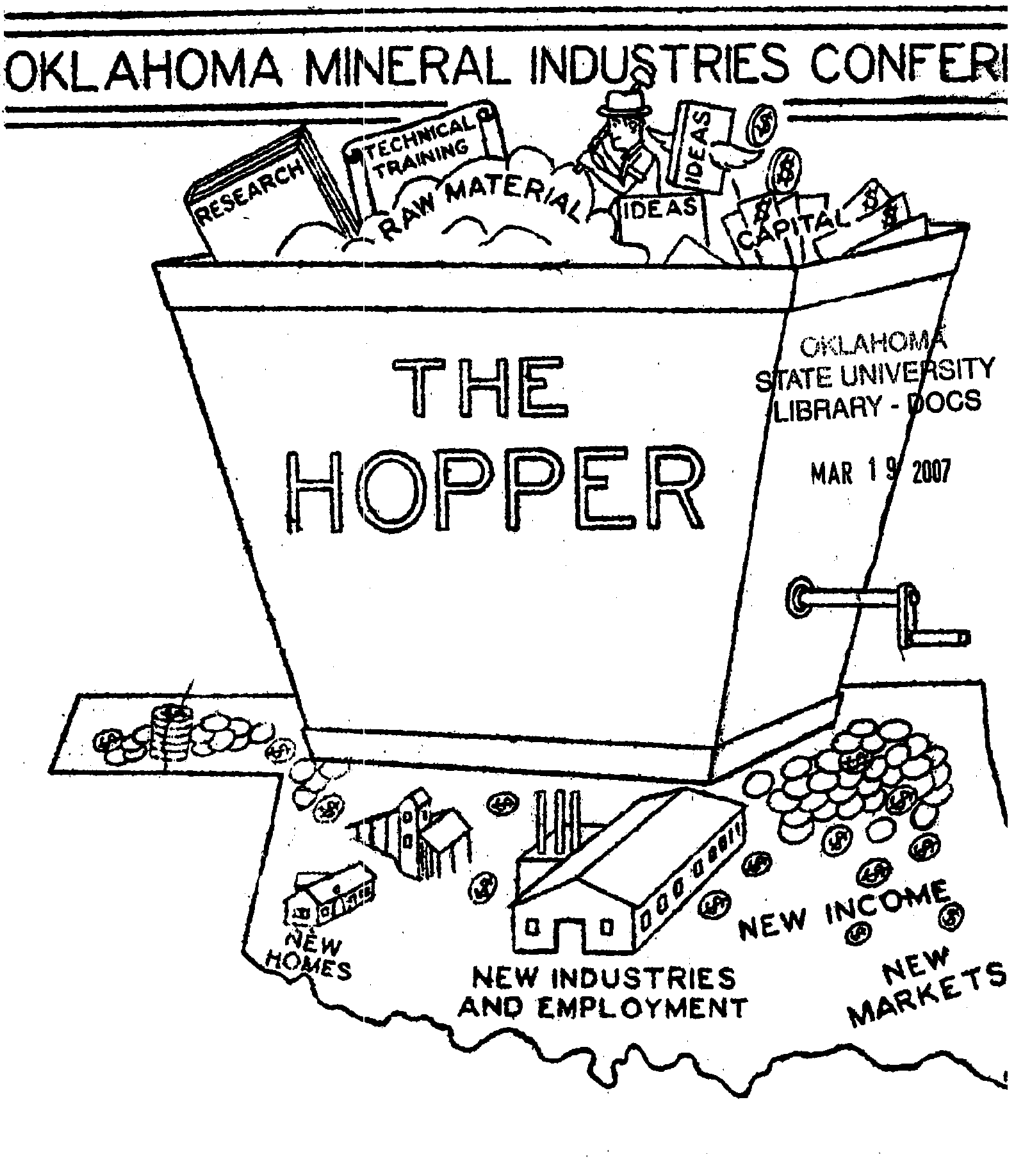

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"MADE IN OKLAHOMA" MANUFACTURERS' EXPOSITION

By
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Okla. City Chamber of Commerce

Oklahoma manufactured products, both large and small, will be on display when the first "Made in Oklahoma" manufacturer's exposition opens its doors at the Municipal Auditorium in Oklahoma City next October 12. The exposition will last one week. The sponsors of this industrial show are very hopeful that the people of Oklahoma will become better acquainted with Oklahoma manufacturers who create products for markets all over the country and for shipment abroad.

