HISTORY OF MINING IN ARIZONA

by

James Brand Tenney

Assistant Geologist, Arizona Bureau of Mines

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INTRODUCTION

The history of mining in as large a territory as is embraced in Arizona is difficult to coordinate. Each district had its start, to a large extent, independently of the others, and each continued, as an isolated entity. Certain economic factors, however, governed their growth as a whole, and these factors are shown in the succeeding chapter on General History.

The legendary mining done prior to the United States' occupation in 1849 is lightly touched. The period embraced in the following pages is virtually the eighty-year period from 1849 to 1930.

In the chapters following Chapter I the history of the nine largest camps is given, followed by chapters giving a more generalized history of the smaller camps grouped areally.

In the Appendix, the production records in detail are given of the camps and the individual mines. These records are as complete as possible, and the degree of error where estimates are given, is shown.

The writer is indebted to so many individuals and mining companies for information that no attempt is made to acknowledge them all. Where verbal reports have been given of events and figures, they have been compared with reports published at or near the time of transpiration. As these early reports were very meager and were often written from a biased viewpoint, they have been interpreted liberally.

A history of one industry, even of such a one as mining with all its potentiallity for romance, is necessarily dry reading for the

layman. Wherever possible the influence of such strong pioneers as Dr. James Douglas, Senator William Andrews Clark, Governors Tritle and Safford and numerous others is emphasized and woven into the story to add personal interest. However, the main object of the author is to present as accurate and orderly a sequence of events as is possible, to be used as a record for the future by those interested in the mining industry.

CHAPTER 1

GENERAL HISTORY OF MINING IN ARIZONA

Spanish and Mexican

Mexico was conquered by Cortez in 1521 and 1522. The motives activating the conquest were a mixture of religious fanaticism and greed for gold and silver. The rapid exploration and penetration of Mexico by the Spanish conquerors and missionaries was one of the most remarkable feats recorded in history. By the end of the 15th century the principal fertile plains and valleys had been transformed from a barbaric state into that of Spain. This was done not by driving out the aborigines but by their conversion to the religion, language and customs of Spain. By the middle of the 10th century a large part of the coast and central valley of the southern half of California had been similarly transformed. The Spanish penetration did not extend far into Arizona for several reasons. The severe aridity of the southern part of the territory was not adapted to the crude farming methods of Spain so that there was little incentive to settle north of Tucson in the valley of the Santa Cruz River and beyond Yuma in the Colorado River Valley. The search for gold and silver deposits ended near the present border of Arizona and Mexico, and although early exploring parties further north reported rich deposits, they were separated from those already found in Sonora and Chihuahua by a well-nigh impassable desert. A third reason was that the greater part of Arizona was dominated by fierce warlike Indian

tribes, against whom no headway could be made. These tribes were not amenable to the influence of the Church padres as were the more peaceful agrarian Indians of Mexico and the Pimas of southern Arizona.

The small and insignificant mining that was done during Spanish and Mexican days was confined almost entirely to the winning of gold from placers and the crude smelting of the richer silver ore outcropping in the mountains bordering the ranch settlements in the Santa Cruz valley as far north as Tucson. This work was done by Indians under the tutelage of the padres, the object being to furnish the gold and silver ornaments for the mission churches. Some of the larger deposits were worked by Spanish miners, but on a very small scale. "Antiguas" with long forgotten histories were reported by the first American prospectors in the Oro Blanco, the Sierritas, the Tucson, the Patagonia, Santa Rita, and Catalina Mountains.

The settlements on the northern frontier were guarded during Spanish times by garrisons sufficiently strong to protect the mountain mining camps. After the Mexican revolution in 1822 these garrisons were so much reduced that the Apaches drove out the Mexicans from all but the better-guarded walled towns, such as Tucson and Tubac. All mining ceased, and the country, at the time of the American occupation was over-run not only by Apaches but by renegade Mexican and American outlaws.

