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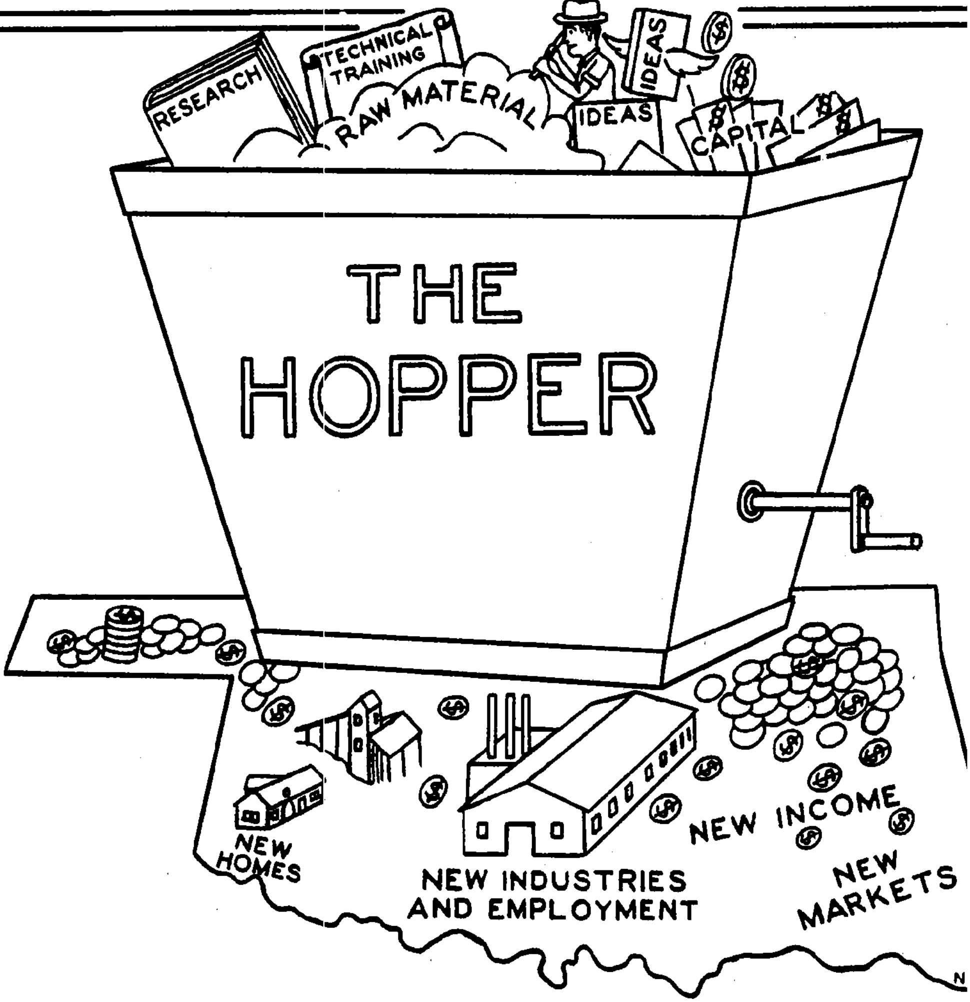

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AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS COMING TO OKLAHOMA FOR REGIONAL MEETING

First regional meeting of the Industrial Minerals Division of the American Institute of Mining and Metallurgical Engineers ever to be held in the Southwest is scheduled for Oklahoma, October 17-20, 1950, with the Oklahoma Geological Survey and the University of Oklahoma as hosts. Because of the growing importance of the industrial mineral resources of the Southwest in the national economy, the meetings are expected to draw attendance from the eastern industrial areas as well as from the states of the Southwest.

The meeting will consist of regular sessions for the presentation of papers and general discussions October 17 and 18, followed by field trips to the Arbuckle Mountain region October 19 and 20. The program for the first two days will include several papers dealing chiefly with industrial mineral resources and development trends in the Southwest. The field trips will give opportunity for visitors to see the interesting geology of the Arbuckle Mountains and to inspect several operating plants that are making important contributions to Oklahoma's industrial mineral production.

The Industrial Minerals Division of the A.I.M.M.E. is recognized as a leading organization of technical and professional people engaged in the production and processing of the large group of rock and mineral materials generally referred to as industrial minerals.

All meetings in Oklahoma will be open to nonmembers, and anyone interested in the program or the furtherance of knowledge and utilization of the industrial minerals of Oklahoma and the Southwest is invited to attend part or all of the sessions, including the field trips.

Meetings will be held October 17 and 18 at the Extension Study Center, North Campus, University of Oklahoma, Norman. Accommodations in Norman will be available at the Extension Study Center, Norman Courts Hotel, and O. U. Motel. Meals will be served at the Study Center. Reservations for Norman should be made with John B. Freeman, Extension Study Center, University of Oklahoma, Norman.