The exposition is state-wide in scope and the management of the show reports to us that they are getting representation from almost every section of the state. At least 15 of Oklahoma's larger communities are already represented in the show by their manufacturers. To date there are approximately 70 firms that have contracted for exhibit space. An interesting pattern is being formed by the manufacturers that are participating in the exposition. The show will actually be a series of small industrial exhibits under the roof of one exhibition. For instance, the petroleum industry, the food processors, the metal trades, the pottery industries, the glass industry, the leather industry, and others have already come into the show. The management of the exposition reports that the firms in each industrial group are taking exhibit space close to each other so that the public will be able to see how each industrial group is represented and what kind of job it is doing.

The exposition will not only be a series of production displays, but a number of the exhibitors will demonstrate actual manufacturing or processing right on the floor. The Frankoma Pottery Company of Sapulpa, Oklahoma, will demonstrate the process of manufacturing pottery. The Fred Jones Manufacturing Company of Oklahoma will have a small assembly line and will demonstrate how they assemble Ford, Lincoln, and Mercury motors. The Brockway Glass Co. of Muskogee will have a small glass machine in operation. The Oklahoma Cotton Seed Crushers Association will demonstrate what happens to the raw cotton from the time it is picked from the fields until the time it ends up in finished products.

This is the first time that the manufacturers of the great State of Oklahoma have had an opportunity to show the general public the important part they play in the economy of our state. Heretofore, very little attention has been paid to this phase of the state's economy which provides employment for a large segment of our population, utilizes some of the mineral and agricultural resources of the state, and provides a large amount of our local and state tax revenues. Here is an opportunity for the manufacturers of Oklahoma to perform a very important public relations job for themselves, and provide the people of Oklahoma with an education on what is manufactured in the state.

The management of the exposition has informed us that advance commitments indicate that there will be some 200 Oklahoma manufacturers represented in the show.

In addition to the manufacturers' exhibits and demonstrations, there will be a few general exhibits depicting the resources and advantages of Oklahoma. These will include mineral resources, agricultural resources, and fuel and power. It is believed that attendance at the exposition will be high. Admission to the exhibits will be free, and the variety and quality of the exhibits should attract thousands of visitors each day.

GROUNDWATER SUPPLIES IN OKLAHOMA AND THEIR DEVELOPMENT

by Robert H. Dott, Director

Oklahoma Geological Survey, Norman

Part I

All water used directly by man for physiological needs, sanitation, agriculture, or industry, falls to the earth as rain or snow, regardless of whether its immediate source is a river, lake, well, or spring. This is known as meteoric water. Rain water is nearly pure, and contains only the substances picked from the air. In many sections of Oklahoma, rain water is collected in cisterns to serve domestic needs.

After meteoric water reaches the surface of the earth, a portion of it runs off into drainage channels, and may be impounded in reservoirs. Part evaporates and part sinks into the soil to become soil moisture and is used by plants. When the soil is thoroughly saturated, and plant requirements have been met, further additions of water to the soil will penetrate to the zone of saturation, and become ground water. Ground water may return to the surface as springs, or drain into the streams, and it may be recovered from wells.

Depending on geological conditions, ground water is defined as "free" or "confined". The same ideas are sometimes expressed by saying that water occurs under "water table conditions" or "artesian conditions".

Free water is not under pressure, and will not rise in the well above the level at which it is first encountered. The top of the zone of saturation is called the water table, and conforms roughly to the topography of the land surface, so that depths to water in a given area are approximately the same. The water table, however, is somewhat deeper below the hills than below the valleys. The level at which the water table stands, and therefore the level of the water in wells, depends largely on the rainfall, and also the topography.

The quantity of free water in the zone of saturation depends on the thickness and porosity of the water-bearing formation below the water table. The character of the materials determines the rate at which water can be discharged from a well; and the amount of water that is annually recharged or replenished to the formation is a measure of safe yield.

Springs are commonly related to free water and issue where the contact between the permeable aquifer (water-bearing formation) and the underlying layer of impermeable material has been exposed by erosion. Because the water in the aquifer cannot move down into the impermeable layer, it tends to move laterally to the outcrop and therefore to drain the aquifer.

