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Clark County

Item 1

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By William O. Vanderburg 2/

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INTRODUCTION

This paper ^{3/} gives the results of a reconnaissance of mining districts in Clark County, Nev., made from November 18 to December 22, 1936, and from February 9 to March 8, 1937--in all, 63 days. While the field work was being done, virtually all of the mining districts in the county were visited and many data on active and inactive properties were obtained. The report covers the locations of the various mining districts, the nature of the deposits, information on past operations, current activity, and general data likely to be useful to operators, investors, and others interested in mining. The geology of the deposits is discussed only briefly.

The principal metal-mining districts in the county are Goodsprings, Eldorado, and Searchlight. The zinc-lead ores of Goodsprings have been the most important economically, followed by the gold-silver ores of Eldorado and Searchlight. In the industrial-mineral field, gypsum, limestone, silica sand, and borates are the principal products.

Metal mining in the county is characterized by numerous small operations, and the ores are either milled locally or shipped to distant smelters.

ACKNOWLEDGMENTS

Thanks are due Frank Williams, Yeoman Briggs, and Albert C. Calkins, who gave assistance and information during the field work in the Goodsprings, Nelson, and Searchlight districts, respectively, and other owners, operators, and lessees too numerous to mention individually.

Charles White Merrill, supervising engineer, San Francisco office, Mineral Production and Economics Division, United States Bureau of Mines, furnished the data for the mineral-production tables, and the Mackay School of Mines, University of Nevada, at Reno, cooperated in making mineral determinations and assays and offering the use of its technical library.

CLARK COUNTY

Clark County, in southeastern Nevada, was organized and created from that portion of Lincoln County lying south of the third standard parallel south of the Mount Diablo base line, by an act of the State legislature approved February 5, 1908. By this act the place formerly known as Clark's Las Vegas Townsite was renamed Las Vegas and made the county seat. The county has an area of 8,045 square miles, or approximately that of Massachusetts (8,266 square miles) or New Jersey (8,224 square miles).

According to the census of 1930, the population of the county was 8,532, the majority residing in Las Vegas. The principal industries are agriculture, stock-raising, and mining.

^{3/} Manuscript completed April 12, 1937.