The program will consist of 16 technical papers and discussions dealing with various industrial minerals in Oklahoma, Arkansas, Texas, New Mexico, Kansas and Missouri; and will include a symposium on the occurrence of titanium-bearing iron ores in the Wichita Mountains, Oklahoma, and the Adirondack Mountains, New York. There will be a banquet Tuesday night, October 17, with Hugh D. Miser, U. S. Geological Survey, as speaker, on the subject, "Making a Geologic Map of Oklahoma."

The detailed program is as follows:

TUESDAY, OCTOBER 17

9:00 - 10:30 a.m. -- Registration.

10:30 a.m. - 12:30 p.m. -- Technical Session.

Richard M. Foose, Chairman, Industrial Minerals Division and Robert H. Dott, Director, Oklahoma Geological Survey -- Co-chairmen.

1. Trends in the Industrial Mineral Industries of the Southwest, by Harold B. Foxhall, Director, Arkansas Geological Survey.

2. Geology and Industrial Minerals of Oklahoma, by Robert H. Dott, Oklahoma Geological Survey.

3. Industrial Minerals of the Arbuckle Mountains, Oklahoma, by Wm. E. Ham, Okla. Geol. Survey.

4. Chemical Grade Limestone and Dolomite in Oklahoma, by Homer Dunlap, St. Clair Lime Co.

12:45 p.m. -- Luncheon.

2:00 - 5:00 p.m. -- Technical Session.
C. H. Moore, Jr. and R. C. Stephenson, Co-chairmen.

1. Titaniferous Magnetite in Basic Rocks of Wichita Mountains, Oklahoma, by Gerald W. Chase Oklahoma Geological Survey.

2. Geology and Utilization of the Titaniferous Magnetites at MacIntyre Development, Tahawus, New York, by George W. Wunder and Paul W. Allen, National Lead Co.

Papers followed by a discussion of titaniferous magnetite occurrences in the light of current concepts by J. L. Gillson, B. T. Denis, H. Ramberg, C. B. Carpenter, A. M. Bateman, and others.

5:00 p.m. -- Executive Committee Meeting.

7:00 p.m. -- Dinner.

Richard M. Foose, Chairman, Industrial Minerals Division, presiding.

C. V. Millikan, Amerada Petroleum Corporation, Toastmaster.

Speaker: Hugh D. Miser, U. S. Geol. Survey.
"Making a Geologic Map of Oklahoma."

WEDNESDAY, OCTOBER 18

9:00 a.m. - 12:00 n. -- Technical Session.

E. H. Crabtree, Jr. and J. D. Sullivan, Co-chairmen.

1. Mineral Industry in Texas, by John T. Lonsdale, Texas Bureau of Economic Geology.

2. Gulf Coast Sulphur--an Industrial Mineral, by Albert G. Wolf, Texas Gulf Sulphur Company.

3. Production of Anhydrous Sodium Sulphate from Natural Brines, by William I, Weisman and R. C. Anderson, Ozark Mahoning Co.

4. Clay Resources of the Wilcox Group in Arkansas, by Norman F. Williams, Arkansas Geol. Survey.

12:00 n. -- Luncheon

1:00 - 4:00 p.m. -- Technical Session

V. H. Schnee and H. M. Bannerman, Co-chairmen.

1. Drama of Making Portland Cement(movie). Introduction and discussion by Cecil Perkins, Portland Cement Association.

2. Review of the Kansas Salt Industry, by Earl K. Nixon, Kansas Geological Survey.

3. Specifications for Specific Uses of Limestone and Dolomites, by Edward L. Clark and Mabel E. Phillips, Missouri Geological Survey.

4. Barite Production in Missouri, by Garret A. Muilenburg, Missouri Geological Survey.

5. Chats in the Tri-State District, by Ernest Blessing, U. S. Geological Survey.

FIELD TRIP - OCTOBER 19-20

Headquarters: Aldridge Hotel, Ada, Oklahoma.

Wednesday, 5:00 p.m. -- Arbuckle Mountains Field Trip. Departure for Ada, Oklahoma, starting point for field trip on October 19-20.

Field trip transportation information will be available at the registration desk. If there is sufficient interest, an alternate trip to the Wichita Mountains will be arranged to the area of pre-Cambrian basic rocks and associated titaniferous magnetite.

The two-day field trip is in the charge of Wm. E. Ham, of the Oklahoma Geological Survey. The group will leave Norman at the close of the Wednesday afternoon meeting, and proceed to Ada. Dinner will be served as soon as the group arrives. It is requested that anyone wishing to take in these trips advise the Oklahoma Geological Survey, Norman, at once. Room reservations should be made directly with the Aldridge Hotel, Ada.

