

county made its greatest gain during that period, due largely to an increase in settlement of the black prairies during the decade. By 1900 Dallas County reached a population of about fifty thousand in excess of the city, and has maintained that population excess to the present. The growth of the city began in 1900 from a small town of 42,638 people to a large urban agglomeration of 260,745 in 1930, an increase of more than 500 per cent in a space of thirty years. Estimates for 1935 place the population above 300,000, and the present rate of growth indicates a federal census return of about 350,000 by 1940.

Unlike many northern and eastern cities that have experienced rapid growth during the last two or three decades, Dallas is not primarily an industrial center. Its population growth has been based upon the growth of Texas, and particularly north Texas, which it serves as a trade center. One wonders if the Dallas of the future will maintain this rate of growth, or will it increase at a slower rate. From all indications, it seems reasonable to assume that the growth curve will hold up for at least two more decades before it begins to flatten.

GYPSUM—ITS VALUE TO TEXAS

May L. Whitsitt

“Gyp” water is for many people the only means of acquaintance with gypsum. A grayish deposit in the tea-kettle and the difficulties encountered when “gyp” water is used for laundering do not serve as a fitting introduction to the beautiful alabaster of the Taj Mahal. For alabaster is gypsum, too. There are still other forms of gypsum which are making this mineral increasingly important.

The most abundant form is a grayish-brown opaque rock or massive gypsum which is a hydrated, crystalline calcium sulphate, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. When this massive form is especially free from impurities and is clean, finegrained and pure white, it is called alabaster. Selenite is a transparent, crystalline form almost identical in appearance with calcite though not so hard. There is also found naturally an

anhydrous calcium sulphate called anhydrite. When gypsum is heated 100° and up to 205° C., three-fourths of the water is lost; the product remaining is plaster of Paris. When the heating is carried beyond 205° C., all the water is lost. These dehydrated products are called calcined gypsum; the process of calcining is in itself a large industry. When either the anhydrous calcium sulphate or the plaster of Paris comes in contact with water the original hydrated calcium sulphate eventually results. Many of the important uses of gypsum depend on this reaction involving the loss or gain of water of hydration:



Uses of Gypsum

Some use of gypsum as a building material dates back to the time of the ancients. But it is only in the past forty years that its value has been appreciated. During this time there has been a gradually increasing development of new uses for gypsum so that now it has become the center of a real industry. Over 90% of the calcined gypsum is used in some way for structural purposes. Perhaps the most rapid development of new uses has been due to the building trade.

When plaster of Paris is thoroughly mixed with water the resulting mass can be easily molded or cast. As it sets, it expands so that very delicate designs can be reproduced. This same material is used for surgical plaster. The anhydrous calcium sulphate will set in the same way but the time of setting is much longer than for the partially dehydrated products. This gypsum plaster is highly fire resistant and is an excellent heat insulator. Because of this property, building columns are protected by it; this has shown greater fire resistance proportionate to the coating thickness than any other covering. Gypsum-coated saw dust has been used as an aggregate ingredient in concrete used for fire proofing. This same plaster is being molded into hollow and solid blocks to be used as inside walls for heat insulation. The plaster reinforced with wire netting is molded into tile used for insulation for roofs.

Using gypsum plaster for manufacturing of wall board or plaster board is becoming increasingly important because of improvements in the manufacture and because of new uses found for the product. Plaster board¹ is made by mixing finely ground calcined gypsum and finely screened sawdust in proper proportions. The mixture is carried on a belt-conveyor through water until enough is absorbed to give the mass, when thoroughly mixed, the right consistency. The conveyors then drop the plaster on a sheet of paper running on an iron table at right angles to the conveyor-belt. An upper sheet of paper is then drawn over the plaster and by means of a heavy roller a sheet of uniform thickness results. The plaster sets and hardens. It is cut in desired lengths and dried. In this form it is useful for walls, partitions, ceilings, and heat insulating materials. In 1933² a method of manufacturing a perforated plaster board was developed by addition of hydrogen peroxide and a catalyzer to the plaster. The catalyzer brings about a speedier and more complete decomposition of the hydrogen peroxide. As the oxygen gas is evolved it creates a cellular condition in the plaster which becomes permanent as the setting takes place. A board 1000 square feet in area weighs only 1250 pounds. This type of board has been found useful as a sound absorbent.

C. F. Davis³ describes the Gypsteel Plank and its use in construction work. This product which was developed in 1930 is the gypsum plaster reinforced with steel mesh molded 2 inches thick, 15 inches wide and 6 or 10 feet long. It is reinforced on the sides and ends by tongued and grooved copper-steel channels 2 inches deep, the plank has as much flexibility as wood and it can be sawed, nailed, or bored as easily as wood.

