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INVENTORY OF MANUFACTURING POSSIBILITIES
FROM MINERALS IN OKLAHOMA

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The requisites for sound industrial development are: (1) an adequate supply of raw materials; (2) availability of adequate transportation facilities; (3) sufficient labor, both skilled and unskilled; (4) management with the technical skill to plan and direct the enterprises; (5) markets, which may range from local for low-cost heavy articles to nation-wide for speciality items of high intrinsic value; (6) venture capital not afraid to invest in new enterprises with apparent merit; (7) a favorable economic climate in which new enterprises can flourish; (8) intelligent promotion to bring the State's manufacturing opportunities to the attention of capital and management. I attach no particular significance to the order in which I have listed these.

My talk will mostly be concerned with Oklahoma's supply of minerals for manufacturing, but at the risk of encroaching on the field of the speakers that follow me I will touch briefly on some of these other factors.

Oklahoma has an ample supply of labor. The experience of the petroleum industry and of the new industries developed during the war shows that the native unskilled labor can be easily trained into skilled labor. There may be some lack of people with industrial managerial experience, but the universities and colleges are doing an excellent job in turning out young men with the technical background and training to fill such positions. The recent growth in population of this section of the

Southwest is creating new markets, and a better balance between industry and agriculture will furnish increased buying power. I will touch later upon the need for a favorable economic climate and methods of industrial promotion.

RAW MATERIALS

Fuels and Energy

Petroleum and Natural Gas. Petroleum, natural gas, and their byproducts are the greatest source of Oklahoma's mineral wealth and, as a source of cheap heat and energy, the mainstay of her industrial production. In 1948 Oklahoma ranked fourth in the nation in the production of crude oil, third in the production of natural gas, and fourth in the production of natural gas liquids (condensate, natural gasoline and liquefied petroleum gases).

These natural hydrocarbons are produced in 49 of Oklahoma's 77 counties. The refining of petroleum constitutes one of the leading, if not the most important manufacturing industry in the State. As a source of cheap fuel and energy, petroleum, natural gas and their products constitute the most important inducement for the location of manufacturing industries in the State. From them also can be made a wide variety of chemicals and synthetic products. This type of manufacturing industry has had a rapid growth in recent years but largely in Texas and Louisiana. Every effort should be made to push the development of these industries in Oklahoma.

Bituminous Coal. Reserves of bituminous coal in eastern Oklahoma have been estimated by the U. S. Geological Survey to be approximately 55 billion tons. Annual production for the past several years has been about 3 million tons, from both strip and underground mines. About a third of it

is used in Oklahoma and the rest is shipped out of the State.

Most of Oklahoma's coal is high-volatile bituminous, but in eastern Haskell and northern Le Flore Counties are reserves of low-volatile bituminous coal amounting to 2 or 3 billion tons. These are the only coals in the Middle West suitable for making metallurgical coke. They are, or have been shipped to the blast furnaces in Texas, Colorado, Utah, and California for blending with other coals. Considerable quantities are shipped to St. Louis as a means of abating the smoke nuisance, and this use might be pushed in other cities.

Coal as an industrial raw material, rather than a fuel, deserves more research than it has received. It has possibilities for the manufacture of water-softeners, and for fertilizers by direct conversion to humic acid. At present, however, most of the research is directed toward the manufacture of synthetic gaseous and liquid fuels. Research by the U. S. Bureau of Mines has shown that gasoline can be made by the hydrogenation of coal at costs that would add only 3 to 5 cents a gallon to the present retail prices and with chemical by-products that would be the basis of other industries. Any increase in petroleum production costs would narrow this gap, as would further improvements and economies in the synthetic methods.

(Mr. Smith devoted considerable time to a discussion of the mineral raw materials available for industrial development in Oklahoma. Space is not available for publishing this part of the discussion, during which he listed many of the minerals which Oklahoma has, and discussed the part they could play as a basis on which to build new industries. The list included industrial minerals, ceramic materials, construction materials, and metals.)

WATER

The processing by industry of many of Oklahoma's mineral resources requires supplies of water adequate in quantity and quality. Knowledge of the availability and chemical composition of such supplies is essential for the selection of new industrial sites or for planning expansions of those industries which use water in their processes. Furthermore, industrial expansion will bring increased urban population with resulting increased demands for municipal water supply. This factor is often overlooked in locating industries. Water may be obtained from both surface and underground sources.