October 19 will be devoted to inspection of industrial minerals deposits and operating plants. The second day will be spent on geological features of the sedimentary rocks of the central and western Arbuckle Mountains.

Officers of the Industrial Minerals Division of the A.I.M.M.E. are: Richard M. Foose, Franklin and Marshall College, Lancaster, Penn., Chairman; John H. Melvin, Ohio Geological Survey, Columbus, Ohio, Eastern Vice-Chairman; Arthur Blair, Tennessee Coal, Iron, and R.R. Co., Birmingham, Ala., Southeastern Vice-Chairman; Jack C. Pierce, New Mexico Miners and Prospectors Association, Albuquerque, N. M., Rocky Mountains Vice-Chairman; George D. Dub, Los Angeles, Calif., Western Vice-Chairman; Elwood S. Moore, University of Toronto, Canadian Vice-Chairman; and D. G. Runner, U. S. Bureau of Mines, Washington, D. C., Secretary-Treasurer. Robert C. Stephenson, Pennsylvania Topographic and Geologic Survey, is chairman of the Papers and Programs Committee; and Robert H. Dott, Oklahoma Geological Survey, is chairman of the local committee on arrangements for the regional meeting this fall.

INCREASED USE OF GROUND-WATER FOR IRRIGATION IN THE DUKE AREA, OKLAHOMA

by

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U. S. Geological Survey
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Measurements of water levels made in pril, 1950, in irrigation wells of the Duke area, Jackson and Greer Counties, Oklahoma, showed that water levels had declined, on the average, nearly 1 foot since October, 1949, probably in large part because of scant rain during the winter and early spring. Compared with April, 1949, however, they averaged nearly 0.75 foot higher.

The measurements were made by the U. S. Geological Survey as part of the program of ground-water investigations conducted in Oklahoma in cooperation with the Oklahoma Geological Survey and the Oklahoma Planning and Resources Board.

The irrigation wells tap porous and cavernous gypsum and dolomite beds interbedded with the shale bedrock of the region, and have some of the largest yields recorded in the state. Discharges up to 2,200 gallons per minute have been measured by the Geological Survey. It is estimated that about 940 acre-feet of water was pumped in 1949 to irrigate more than 1,000 acres, principally of wheat and cotton. This represents an increase of 550 acre-feet compared with the estimate for 1948.

The analysis of water from an irrigation well at Duke, reported in 1948 by Schoff,1/ showed high values for hardness, dissolved solids, calcium, and sulfate. To provide more facts on the quality of the ground water, samples of water collected from

1/ Schoff, S. L., "Ground-water irrigation in the Duke area, Jackson and Greer Counties, Okla. Okla. Geol. Survey Mineral Rept. 18, p. 7, 1948.

five wells in April, 1950, were analyzed in the laboratory of the Quality of Water Branch of the U. S. Geological Survey at Stillwater, Oklahoma (see TABLE I.) These indicate somewhat greater mineralization than the previous sample. The temperature of the water from four of the five wells was measured and in each case was 65° F.

TABLE L. Chemical analyses of water from irrigation wells in the Duke area, Jackson and Greer Counties, Okla., April, 1950. (Parts per million)

	Jackson County			Greer County	
Well	2	7	12	6	7
Calcium (Ca)	624	634	600	606	614
Magnesium (Mg)	159	137	113	128	121
Sodium and potassium (Na+K)	181	222	94	52	69
Carbonate (CO_3)	.0	0	0	0	0
Bicarbonate (HCO_3)	201	257	263	260	174
Sulfate (SO_4)	1,840	1,840	1,720	1,760	1,720
Chloride (Cl)	370	350	109	66	171
Nitrate (NO_3)	3	10	7.7	17	6.8
Dissolved solids	3,650	3,690	3,110	3,060	3,150
Total hardness as $CaCO_3$	2,210	2,150	1,960	2,040	2,030
Noncarbonate hardness as $CaCO_3$	2,050	1,940	1,750	1,830	1,890
Specific Conductance (micromhos at 25° C.)	3,830	3,940	3,090	2,970	3,120
Percent sodium	15	18	9	5	7

Jackson 2, SE¼ sec. 5, T. 2 N., R. 22 W. Owner, F. A. Johnston; Depth 135 ft.; discharge 375 g.p.m.
Jackson 7, SE¼ sec. 33, T. 3 N., R. 23 W. Owner, M. Carroll; Depth 75 ft.; discharge 600 g.p.m.
Jackson 12, SE¼ sec. 27, T. 3 N., R. 23 W. Owner, T. L. Spraggins; Depth 118 ft.; disch. 730 g.p.m.
Greer 6, SE¼ sec. 33 T. 4 N., R. 23 W. Owner, E. Thomas; Depth 155 ft.; discharge 500 g.p.m.
Greer 7, NE¼ sec. 22, T. 5 N., R. 23 W. Owner, S. Burcham; Depth 135 ft.; discharge 650 g.p.m.