Early American Occupation 1849 to 1861

The outbreak of the Mexican War in 1846 further increased lawlessness in Northern Sonora and Southern Arizona by the further withdrawal of troops. It was not until after the completion of the

Boundary Commission's work in 1855 that a semblance of order obtained. The work of the Commission started in 1849 and was nearly completed in 1853 when the Gadsden Purchase of the strip south of the Gila River necessitated renewal of the work. The commissioners and accompanying surveyors and scientists were accompanied by a small body of U. S. and Mexican troops. No serious clashes with the Apaches occurred, the Indians maintaining a friendly attitude throughout.

During the time of the work of the Boundary Commission, gold was discovered in California resulting in the '49 rush of miners and adventurers across the continent. There were two routes followed across Arizona. One of them followed the old Santa Fe Trail blazed by Kit Carson, Bill Williams, Pauline Weaver and other pioneer trappers of the west before the Mexican war. This route crossed the Colorado River at Fort Mohave west of the present town of Oatman and followed the present road bed of the A. T. & S.F.R.R. The second route started from Texas points, led through El Paso, and thence southwest through Chihuahua and Sonora, Mexico, to Altar and Ures in Sonora. From these points, the route branched. One way led through the Altar Valley to Sonoita on the present international line south of Ajo thence across the desert to Yuma. The other way led up to the head waters of the Santa Cruz River near Nogales north to Tubac and Tucson, north from there to the junction of the Santa Cruz and Gila Rivers, and thence west, following the Gila River to its junction with the Colorado River at Yuma. The river was crossed by boats operated by the Yuma Indians. In 1853, a regular ferry was established and operated by Americans. The route then led west through the desert of Imperial Valley and over the mountains to San Diego. Both of these two southern routes through Arizona were hazardous in the extreme. The Sonoita-Yuma route was the

shortest, but the desert was so devoid of water and fodder that it was known as the Camino del Diablo, the Devil's Road. The route north and west following the Santa Cruz and Gila Valleys was almost equally hazardous due to the menace of Apaches and outlaws.

No permanent settlements were made in Arizona until after the California gold excitement had somewhat abated. United States troops were stationed at two points. Fort Buchanan was established near the present town of Patagonia in the Sonoita Creek valley separating the Patagonia and Santa Rita Mountains, and Fort Yuma was established near the town of Yuma to guard the Colorado River crossing. Prospecting companies were started in the years between 1853 to 1855 to operate ore bodies located by army men and by those accompanying the Boundary Commission. The leading spirits in these first ventures were Charles D. Posten, Maj. Heintzelman, Lieutenant Sylvester Mowry and Herman Ehrenburg, the last a German mining engineer adventurer. The first mine located was the copper mine at Ajo in 1854 by a San Francisco company known as the Arizona Mining and Trading Company. This venture was short-lived, as transportation charges proved too heavy for base metal mining. The succeeding ventures in the Patagonia, Santa Rita and Cerro Colorado Mountains proved more lucrative. The two richest deposits, the Cerro Colorado and Mowry mines, had very rich silver outcrops. Although some of the ore was hauled either to Guaymas or east to Kansas City, most of it was smelted in crude plants near the deposits, and the silver bars won were either shipped or used as local medium of exchange. These later ventures were financed chiefly in New York and Texas, and the outfitting was done in Texas.

In 1858 the Butterfield Overland Mail was established to carry mail from St. Louis to San Francisco by way of Tucson, Yuma, and

Los Angeles. Troops were stationed at several points on the line to guard against Apaches and outlaws. Service was discontinued upon the outbreak of the Civil War.

During the work of the Boundary Commission very little trouble was experienced with the Apaches. On the entrance of American miners and other settlers trouble was inevitable, and a state of war soon existed. The lot of the miner and rancher of that early period was severe in the extreme. In addition to the Apaches, the country was over-run by Mexican outlaws. The murder of American mine superintendents and ranch owners by their Mexican employees was an almost every day occurrence. In spite of well-nigh insuperable handicaps headway was being made toward law and order when the Civil War was declared.

On the outbreak of the Civil War, the troops at the different forts were quickly withdrawn leaving the country to the mercy of the Apaches and outlaws. To add fuel to the fire, the settlers found themselves arrayed against each other. Mines and ranches were all abandoned and almost all the American settlers left.