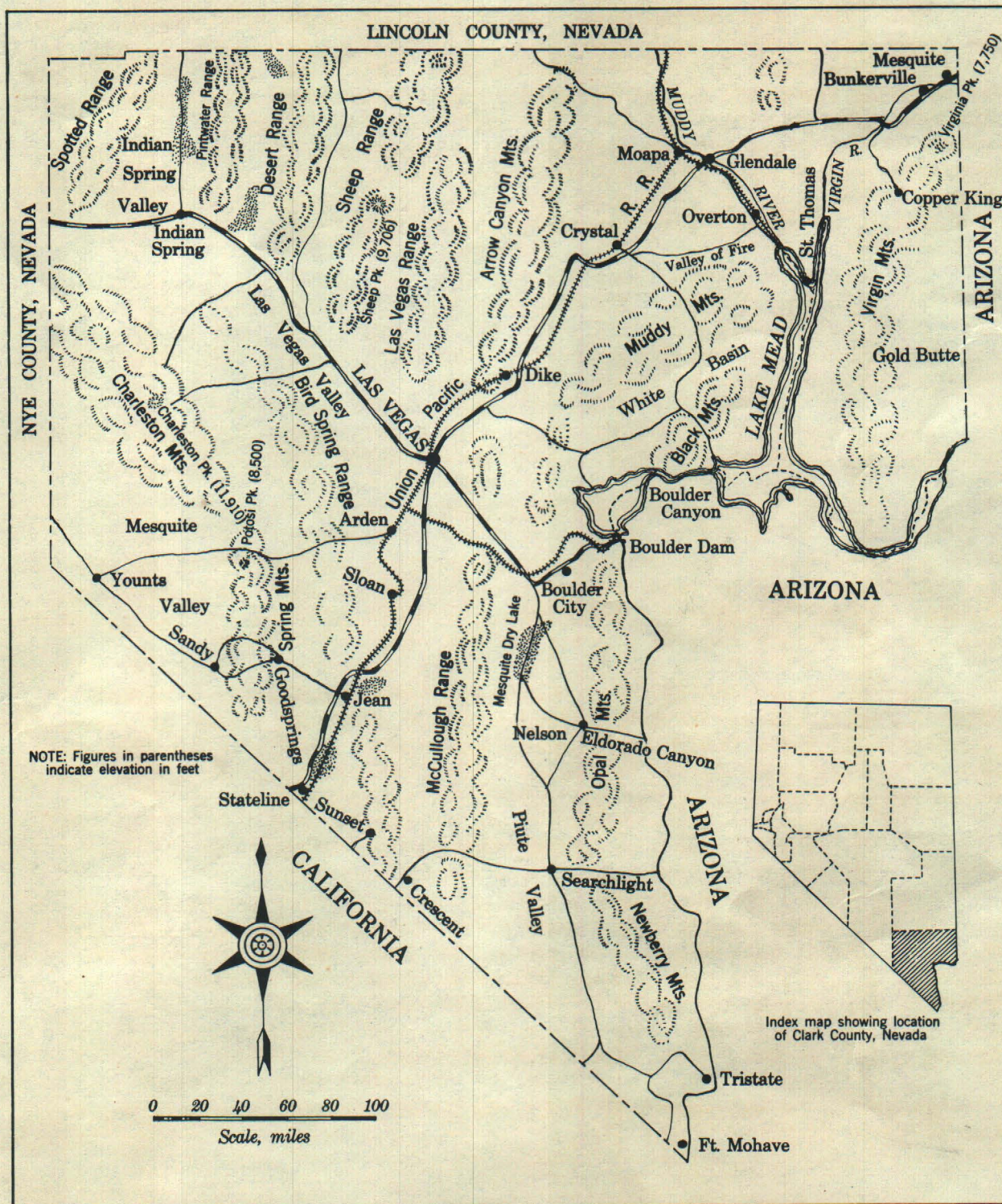


Figure 1.—Sketch map of Clark County, Nev.

The assessed value of real property for the fiscal year 1935-36 was \$14,552,500. The county and State tax rate for that year was \$2.52 per \$100, exclusive of special taxes.

A sketch map of the county is shown in figure 1.

Topography

The topography of Clark County is characteristic of the Great Basin region and comprises a series of broad valleys between more or less parallel mountain ranges having a north-south trend. Most of the ranges are short; few extend in an unbroken chain more than 30 miles. The most prominent ranges are Charleston, Spring Mountain, Sheep, Las Vegas, McCullough, Opal Mountains, Muddy Mountains, and Virgin Mountains. In general the altitude is from 3,000 to 6,000 feet, although isolated peaks are higher. Charleston Peak, in the Charleston Range, the highest point in Clark County and the third highest mountain in the State, has an altitude of 11,910 feet; Sheep Peak (not to be confused with Sheep Mountain near Jean, Nev.), in the Sheep Mountains, is 9,706 feet high; Potosi Peak, in the Spring Mountain Range, is 8,500 feet; and Virgin Peak, in the Virgin Range, is 7,750 feet. Only a few of the mountain ranges have form sufficiently striking to give them individuality, and with the exception of the higher slopes in the Charleston, Spring Mountain, and Virgin Ranges are virtually barren of timber growth.

The altitude of the lower parts of the valleys ranges from 2,000 to 3,000 feet. The principal valleys are Indian Spring, Las Vegas, Muddy River, Piute, and the Virgin River.

Climate and Desert Vegetation

Clark County, with its limited rainfall and abundant sunshine, is one of the driest areas in the United States. During the summer the weather is quite warm, and a temperature above 110° in the middle of the day is not uncommon. However, the humidity is so low that a high temperature can be endured with less physical discomfort than with a lower temperature but higher humidity. In the valleys light snowfalls may occur, but the snow seldom stays on the ground more than a few days. In virtually all the districts mentioned in this report mining can be carried on the year around without difficulty.

Some kind of vegetation is prevalent over the whole area, with the exception of the lower parts of the valleys that have alkaline soil injurious to vegetation. On the higher mountain slopes there are growths of cedar, piñon pine, mountain mahogany, and some spruce. Among the common desert growths at lower elevations are the creosote bush (*Covillea tridentata*), greasewood (*Atreplex canescens*), sagebrush (*Artemesia tridentata*), Joshua tree (*Yucca arborescens*), and a great variety of plants from the Cactaceae family. The Yucca, sometimes mistaken for a cactus, belongs to the lily family.