The American Cyanamid and Chemical Corporation is now building a gypsum house. The frame-work is of reinforced gypsum studs; the exterior surface 2 inch gypsum plank both laid horizontally and nailed to the vertical supports. The floors and roof are gypsum plank on metal joists; the partitions are gypsum and the stairs are gypsum block on an iron frame. All wood trimmings and floorings are nailed directly to the gypsum. The exterior finish is to

be stucco. From the present indications these materials soon can be made available in large lots to the building trade; the man of modest income can, without a large expenditure of money, own a home of permanent structure, which is fire-proof, heat insulated, sound-proof, insured against termites, and economical to maintain.

Hammond and Withrow⁴ describe the use of anhydrous calcium sulphate as a drying agent. The gypsum is entirely dehydrated at temperatures slightly under 300°C. In this form it is called soluble anhydrite. It very rapidly and efficiently removes water from solids, liquids, and gases. Both the anhydrous and hydrated calcium sulphate are inactive and insoluble in the ordinary organic liquids so the anhydrite is particularly valuable as a desiccant for these substances. When absolute alcohol is made from 95% alcohol, the liquid may be refluxed an hour or more with metallic calcium or it may be left standing several days with calcium oxide. If soluble anhydrite is used as the drying agent a ten minute treatment is all that is necessary to render the liquid entirely anhydrous. Furthermore, when the granules of anhydrite which have been used as a desiccant are heated for two hours at 230° to 250° C., they are completely regenerated as a drying agent and can be used many times over.

The uncalcined gypsum finds large use in cement mills where it acts as a retarder in the cement setting. Roller⁵ gives an interesting discussion of the role of gypsum in its relation to cement manufacture.

Successful paper manufacture needs finely divided gypsum added to the paper felt to insure good body, a smooth surface and a medium which will easily take printer's ink.

Smaller amounts of gypsum are used as a fertilizer in some types of soil, in plate glass works, in pottery works, in making terra cotta and other industries of less importance.

Production In Texas

The United States produces about one-fifth of the world's gypsum. In 1931⁶, 2,559,017 short tons with a value of \$20,801,357 were mined in this country. Of this amount,

Texas, ranking fourth among the states in gypsum production, furnished 239,391 tons valued at \$2,025,440. In 1933² due to the continued impact of the depression on the building industry, the entire production in this country dropped to 1,335,192 tons—the lowest production since 1905. Even in that year 338,189 tons were imported from Canada and 21,277 tons from Mexico, bringing the amount spent for gypsum in the United States to a total of \$11,927,478.

The Texas gypsum deposits were discovered by expeditions sent out by the war department in 1852 and 1855⁷. The largest gypsum area lies in the north-central part of the state, east of the Staked Plains, in a belt twenty to fifty miles wide which varies in thickness from a few inches to twenty feet. This deposit extends from the Red River near Quanah and Acme to the Colorado River at Sweetwater, a distance of approximately 150 miles.

A second large deposit was found in Hudspeth and Culberson counties. W. E. Wrather⁷ describes a bed of massive white gypsum 20 to 30 feet thick near the base of Double Mountain formation, and another in Culberson County, east of Guadalupe Mountain, with an area of some 600 miles, known as Castile gypsum. These beds are, in some places, 300 to 500 feet thick and contain gypsum in a variety of forms and different degrees of purity. Both of these deposits are workable because they are near the surface and can be mined easily. They are also near the railroad, so the cost of production and delivery is within reasonable limits.

In southeast Texas great deposits of gypsum have been encountered in oil drilling. Some of the beds are 600 feet thick, but are 600 to 1200 feet below the surface and their inaccessibility makes them commercially of little value so long as the gypsum deposits at the surface remain abundant. Near Falfurrias in Brooks County are large deposits of gypseous sand and selenite; in places these deposits are 1000 feet in thickness. Most of the mineral in this area is accessible and is pure enough to be used for any purpose for which gypsum can be used.

The size of the industry, the large natural deposits in Texas, and the growing usefulness of this mineral are sufficient reasons to demand one's respect for gypsum and to arouse one's interest.

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**CHARLES WRIGHT'S 1849 BOTANICAL COLLECTING-
TRIP FROM SAN ANTONIO TO EL PASO; WITH
TYPE-LOCALITIES FOR NEW SPECIES**

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In the spring of 1849, Lt. William Farrar Smith, of the Corps of Topographical Engineers, U. S. A., discovered a southern route between San Antonio and El Paso. He had left San Antonio February 12, for El Paso over the "Northern Route" [by way of Fredericksburg and the San Saba valley, crossing the Pecos at the Liveoak Creek Crossing] and beyond the Pecos by Comanche and Leon Springs, the Limpia, and on to the Rio Grande. On his return he recrossed the Pecos at Liveoak Creek; then turning southwardly, he paralleled the left bank of the Pecos for about twenty miles, crossed in a southeasterly direction present Howard Creek at Howard Spring to present Johnson's Draw, and passed southerly down Johnson's Draw to the Pecan Spring, and the summer head of Devil's River. Following the Devil's River for seven or eight miles (during which he crossed the river three or four times) he left that river by its right bank by a road passing over the table-land