During the first year of the war the uncertainty of the stand California would take caused the confederate Texas troops to attempt an invasion of California through New Mexico and Arizona. Tucson was occupied for a short period by the Confederates. They soon withdrew into Texas on the advance of General Carleton and the California Column and the whole of Arizona and New Mexico was quickly occupied by the Federals.

The scene of mining activity changed entirely. The first new major operation was in 1861 when rich gold placers were discovered east of the Colorado River 75 miles north of Yuma at La Paz by Pauline Weaver. About $2,000,000 was won from this placer field in the first

five years after its discovery. In 1862 and 1863 two prospecting parties were organized to explore the north central mountains of the Territory. One party was headed by Joseph Walker. He with 33 followers outfitted in Pueblo, Colorado, and entered the territory by way of the Rio Grande and Gila River to the Pima villages at the present settlement of Sacaton, headed north from there and finally stopped near the site of Prescott. Gold placers were discovered in Lynx and Hassayampa Creeks, and the party settled down to work. Some of the party were supposed to be Southern sympathizers, and they were under suspicion. Carleton soon sent troops in from Santa Fe to watch them, and other troops were sent in from California by boat up the Colorado River from Yuma to Fort Mohave and overland to Prescott.

The second party was headed by A. H. Peoples and was guided by Pauline Weaver, a veteran trapper and guide of the period. This party started in 1863 from California and crossed the Colorado River at Yuma. Here they were met by Pauline Weaver, and ascended the Colorado River as far as the La Paz Placers. From there they went east by way of the McMullens Valley to the foothills of the Bradshaw Mountains. Rich placers were found at Antelope Peak north of the present settlement of Wickenburg.

During the next few years gold lode mines were found near Prescott and Wickenburg and were worked in a crude way by means of arrastras and small stamp mills. The most spectacular of them was the Vulture Mine which yielded $2,000,000 in the first three years of its operation.

The California troops sent up the Colorado River to Fort Mohave were followed by prospectors who located a few rich gold ledges near Oatman. On their exhaustion, the larger and richer silver deposits of Mineral Park and Chloride, in the Cerbat Mountains were located

and worked. During this time regular transportation companies were operating packet boats between San Francisco and Guaymas, and from Guaymas to the head of the Gulf south of Yuma. Shallow-draft river boats were in regular service from the mouth of the Colorado to Fort Mohave. All supplies were sent into Fort Mohave by boats and hauled overland from there through hostile Inidan Country to Mineral Park, Chloride, Prescott, and Wickenburg.

Lode mining also started then in Yuma County in the ranges bordering the Colorado River. The most successful of these Yuma county camps were the Silver District, Castle Dome, and Planet copper mines.

By the end of the Civil War the old camps in the southern part of the territory were all abandoned, and the only active camps were in the Colorado River ranges from Yuma north, in the Cerbat Mountains in the northwest corner of the Territory, in and around Prescott, and near Wickenburg. All the mines except that of the Planet Copper Mine at the mouth of the Bill Williams River, were gold or silver mines.

For ten years after the Civil War the Territory was the scene of slow settlement by cattlemen and a few farmers, and continued war with Apaches. Forts were established at strategic points, reservations were established, and attempts were made to induce the Apaches to enter them. Very little progress was made in the Territory in any line of endeavor, and the situation was aggravated by the entrance of American outlaws pushed westward by the settlement of the Middle West. Only gold and silver mines could be worked under these conditions, and only the richest of them.

Period of Settlement 1872 to 1898

In the early seventies, the rapid growth of California made transcontinental rail connections with the east imperative. The first road to be completed was the Union Pacific in 1869. Surveys were made on the completion of this line for two others, one following the present Atchison, Topeka and Santa Fe Railroad, and the second following the present Southern Pacific. For several years difficulties arose due to rivalry as to rights of way. The Southern Pacific Company started building from Los Angeles eastward and by 1876 had reached as far as Casa Grande. From there east, the right of way was contested by interests allied with the A.T. & S.F. Similar contests on parts of the northern route existed. The A.T. & S.F. interests started a southern route with Guaymas, Mexico as its Pacific Ocean terminus and by 1893 had reached Negales and by 1884 had built as far east as Fairbank. By the end of the 70's most of the necessary right of way adjustments were made and in the early 80's the two railroads were completed. The first line completed was the present Southern Pacific then known as the Southern Transcontinental Railroad. The road was extended to Tucson in 1880 and made final connections with the westward extending link near Wilcox in 1881. The northern route, then known as the Atlantic and Pacific Railroad, was completed in 1882.