The Cactaceae are particularly interesting, as they occur in greater number and variety in southern Clark County than in any other part of the State. Among the more common varieties are the fox-tail (*Coryphantha deserti*), California pin-cushion, (*Mammillaria tetrancistera*), the hedgehog (*Echinocereus mojavensis*), Indian strawberry (*Echinocereus Engelmannii*), beaver-tail prickly pear (*Opuntia basilaris*), flapjack prickly pear (*Opuntia chlorotica*), porcupine prickly pear (*Opuntia hystricina*), buckhorn cholla (*Opuntia asanthocarpa*), golden-spined jumping cholla (*Opuntia Bigelovii*), nigger-head (*Echinocactus Le Contei*), California barrel cactus (*Echinocactus acanthodes*), fishhook cactus (*Echinocactus polyancistrus*), and harem cactus (*Echinocactus polycephalus*). The barrel cacti are particularly interesting to the desert traveler, for many a life has been saved by the cooling, refreshing water stored within the pulpy interior.

Water Resources

The only large body of water in Clark County is Lake Mead, formed by Boulder Dam. When the water reaches the crest of the dam it will back up the Colorado River about 115 miles and have an area of 227 square miles. The water supply for Boulder City is obtained from this lake; it is filtered and chlorinated for domestic use.

Water for domestic use in Las Vegas and for irrigation is obtained from artesian wells in Las Vegas Valley. The artesian basin has an area of 100 square miles, and in it there are 300 wells 300 to 1,100 feet deep. One of the wells owned by the Union Pacific R.R. is 650 feet deep and flows 3 1/2 million gallons per day.

The only areas in the county where enough water is available for irrigation are the Las Vegas, Virgin, and Muddy River Valleys. The Virgin River rises in the mountains in southwestern Utah and flows southwesterly across the corner of Arizona into Nevada, emptying into Lake Mead. Its principal tributary is the Muddy River, which has its source in Lincoln County, Nev. It flows almost due south, joining the Virgin River a little below St. Thomas, Nev. These rivers supply water to irrigate only small portions of the very fertile valleys bearing their names. The chief crops are cantaloupes, tomatoes, alfalfa, and various truck-garden products.

In the valleys, the precipitation is 2 to 3 inches per year. The amount of precipitation increases progressively with the elevation, and in the higher mountains it is considerably more. Cloudbursts that may do considerable damage sometimes occur during the summer months.

In the Goodsprings district, water for mining and milling is available from shallow wells; in the Searchlight district, from mine workings; and in the Eldorado district, from the Colorado River about 7 miles east.

Power Facilities

Clark County has no public-service power company at present, and all the mining districts depend upon either Diesel or gasoline engines for power. Work

on Boulder Dam, on the Colorado River at Black Canyon, 25 miles southeast of Las Vegas, was begun officially on July 7, 1930, and was virtually completed in 1936. Installed hydraulic turbine capacity at the dam will be 1,850,000 horsepower, of which the firm output is estimated to be 663,000 horsepower. Eighteen percent of the firm power can be withdrawn for use in Nevada, subject to 6 months to 2 years notice on contract, depending upon the amount withdrawn.

The Southern Sierras Power Co. owns a 132-kv transmission line from the Dam to southern California, and the City of Los Angeles has two 278.5-kv transmission lines to Los Angeles. A transmission line to Pioche, Nev., is now under construction.

A number of problems connected with the use of Nevada's allotment of power have not been worked out, and the interested reader is referred to the report of the Colorado River Commission of Nevada ^{4/}.

Transportation Facilities

Las Vegas is on U. S. Route 91 (Arrowhead Trail), which connects Salt Lake City, Utah, and Los Angeles, Calif. This highway is oil-surfaced and traverses the county northeast and southwest. Other oiled roads connect Las Vegas with Boulder City and points south, via the road over Boulder Dam; Las Vegas with Beatty, Nev., and points north; and Glendale, on U. S. Route 91, with Overton, Nev. All the other roads in the county are either gravel or natural and afford easy access by automobile to all the districts mentioned in this report, except the territory between the Virgin River and the Arizona-Nevada boundary. Here the roads are in poor condition and in places virtually impassable.

