

\* \* \* \*

## CALICHE—A NEGLECTED OKLAHOMA RESOURCE\*

Chas. N. Gould, Norman, Oklahoma

The term caliche is of Spanish origin, from Latin Calx. lime, and in North America is commonly applied to a porous earthy calcium carbon-

---

\* The greater part of the materials used in this paper has been excerpted from a report prepared by Dr. Roy A. Wilson, as part of an FERA project, "Construction Materials of Oklahoma."

ate containing impurities of soil, sand and gravel, which occurs widely at the surface or at shallow depth in the soil, or penetrating porous rock outcrops in the zone of weathering. To say it differently caliche is a soft secondary limestone. It is formed by leaching of water carrying lime. Caliche occurs chiefly in warm regions. Temperature and humidity are the chief controlling factors.

Caliche deposits in Oklahoma occur in late Tertiary and Pleistocene beds of the Panhandle region and extend into adjacent states. These beds are found in Cimarron, Texas and Beaver Counties, and parts of Harper, Ellis and Woodward Counties. Small outliers of Tertiary strata to the east and south of these areas contain local deposits.

The caliche lies at the surface or just below the surface of the High Plains over this area, the beds differing in quality and thickness. Exposures from light-colored out-crops along the upper part of excarpments, buttes, and mesa or in the swales, hollows and shallow valleys of the surface plains. Elsewhere the caliche lies a few feet below the surface under the thin widespread sheet of alluvium formed by a recent change to a more humid climate.

The term caliche was first used in Oklahoma about fifteen years ago, when the early reports on the geology of Oklahoma and the Panhandle of Texas were published from 1905 to 1908. The term indurated clay, cap rock, or "gyp" rock was used to describe the material. The term caliche was brought to Oklahoma and the Texas Panhandle about 1920, by geologists who had worked in Mexico and the Rio Grande region of Texas.

The use of caliche for road-surfacing began some fourteen years ago in Texas, and later in New Mexico. During the last few years this material has begun to be used in Oklahoma.

On the basis of texture, toughness, and hardness of the material, Mr. H. S. Gillette, of the U. S. Bureau of Roads, our best authority on the utilization of caliche, classifies caliche pits into three general types, "hard," "semi-hard," and "flour-like Caliche." The first type is hard, tough and crushes readily. This type contains minimum of clay and fine material and has a coarse texture, due to the sand and large fragments.

"Flour-like" caliche is named from its flour-like texture in the pit as a whole. This type is less thoroughly cemented than the hard caliche. "Semi-hard" lies between these two varieties.

In building caliche roads the general practice in Texas and Oklahoma is to spread the material over the road in two layers. The first layer or base course is applied, spread evenly, and then saturated with water to make it "set." It is then rolled to a smooth surface. The second layer is applied in a similar manner.

The base course must be smooth and even, as caliche "pits" and forms "chuck holes" readily. The smooth base course assures a smooth top course and reduces traffic vibration to a minimum, and prolongs the time before the surface will roughen. If covered by a "black top" of asphalt or other heavy oil the roads are very durable.

In New Mexico caliche as base course material has been used on some five hundred miles of roads. This has been done, "not so much because of its superiority as a surfacing material, but more as a matter of economy, due to the fact that deposits of hard caliche, or caliche gravel, were near at hand." The only advantage over other surfacing materials, that is, hard river gravel or crushed limestone, is that caliche has much better binding qualities, and while the binder is whipped out by the traffic and blown away, the softer stone is at the same time gradually ground away, producing more binder. Rainfall, even moderate showers,

materially improves caliche-surfaced roads, and this material retains moisture longer than other types of surfacing.

The practical utilization of caliche for road-building in Oklahoma will be confined to the northwestern part of the state and the Panhandle region, that is, to the areas where deposits are present. Caliche has been used for road-building only a short time in Oklahoma, and, so far, the mileage of caliche surfacing is small.

Caliche was used for surfacing the airport runway at Woodward, Oklahoma, and is said to be excellent for this purpose. One favorable factor is the resulting visibility of the runway. Colonel Lindbergh has commented favorably on this airport.

In conclusion, caliche, though neglected for many years, is now known to be a valuable resource. In regions where it occurs, this material in some cases has been found superior to gravel for building roads.

◆ ◆ ◆ ◆