Whether water is acceptable for irrigation use lepends on the soils and crops as much as on the iineral content of the water. Standards for evaluating irrigation waters have been proposed by several authors, among them Magistad and Christiansen2/, who suggest a threefold classification of irrigation waters and limits for the classes as shown in TABLE II.

'ABLE II. Standards for irrigation water

Class	Conductance micromhos at 25° C.	Salt content Total (ppm)	Tons per acre-foot	Sodium (per-cent)	Boron (ppm)
1	1,000	700	1	60	0.5
2	1,000-3,000	700-2,000	1-3	60-75	0.5-2.0
3	3,000	2,000	3	75	2.0

Class 1. Excellent to good, suitable for most plants under most conditions.

Class 2. Good to injurious, probably harmful to the more sensitive crops.

Class 3. Injurious to unsatisfactory, probably harmful to most crops and unsatisfactory for all but the most tolerant. If a water falls in Class 3 on any basis, i.e., conductance, salt content, percentage of sodium, or boron content, it should be classed as unsuitable under most conditions.

Should the salts present be largely sulfates, the values for salt content in each class can be raised 50 percent.

By these standards, the ground waters of the uke area belong near the upper limit of class 2, ven taking into consideration the fact that the alts present are largely sulfates. Magistad and hristiansen point out, however, that "a marked exeption occurs in the Pecos Valley where a good

Magistad, O. C., and Christiansen, J. E., "Saline soils - their nature and management": U. S. Dept. Agri. Circ. 707, pp. 8-9, 1944 growth of alfalfa and cotton was found on lands irrigated with water.... having a conductance of 9,150. The Pecos Valley may be considered a problem because of the heavy soil content of gypsum and lime." A similar exception may occur in the Duke area. The analysis quoted for the Pecos Valley shows about twice the concentration of dissolved salts that is in the water of the Duke area.

Smith 4/ proposes standards for irrigation waters in Oklahoma on a different basis (Table III).

TABLE III. Suggested limits of tolerance for irrigation waters

As a general rule, and under usual conditions a water is suitable for irrigation in Oklahoma when it contains less salts than are shown in each of the four following conditions:

The sum of the calcium, magnesium, and sodium chlorides	330 p.p.m.
The sum of sodium carbonate (sodium bicarbonate) and sodium chloride	500 p.p.m.
The sum of the calcium, magnesium, and sodium sulfates	2,000 p.p.m.
or	
Total dissolved salts	2,000 p.p.m.

Smith qualifies the table by stating, "The kinds of salts in solution are very important in determining the effect of water to be used for irrigation on plant growth. The most toxic are the sodium salts; in order of descending toxicity they are sodium carbonate, sodium chloride, and sodium sulfate...

4/Smith, O. M., "The Chemical analysis of the waters of Oklahoma": Okla. Agri. and Mech. College Eng. Exper. Sta. Pub. 52, pp. 16-18, 1942.

"The least objectionable are the calcium salts. Calcium bicarbonate in any quantity is not considered objectionable, unless there develops sufficient basicity (pH) to reduce the available phosporus, iron, and other essential elements below normal plant requirements. Calcium sulfate ("gyp" or gypsum) is often added to black alkali soils or to irrigation water to neutralize the undesirable effect of the sodium which is absorbed on the clay minerals present in the soil and thus make the soil more useful."

Smith emphasizes (p. 16) that the quality of the water is only one of the many variable factors that influence the success or failure of an irrigation project. He says, "It is extremely difficult, because of the large number of conditions that affect the results, to place maximum limits on the concentration of salts in water that can be used with safety for irrigation. Water that is satisfactory in one locality may not be suitable in another on account of rainfall, soil types, and the crop grown. A sandy soil with a permeable subsoil through which the water may percolate freely can be successfully irrigated with a very much more highly mineralized water than one with a compact subsoil, through which water moves very slowly. As the water evaporates from the surface of the ground, salts which were in solution accumulate and, unless removed, may exceed the toxic limits for plant growth. The amounts of water used, the frequency of application, the intermittency of treatment with large quantities of water to wash the evaporated salts from the soil, and the rate of evaporation are all factors that may mean the success or failure of an irrigation project.

"The crops grown and the stage of growth are often of major concern. Different crops have various degrees of tolerance and, in general, young seedlings cannot tolerate as high a concentration of soluble salts as well as the older plants."