The Western Air Express operates three planes daily between Salt Lake City and Los Angeles, stopping at Las Vegas enroute.

The trunk line of the Union Pacific R.R. connecting Salt Lake City with Los Angeles traverses the county in a northeast-southwest direction, roughly paralleling U. S. Route 91. A branch line extends from Las Vegas to Boulder City and another from Moapa to a point several miles south of Overton. The freight rates on ores from various points in Clark County to Salt Lake Valley smelters are shown in the following table.

^{4/} Report of the Colorado River Commission of Nevada to Gov. Richard Kirman and the Nevada State Legislature, period Sept. 1, 1935, to Jan. 1, 1937, Alfred Merritt Smith, Secy.

Value of ore per ton	\$15	\$20	\$30	\$40	\$50	\$60	\$70	\$80	\$90	\$100
Roach	4.00	4.00	4.50	5.00	6.60	7.30	8.00	8.70	9.40	10.10
Jean.	4.00	4.00	4.50	5.00	6.60	7.30	8.00	8.70	9.40	10.10
Sloan	-	-	-	-	-	-	-	-	-	2/9.75
Arden	-	-	-	-	-	-	-	-	-	2/9.75
Las Vegas . . .	-	-	-	-	-	-	-	-	-	2/9.75
Boulder City.	-	-	-	-	6.30	6.80	7.30	7.80	8.30	8.80
Moapa <u>1/</u> . . .	-	-	-	-	6.30	6.80	7.30	7.80	8.30	8.80
Arrowhead <u>1/</u> .	-	5.29	6.30	7.43	8.44	9.11	9.45	9.90	10.24	10.58
St. Thomas. . .	-	5.29	6.30	7.43	8.44	9.11	9.45	9.90	10.24	10.58

NOTE: Minimum weight, 40,000 lb., unless otherwise specified.

1/ Minimum weight, 80,000 lb.

2/ Minimum weight, 60,000 lb.

The freight rates shown in the table do not apply to industrial minerals, since it is the practice of railroads to give special consideration to enterprises that can supply a large and steady tonnage, and such rates are determined largely by competitive conditions.

History of Mining

Nevada was part of the territory acquired from Mexico in 1848 by the treaty of Guadalupe-Hidalgo. In 1850 it was made a part of the Territory of Utah. By Act of Congress, approved March 2, 1861, the Territory of Nevada was created, and on October 31, 1864 it was admitted into the Union.

Clark County is one of the oldest sections of Nevada, and the first mining in this area was done by Indians who settled in the Muddy and Virgin River Valleys at the dawn of the Christian era. Archeological investigations at Pueblo Grande de Nevada (The Lost City) near St. Thomas show that these ancient inhabitants reached a fairly high stage of civilization. Their homes, burials, and specimens of their culture may be seen in the Lost City museum a short distance south of Overton. The mining activities of this aboriginal race were confined largely to the exploitation of the Virgin River salt deposits (probably for trade purposes) and for turquoise. Pipes and other articles made from soapstone have been found also.

The earliest white men in Nevada were the Franciscan monks, who passed through Clark County on their way from Mexico to California as early as the middle of the eighteenth century. There is some evidence to show that a little mining was done by Spanish explorers, who followed in the trails of the Franciscan fathers.

Southern Nevada was colonized by the Mormons in 1850, and settlements were established at Las Vegas, Callville, and along the Muddy and Virgin Rivers. Aside from the mines of the Indians and Spanish explorers, the Potosi

mine in the Goodsprings district is the oldest lode mine in the State. It was discovered in 1855 by some of the Mormons who returned from San Bernardino, Calif. According to Helen J. Stewart^{5/},

A man by the name of Slade was made superintendent of the Potosi mine in 1855, having been sent out by the church authorities to supervise the lead mining. They made an attempt to smelt the ore at the mine, using pitch-pine for fuel, with no result save badly burned hands. They also tried cedar wood for that purpose, which was better, but still not successful. Not being satisfied with the results, they brought their ore down to the Las Vegas rancho. Dudd Leavitt and Isaac Grundy here built a furnace in a fireplace, using the chimney for making a draft. When the ore became too hot they devised the plan of placing an adobe brick in the furnace to even the temperature. In this crude way they succeeded in making a success of their smelting operations. They moulded their lead in an old iron skillet which gave the bars the appearance of miners' loaves of bread. In this manner they prepared and sent to Cedar City, Utah, ten thousand pounds of lead, which was put in charge of Bishop Smith and by him distributed.