Where large quantities of water are involved, surface-water supplies may be cheaper to develop, though upstream storage may be required to regulate the flow. The quantities of surface water available in the more humid region of eastern Oklahoma are many times greater than those in the semiarid region in the western part. In some areas the water is clear and soft, but in other areas it is often so muddy and mineralized that it will usually require some kind of treatment to render it satisfactory for use.

Ground water is used in Oklahoma for domestic, municipal, industrial, stock-raising and irrigation purposes. Most of the smaller cities and towns obtain their supply from ground-water sources. Although some ground water is available in nearly all parts of the State, the supply is limited both in quantity and quality, and this fact must be taken into consideration in all large developments of ground-water supplies.

Detailed investigations of the water resources of Oklahoma has been and are being made by the United States Geological Survey in cooperation with the Oklahoma Geological Survey, Division of Water Resources; Oklahoma Planning and Resources Board

the Oklahoma Agricultural and Mechanical College; and other state agencies. More detailed measurements of the smaller streams and a stepped-up program of underground water investigations will be necessary before a knowledge of Oklahoma's water resources is available in the detail needed for industrial and municipal development. Before undertaking any development of water resources, industries and others would do well to consult the reports and unpublished data resulting from the studies that have already been made. It would surprise you to know how often this important step is neglected with resulting waste of money.

RECOMMENDATIONS

Need for Basic Data. The primary need for developing Oklahoma's mineral resources to their fullest extent is basic data.

Accurate and detailed topographic maps are a vital necessity for mineral and water development and for locating industrial sites and planning their development. They save thousands of dollars in surveying costs in locating highways and access roads. They are essential for the planning of every type of activity involving the configuration of the land. Yet only 59.9 per cent of Oklahoma is covered by topographic maps of any kind and only 5 per cent is covered by recent maps on adequate scales. In fact, the United States is the most backward of the civilized nations in its coverage by topographic maps.

Topographic maps of this type are made primarily by the U. S. Geological Survey, and most of the funds are spent in states that cooperate by paying half of the cost. Oklahoma in 1948 (fiscal year 1949) appropriated only \$1,588 for topographic mapping, which is matched by an equal amount by the U. S. Geological Survey which does the work. No state appropriations for this purpose were made for

fiscal 1950 and 1951. Compare this with Tennessee's appropriation of \$90,000 and California's of \$300,000. Every dollar appropriated for this purpose would result in savings many times the cost to the State agencies and to the citizens.

Accurate and detailed geologic maps showing the bedrock geology and structure are necessary for locating new mineral deposits and extensions of known deposits. Oklahoma would be practically out of oil and natural gas today if the oil companies had not realized this and supported their own geological mapping departments, yet most mineral producers have not recognized their own needs along this line. Most of them cannot afford to support a geological department, but some of them use consulting geologists and all could cooperate in supporting the State Geological Survey.

Only 10 per cent of Oklahoma is covered by published detailed geologic maps on the scale of 1 inch to the mile or larger.

More than mere knowledge of the occurrence of a mineral of possible commercial value is necessary before it can be used as an industrial raw material. The size of the deposit in three dimensions must be at least roughly ascertained, as well as the character and grade of the mineral and the gangue minerals associated with it. This usually requires physical and chemical tests and laboratory tests on methods of beneficiating and utilizing the mineral. Often alluvium or weathering debris conceal most of the deposit, requiring preliminary prospecting of some kind.

The State Geological Survey should have the cooperation of every individual and agency in the State. Local newspapers, municipal and county governments can aid in the field work, send in samples to be identified for their citizens, and report any new mineral developments or discoveries. In many

states, municipal and county governments have cooperated financially in mineral investigations of their area.

Other state agencies can be of material assistance. The Geological Survey can furnish summer work to graduate students and instructors of Geology Departments of colleges and universities. The Economics Departments of the colleges and universities can make the necessary market studies needed to determine the feasibility of new mineral developments. The Engineering Departments can cooperate in testing the samples. The employees of the State Highway, Forestry, Fish and Game, and Extension Service agencies should become mineral conscious, report any unusual minerals they find, and act as contacts between the people and the Survey.

Close cooperation should be maintained between the State Geological Survey and the federal Geological Survey and Bureau of mines. They should cooperate financially in the broader geological and mineral studies that are the proper function of the federal agencies.

Dissemination of Information. Information about Oklahoma's opportunities for new mineral industries should be spread by every possible means.