In Oklahoma, the formations that contain free water are the valley alluvium, the terrace deposits adjacent to major streams, the sand dune areas, the sand and gravel deposits underlying the High Plains in Cimarron, Texas, Beaver, and parts of Ellis and Harper Counties, and also the outcrop areas of sandstones and limestones that constitute bed rock in many parts of the state.

Confined water occurs in stratified, generally consolidated, permeable rock strata that are overlain and underlain by impermeable strata, and dip or slope away from their outcrops. Meteoric water enters the aquifer at the outcrop, and sinks down in the same manner as in the case of free water. It then flows by gravity down the dip away from the outcrop, somewhat like water passing through a conduit or pipe, except that it is actually going through many small conduits of irregular size and shape, made by the openings between the mineral fragments of the rock.

As more water is added at the outcrop, its weight creates pressure on the water at depth in the formation, and accelerates movement. When the aquifer is penetrated by a well, the water will rise to a height a little lower than the outcrop or intake area. The water is said to be under artesian pressure, or to occur under artesian conditions. If the mouth of the well is lower than the intake area, the water will flow at the surface. Such a well is commonly called "artesian", although technically the term "artesian" applies to all wells in which the water rises substantially above the zone of saturation, that is, above the level where water is first encountered. A flowing well, therefore, is only a special kind of artesian well.

The greater part of the area of Oklahoma is underlain by consolidated rock formations that contain confined water, under artesian conditions, which they yield to wells in greater or lesser amounts, depending on the character of the materials. Except in a few areas, as at Sulphur and Lawton, artesian water in Oklahoma will not flow at the surface in wells.

Properties of Water-Bearing Rocks. The water-bearing properties of the most important aquifers in Oklahoma are summarized in following pages. Their importance is due principally to the relative abundance of the water they contain, partly to their location, and to the chemical character of the water they yield.

Good aquifers are rock formations that have high porosity, high permeability, considerable thickness, and large intake areas. The porosity of a rock is the pore space, or openings between the mineral grains, and its permeability is its capacity for transmitting water under pressure. Porosity and permeability are not synonymous. Some clays have high porosity but will transmit very little water, whereas gravels and sands, because of larger openings between the grains, will transmit water freely. If a rock is porous, its permeability depends on the coarseness and uniformity of the size of the grains in it, and the extent to which the pore spaces have been filled with cementing material.

Gravel and coarse, well-sorted sand make the best aquifers, but coarse-grained sandstone and thick limestone containing cracks, crevices, joints, and solution openings are almost as good. Shale is ordinarily too impervious to yield much water to wells, but if it is much jointed and cracked it will yield moderate supplies of water.

The intake area of an aquifer is approximately equal to the outcrop area of the formation. It is the area where the formation is exposed at the surface so that meteoric water can seep downward into it.

The value of a formation as an aquifer is greater if it is thick, because a thick formation, obviously, has a greater reservoir capacity than a thin one.

Mineral content. Most of the rocks of the earth's surface contain soluble mineral salts in greater or lesser amounts, and these are dissolved by the waters that pass over or through the rocks. Thus both surface and ground waters become mineralized, and may contain some of the common salts; Among these are calcium and magnesium bicarbonate, calcium and magnesium sulfate, bicarbonate of soda, sodium sulfate (glaubers salt), and sodium chloride (common salt).

Calcium carbonate is the principal constituent of limestone, and also occurs in many sandstones and shales, causing waters to be hard. Therefore, the analyses of waters from limestone areas, such as the Arbuckle and Ozark Mountains, show relatively high concentrations of this compound, in the form of calcium bicarbonate. Such waters are hard and produce a white scale in tea kettles, water heaters, and boilers. In general, the waters from sandstones in Oklahoma are soft, containing relatively little calcium bicarbonate but higher concentrations of sodium bicarbonate and sulfate. Excepting limestone, the rocks of western Oklahoma are more highly impregnated with soluble salts including gypsum and common salt, at shallow depths than are those in eastern Oklahoma. Consequently, the waters from these regions are more highly mineralized.

The degree of mineralization of the water is proportional to the quantity of soluble salts in the rocks and the length of time that the water is in contact with them. It may also depend on the circulation through them, because in time the soluble salts may be largely removed where the circulation is good. In the same area, ground water will contain more mineral matter than surface water because of its greater opportunity for dissolving the salts. During heavy rains, when large volumes of water rapidly run off the surface into the streams, the surface water contains relatively less dissolved mineral matter than during low stages when the stream flow is maintained chiefly by ground-water inflow. During protracted droughts, when evaporation may be high, the mineral matter in surface water may become highly concentrated.