Notwithstanding this early discovery, little attention was paid to the mining of base metals until 45 years later.

The first systematic mining in Clark County began with the discovery of gold-silver deposits in the Eldorado (Colo.) district in 1857. As this district was on a natural travel route (the Colorado River), it was actively exploited. This discovery was followed by the discovery of the Keystone mine in the Goodsprings district in 1892 and mines in the Searchlight area in 1897.

In 1905 the San Pedro, Los Angeles & Salt Lake R.R. was completed and the town of Las Vegas established. The completing of this railroad stimulated the mining of zinc, lead, and copper deposits in the Goodsprings district, and the greatest activity occurred here during the war, when the price of base metals became very high.

The exploitation of nonmetallic deposits in the county began about 1910. In recent years most of the metal mining has been done by lessees and small companies, principally of gold and silver deposits.

Mineral Production

The annual metal production of Clark County from 1908 to 1934 is shown in table 1. Nearly all the metal shown in the table was produced in three districts; the gold and silver came principally from Searchlight and Eldorado, and the copper, lead, and zinc from Goodsprings. Other metals

^{5/} Stewart, Helen J., History of Nevada: Edited by Samuel P. Davis, vol. 1 1913, pp. 217-218.

TABLE 1. - Metal production, Clark County, 1908-1935.

Year	Gold		Silver		Copper	
	Fine ounce	Value	Fine ounce	Value	Pounds	Value
1908....	13,553.03	\$ 280,166	21,213	\$ 11,243	62,719	\$ 8,279
1909....	16,594.41	343,037	35,294	18,353	23,308	3,030
1910....	10,603.36	219,191	30,650	16,551	216,773	27,530
1911....	1,229.40	25,414	55,643	29,491	185,915	23,239
1912....	2,401.43	<u>1/</u> 49,740	236,465	145,426	173,887	28,692
1913....	6,970.35	144,090	198,922	120,149	351,855	54,537
1914....	4,468.74	92,377	127,233	70,360	188,154	25,025
1915....	8,109.54	167,639	160,749	81,500	301,327	52,732
1916....	14,912.66	308,272	404,788	266,351	573,088	140,980
1917....	10,599.88	219,119	319,836	263,545	878,646	239,870
1918....	8,391.95	173,477	252,694	252,694	467,486	115,469
1919....	7,016.45	145,043	258,288	289,283	148,469	27,615
1920....	5,870.69	121,358	186,945	203,770	121,508	22,357
1921....	3,602.78	74,476	12,094	12,094	31,247	4,031
1922....	1,668.21	34,485	11,682	11,682	12,899	1,741
1923....	1,093.03	22,595	36,669	30,069	24,005	3,529
1924....	1,838.59	38,007	127,182	85,212	23,257	3,047
1925....	3,867.48	79,948	78,418	54,422	22,610	3,211
1926....	3,275.86	67,718	39,121	24,412	21,240	2,974
1927....	1,286.39	26,592	15,843	8,983	9,879	1,294
1928....	749.52	15,494	27,805	16,226	118,085	17,004
1929....	1,566.29	32,378	21,022	11,205	47,000	8,272
1930....	1,368.77	28,295	6,565	2,527	18,346	2,385
1931....	5,659.39	116,990	12,662	3,672	8,887	809
1932....	3,100.93	<u>2/</u> 66,419	8,592	2,423	4,353	274
1933....	1,866.83	<u>3/</u> 39,424	5,038	1,763	4,201	269
1934....	3,906.26	<u>4/</u> 136,926	19,783	12,789	10,352	828
	145,572.22	3,068,670	2,711,196	2,046,195	4,049,496	819,023

- 1/ Includes placer gold valued at \$ 98.
2/ Includes placer gold valued at \$2,317.
3/ Includes placer gold valued at \$1,035.
4/ Includes placer gold valued at \$402.