The State Geological Survey should report the results of its investigations by printed reports and maps. These may be either commodity reports, giving all the facts about one particular mineral, or county reports giving the geology and mineral resources of the county.

The State Geologist and his assistants should take every opportunity to advertise the State's mineral industry opportunities nationally by talks and exhibits at technical and trade association conventions. The State already has good industrial moving pictures, and more could be made and nation-

ally distributed to tell the story. One specifically on mineral opportunities would be helpful. The Oklahoma Planning and Resources Board is telling of the opportunities by advertising in national magazines of wide circulation. The industrial train of 1947 to the northeastern United States was a unique and very effective means of telling your story in the large industrial centers and could very well be repeated.

Above all, the people of Oklahoma should know about the mineral resources and industrial opportunities in their state and their own locality. The State Geologist should offer his services and those of his assistants for talks and moving pictures to schools, amateur mineral clubs, service clubs, and Chambers of Commerce. He should be sure that every Chamber of Commerce executive knows about the mineral resources in his territory and has the necessary reports on file in his office. He should encourage every Chamber of Commerce to have an active petroleum, mining, or natural resource committee.

Favorable Climate for Industry. Industrial development will not be possible without a favorable climate for private enterprise to flourish. This consists, among other things, of a fair but not prohibitive tax structure, and the attainment of reasonable, non-discriminatory transportation rates. If taxes, particularly corporate and personal income taxes, are too high they will dry up the sources of venture capital necessary for new industries. I urge you to read an excellent article on this subject in the Saturday Evening Post for October 1.

Too much, of late years, our desire for security and "free" money has led us to run to the federal government with all our problems, instead of trying to solve them by our own ingenuity. Working for the federal government gives a man no more

brains than working for private industry, but he has less responsibility for his mistakes. The price we pay for federal handouts and "pork-barrel" projects is high taxes, high administration costs, bureaucracy, and federal control. It is the road to Socialism, as has been pointed out recently by Jimmie Byrnes and Herbert Hoover.

Beware particularly of the promises of "cheap" electric power made by advocates of river authorities and the power-mad Interior Department. Federal power is "cheap" power only because it is subsidized by every taxpayer in the country. Keep your resources and power in your own hands--because where federal money goes, control follows. The state-regulated private electric utilities of Oklahoma recently lost a major battle that may eventually mean their death, when Congress, after a bitter fight in the Senate, gave the Interior Department appropriations for transmission lines for the Southwestern Power Authority that will duplicate private transmission lines. And they did this in spite of the offer of the private utilities to transmit government power over their lines free of cost in return for the privilege of buying surplus power in times of high water and selling steam power in times of low water.

Remember that America is great and has won two world wars only because of its mass-production industry developed by competitive private enterprise.

CONCLUSION

Oklahoma has the opportunity to develop a strong industry based on its mineral wealth if her citizens are willing to finance the necessary investigations and promotional efforts and invest their own money in the enterprises. Don't look entirely to the North or the East to develop the industry for you.

CHAS. N. GOULD WAS FIRST OKLAHOMA GEOLOGY
TEACHER AND SURVEY DIRECTOR

The Constitution of the State of Oklahoma provides for establishment by the legislature of a State Geological and Economic Survey. In accordance with this provision the first legislature enacted a bill creating the Oklahoma Geological Survey.

In August 1949, Dr. Chas. N. Gould, who was credited with seeing that Oklahoma was the first state to have a provision in the state constitution for a Geological Survey, and who became its first director, passed away.

Prior to the organization of the Oklahoma Geological Survey, he had also been the first instructor and head of the School of Geology at the University of Oklahoma. As first director of the Survey, Dr. Gould established a pattern, or general policy for the new institution that involved finding out as much as possible about the geology and mineral resources of Oklahoma; supplying information freely; cooperating to the fullest extent with others interested in furthering the development and utilization of Oklahoma's mineral resources; and publishing widely the opportunities Oklahoma offers.

No small contribution was his ability to bring geology to the layman. Many articles written by Dr. Gould were for publication in newspapers and magazines that reached the average person. This aptitude for putting bits of geological information into simple language no doubt contributed a great deal to an appreciation of the importance of geological information by the people of Oklahoma.

Chronologically, Dr. Gould was the first and fourth director of the Oklahoma Geological Survey. He resigned as director in 1911 to enter private business. In 1924 he was appointed director for the second time, and served until June 30, 1931.