The character of the surface waters reflects the mineralogical nature of the rocks over which they flow. The surface waters containing the smallest amounts of dissolved solids are those of the sandstone and shale area of east-central and south-eastern Oklahoma. Surface waters containing the largest amounts of dissolved solids are found in streams draining areas underlain by limestone and gypsum and areas where salt is present. Calcium bicarbonate from limestone, and calcium sulfate from gypsum give hardness to water.

Part of the ground water found in the alluvium, or valley fill, especially in a band close to the stream, is supplied by underflow from the stream and is similar in chemical character to the water of the stream, although it may differ somewhat in the degree of concentration. As with surface water, the concentration of minerals in the ground water in alluvium is rather closely related to the amount of rainfall, tending to increase in time of drought.

In general the water from a deep aquifer is more highly mineralized than that from a shallow aquifer, and the water in the same aquifer is more highly mineralized where the aquifer is deep beneath the surface than at shallow depths near the outcrop. Thus some sandstones that contain potable water at depths down to 1,000 feet yield only highly mineralized, saline waters from greater depths.

There are some important exceptions to the above general rule, wherein deeper waters are of better quality than those in shallow aquifers. For example, in the early days at Norman, water supplies of very poor quality were obtained from wells about 300 feet deep. It was later discovered that sandstone beds between 400 and 650 feet deep contain water of very satisfactory quality, and present practice calls for setting casing below 300 feet and producing water from the deeper sands. Areas where such conditions exist are very uncommon in Oklahoma, but any municipality now dependent on ground water of poor quality should make inquiry as to possibilities of improvement through development of deeper aquifers.

OKLAHOMA OFFERS A VARIETY OF MINERALS

"Oklahoma has more kinds of minerals and more minerals of a kind than any other state—", or words to that effect, was once featured on the letter head of the Chamber of Commerce of an important city in Oklahoma.

That may have been taking in too much territory, but the fact remains that Oklahoma does have a large variety of mineral resources. This is particularly true of the industrial rocks and minerals --mostly the type of raw material that has comparatively low value in the crude state but from which articles of commerce in large demand can be made.

New discoveries of raw materials, and new uses for materials that have been known, are constantly adding to the potential mineral wealth of Oklahoma. Translation of these materials into wealth depends upon basic research, capital investments in factories, and the application of labor, fuel, and power to make useful products that can be sold.

Year by year the Oklahoma Geological Survey has been finding out new things about the geology and mineral resources of Oklahoma. Doubtless more remains to be learned than has been found out up to the present time. The process of uncovering full information on the mineral resources of a region like Oklahoma is a slow and tedious one. The geology of Oklahoma, and the mineral resources, are as widespread as the agriculture. The rate at which knowledge of these resources can be accumulated obviously depends on the number and ability of the workers employed for that purpose. At best, there is a long time lapse between the discovery of a previously unknown resource or an idea for some new process, and completion of the field and laboratory work necessary to prove the extent of the raw material and its value for industrial uses.

During recent years, new information has been obtained on the following resources:

Glass sand in the Arbuckle Mountains
Dolomites, chiefly in the Arbuckle Mountains
High grade limestone, Sequoyah County and Arbuckle Mountains
Wool rock resources west of Troy, Johnston County, supplementing general results already published
New use for volcanic ash
Coal, mapping and coking tests
Oil field brines
Ilmenite sands (Possible source of titanium.)

The following minerals have been reported for the first time in the state:

Prehnite
Vermiculite
Amethystic quartz

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HAM BACK WITH SURVEY;
STAFF IS INCREASED

William E. Ham, associate geologist, has returned to the staff of the Oklahoma Geological Survey after a leave of absence during the past year while he was doing graduate work at Yale University. Mr. Ham will resume work on the complex geology of the Arbuckle Mountains, with special reference to the industrial minerals of the area.

Phyllis J. Dale and John Warren who have been employed as part time student assistants were appointed as full time staff members with the rank of assistant geologist effective July 1. Miss Dale will work as office and research geologist and Mr. Warren will be employed on general field problems.