TABLE 1. - Metal production, Clark County, 1908-1935. (Continued)

Year	Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	
1908....	765,142	\$ 32,136	1,115,851	\$ 52,445	\$ 384,269
1909....	445,907	19,174	3,013,352	162,721	546,315
1910....	1,309,684	57,626	2,707,071	146,182	467,080
1911....	1,629,571	73,331	3,548,032	202,238	353,713
1912....	6,555,565	295,000	13,254,860	914,585	1,433,443
1913....	6,265,783	275,694	14,369,709	804,704	1,399,174
1914....	4,207,419	164,090	11,862,149	604,970	956,822
1915....	4,655,985	218,832	21,061,182	2,611,587	3,132,290
1916....	8,405,796	580,000	29,400,537	3,939,672	5,235,275
1917....	9,373,817	806,148	20,660,549	2,107,376	3,636,058
1918....	6,541,129	464,420	15,472,155	1,407,966	2,414,026
1919....	4,257,114	225,627	5,974,219	436,118	1,123,686
1920....	4,018,864	321,509	9,381,503	759,902	1,428,896
1921....	284,217	12,790	69,397	3,470	106,861
1922....	360,500	19,827	891,174	50,797	118,532
1923....	1,519,764	106,384	8,755,427	595,369	757,946
1924....	7,764,771	621,182	7,909,042	514,088	1,261,536
1925....	5,409,440	470,621	6,230,664	473,530	1,081,732
1926....	2,044,599	163,568	2,210,162	165,762	424,434
1927....	1,690,443	106,498	3,546,078	226,949	370,316
1928....	2,220,320	128,779	1,425,285	86,942	264,445
1929....	1,080,457	68,069	1,236,702	81,622	201,546
1930....	966,686	48,334	2,474,323	118,768	200,309
1931....	796,107	29,456	1,899,328	72,174	223,101
1932....	450,752	13,523	254,795	7,644	90,283
1933....	75,631	2,798	23,346	981	45,235
1934....	154,437	5,714	28,635	1,231	157,488
	83,249,900	5,331,130	188,775,527	16,549,793	27,814,811

produced in commercial quantities are manganese, vanadium, molybdenum, cobalt, platinum, and palladium. Turquoise has also been produced for semiprecious gem stones.

The county has also produced considerable tonnages of certain industrial minerals. Production statistics of these minerals are not available, but from information gathered in the field past production is estimated as follows: Limestone and dolomite, 1,500,000 tons; gypsum, more than 1,000,000 tons; silica sand, 200,000 tons; borates (colemanite), 200,000 tons (B_2O_3 content about 20 percent); and small amounts of rock salt and feldspar. Large reserves of the foregoing industrial minerals occur in the county, and while some of the deposits have little commercial importance at the present time on account of transportation difficulties and distance from consuming centers, they constitute valuable sources of supply for future needs.

Extensive reserves of magnesite occur in the St. Thomas district, but the material contains too great a percentage of impurities for commercial use. To utilize this magnesite on a large scale as a source of magnesium or for other purposes, research work is necessary.

In February 1937 the writer estimates that 360 men were directly employed in the mining industries of the county; two-thirds of these were employed in metal mining and one-third in the production of nonmetallic minerals.

ALUNITE DISTRICT

(Gold)

The Alunite district is in central Clark County 3 to 5 miles west of Boulder City, the nearest railroad point. In 1908, gold was found here by Robert T. Hill, and the Alunite Mining Co. was organized to prospect in this area. The country rock is generally alunitized, and it was thought that because of the similarity in rock alteration to the Goldfield district important gold deposits would be found. Although considerable exploration was done, this company did not find anything of importance.

The alunite of potash variety is widely disseminated in the country rock as well as in small veins. The district has been examined on several occasions as a source of potash, but on the average the alunite is too low grade to be of commercial importance at present. Samples taken by Gale ^{6/} indicate that the average K_2O content is probably 2 1/2 to 3 1/2 percent.

There is no record of production from this district, but the Quo Vadis property is reported to have made several small shipments of very high grade ore. This property was first worked in 1915 by a company called the Quo

^{6/} Gale, H. S., in Phalen, W. C., Potash Salts: U. S. Geol. Survey Mineral Resources, 1915, pt. 2, 1917, pp. 111-112.