value of the product is relatively high. For example, high-quality porcelain chinaware which sells at high prices can better afford to absorb rather large transportation expense in order to obtain high-quality clays with which to make the product. As is well known certain potteries find it desirable to import English clays with the attendant high costs. At the same time it must be recognized that a plant situated in close proximity to high-quality raw material holds an economic advantage.

As a matter of fact the location of a ceramic plant of any description will be decided by weighing a number of factors among which raw materials, labor, fuel, and markets are the dominant ones. In seeking the reason for the location of existing plants producing art pottery, hotel china, vitrified china plumbing and bathroom fixtures, chemical porcelains, etc., it is observed that proximity of raw materials carries the least weight. Potteries in Ohio originally chose their location because of the low-cost fuel supply and potential markets. Even today much of their raw material is brought in from Georgia, Florida, and Tennessee, where kaolin ball clay and other clays are produced. Presumably, had these states possessed the markets for the finished products as in Ohio and the natural gas originally so plentiful and cheap as in Ohio, they would have had the clay-products plants. Once established and skilled labor developed, it is difficult to bring about a change. In other words, it requires something really tangible to influence management to move an established plant to a new location. More often, it is better logic to suggest a branch plant, using whatever inducements your area can advance, with the hope that once established the branch will prove so successful that it will become the principal plant of the group.

In trying to induce any division of the ceramic industry to locate a plant or plants in Oklahoma due thought should be given to all the factors mentioned. A survey of markets should be made. Potential labor which easily acquires high skill is not a problem in Oklahoma. All three of the principal fuels are available in Oklahoma, at costs generally much lower than the average. Many raw ceramic materials are found in Oklahoma. Some have been developed; others are undeveloped. Furthermore, the state's natural mineral resources adaptable to ceramic uses has been very little explored. New deposits of various materials are constantly being brought to light. New methods and new processes are being brought into use. If to date no deposits of kaolin and ball clays have been found in Oklahoma, "let not your heart be troubled" but recall what Oklahoma can offer to the ceramic industry--markets, labor, fuel, and many clays, shales, sands, limestones, dolomites, and other natural raw mineral materials. Also, recall that science and technology coupled with native business ability just naturally will overcome obstacles. That is the history of American industry everywhere. Oklahoma is no exception.

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OKLAHOMA LIMESTONE NOW AVAILABLE TO THE GLASS INDUSTRY

St. Clair Lime Company has been shipping limestone to glass plants in Oklahoma, Arkansas, and Texas, according to Homer Dunlap, president.

Mr. Dunlap stated that limestone with iron oxide content of .015 percent is being shipped from the quarries at Marble City, Sequoyah County, to glass plants in Muskogee, Okmulgee, and Sand Springs, Oklahoma; Fort Smith, Arkansas; and Palestine, Waco, and Wichita Falls, Texas.

QUARTZ CRYSTAL SUBSTITUTE MADE FROM PETROLEUM

There is an old saying that necessity is the mother of invention. Sometimes we suspect that if necessity is the mother, difficulty of acquisition is the father. All during the recent war the supply of piezoelectric quartz crystals was less than the demand. Tons and tons of quartz was handled in the effort to obtain just a few coveted piezoelectric crystals. The amount obtained in this country was extremely small. Brazil supplied the greatest portion of this material.

Now, as a result of research in their laboratories, the Bell Telephone Company believes that artificial crystals will in a few years replace as much as 90 percent of the natural quartz used in long-distance telephone systems. However, the artificial crystals are not quartz. The material is an organic compound, ethylene diamine tartrate, EDT, which exhibits piezoelectric properties. The percentage of quartz that exhibits these properties is extremely small. For that reason a tremendous tonnage of quartz is handled in the search for crystals that have the desired properties.

The synthetic crystals that have been produced commercially weigh about one pound each. The crystals are cut into thin plates which are coated with a film of gold hardly one-millionth of an inch in thickness. The gold film acts as a means for making an electric connection.

Obviously an organic material is here replacing a "hard to get" inorganic material. It is interesting to note that ethylene diamine tartrate is a derivative of ethylene gas, which is obtained from petroleum oil or natural gas by proper processing.

It has been a common thing in economic development that a change occurs whenever supply and demand for a commodity are out of balance.

OKLAHOMA RANKS FIFTH IN TOTAL VALUE OF MINERAL PRODUCTION

In mineral production, Oklahoma ranks about three times as high as the national average on the basis of land area and population. With 2.33 percent of the land area and approximately 2 percent of the population, Oklahoma produced 6.91 percent of the mineral wealth for the period 1911-1945. The following tables are taken from the 1945 Minerals Yearbook of the U. S. Bureau of Mines:

Rank of States in Value of Minerals and Percent of Total, 1911-1945

State	Rank	Percent of U. S. Total
Alabama	20	1.44
Alaska	31	.50
Arizona	13	2.21
Arkansas	26	.79
California	3	8.61
Colorado	19	1.46
Connecticut	42	.11
Delaware	50	.01
Dist. Columbia	49	.01
Florida	34	.33
Georgia	35	.29
Idaho	28	.74
Illinois	6	4.77
Indiana	15	1.81
Iowa	29	.72
Kansas	9	2.73
Kentucky	8	2.88
Louisiana	12	2.45
Maine	43	.10
Maryland	33	.36

State	Rank	Percent of U.S. Total
Massachusetts	39	.23
Michigan	10	2.66
Minnesota	11	2.62
Mississippi	41	.13
Missouri	18	1.53
Montana	17	1.73
Nebraska	44	.10
Nevada	27	.77
New Hampshire	47	.05
New Jersey	21	1.11
New Mexico	23	1.06
New York	16	1.75
North Carolina	37	.23
North Dakota	46	.06
Ohio	7	4.21
Oklahoma	5	6.91
Oregon	40	.15
Pennsylvania	1	17.82
Rhode Island	48	.02
South Carolina	45	.07
South Dakota	36	.29
Tennessee	25	.87
Texas	2	10.74
Utah	14	1.94
Vermont	38	.23
Virginia	24	.97
Washington	30	.51
West Virginia	4	7.49
Wisconsin	32	.39
Wyoming	22	1.09

RANK OF OKLAHOMA'S LEADING MINERAL PRODUCTS, 1944

roduct	Rank as to Quantity	Rank as to Value
sphalt (native)	3	4
iquefied petroleum gases	4	4
atural gas	4	6
atural gasoline	4	4
res (crude)		
Zinc	1	1
Zinc-lead	1	1
etroleum	4	4
inc (metal)	1	1

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OKLAHOMA IN CENTER OF LARGEST GAS RESERVES

Four of the five states with largest proved eserves of natural gas are Oklahoma, Kansas, Texas, nd Louisiana. These states contained 82.94 per- ent of the proved reserves in the United States, s of January 1, 1947, according to estimates made y the American Gas Association published in World il for February, 1948. California ranks fourth in eserves and Oklahoma is fifth.

Estimated recoverable gas reserves of the United States as of January 1, 1947, on a pressure base of 14.65 lbs. per sq. in., at 60°F.

	Millions of cubic feet	Percent of U.S. Total
klahoma	10,735,845	6.69
exas	86,363,459	53.78
ouisiana	22,411,511	13.95
ansas	13,680,844	8.52
Total	133,191,659	82.94
ther states	27,384,242	17.06
Total U.S.	160,575,901	100.00