Other influences favoring the development of the Southwest at the dawn of the early 70's were the subsidence of the California gold fever and the discovery of the rich silver deposit of the Comstock Lode in Nevada in 1859. The influx of settlers and prospectors in advance of railroad construction had an immediate effect on the federal government's attitude towards the Apaches. The garrisons were strengthened

and new forts were established. A preliminary truce was affected in 1872 when the Apaches promised to enter the two large reservations set aside for them in the central part of the Territory. This truce was not entirely effective, and guerilla warfare with the troops and settlers continued until the death of Cochise in 1879 and the capture of Geronimo in 1886.

Active prospecting, however, started in 1872 which was carried on under the protection of the troops. The first new mine discovered was the bonanza silver deposit of the Silver King, three miles north of the present town of Superior. The Signal silver mine was found in Mohave County about the same time, and three bonanza silver deposits south of Prescott, the Peck, Tiger, and Tip Top.

During this first prospecting period nearly every large copper deposit in the Territory was found and located - more notably the Morenci deposits in 1872, the Globe deposits in 1872, the Bisbee deposits in 1876, the Jerome deposits in 1877, and the Silverbell, Catalina Mountains and Twin Buttes deposits about 1878. None of the copper deposits were actively worked, except those at Morenci, until after the completion of the transcontinental railroads.

In 1879 the attention of the mining world was directed to Arizona through the discovery of the bonanza silver deposits of Tombstone, and for five years this camp held the center of the mining stage in Arizona. The prices of metals at the period were high. Silver was selling at $1.30 an ounce and copper fluctuated between 18 to 26 cents a pound. The principal silver mines found proved to be superficial and short lived. On the completion of the two railroads a copper "boom" started. Companies were organized to work all of the more important discoveries. As the largest of these deposits were found in

the southeastern half of the Territory and as the two larges silver bonanzas, those of the Silver King and Tombstone were also in the south, the center of mining again shifted to Tucson. Mining in Chloride, Mineral Park, and Prescott continued but on a reduced scale.

On the completion of the railroads Colorado River transportation ceased. The route for travel and supplies for the whole Territory changed on the completion of the Southern Pacific railroad to Casa Grande in 1876. Goods and passengers from eastern points went first to San Francisco by way of the Union Pacific, then down to Los Angeles, and from Los Angeles to Casa Grande by the Southern Pacific and by stage from Casa Grande to all points as far as Prescott. River transportation could compete only for these camps contiguous to the Colorado River, that is, the Silver District, Castle Dome and Planet in Yuma County, and Mineral Park and Chloride in Mohave County.

The only camp which had an independent existence from the Southern Pacific was Morenci. This camp was discovered by prospectors from Silver City, New Mexico, and was the first camp in which copper was mined profitably ten years before the completion of the railroads. Supplies were hauled into Silver City from Kansas City by way of the old Santa Fe Trail to Santa Fe, and from there south, following the valley of the Rio Grande. Black copper was hauled out as ballast on the return trips from Silver City to Kansas City.

For a short period after the completion of the railroads the mining prospects of the Territory looked very bright. The first set-back occurred in 1884 when the price of copper started to fall and silver dropped from $1.30 to $1.00 and ounce. Copper continued to fall until 1886 it reached a low of 9 1/2 cents a pound. All copper mining ceased except at the large and rich camps of Bisbee, Morenci, Globe

and Jerome. The price of silver continued to hold to an average of $1.00 an ounce for a longer period but in 1893, on its demonization, it dropped to 63 cents an ounce. Practically all silver mining ceased, and has never been resumed except at short periods.

During the twelve years of low copper prices and discouraging conditions after the break in the market in 1886, the mining industry of Arizona was fortunate in having two outstanding men of faith and vision at the helm, Dr. James Douglas and Sen. William A. Clark.

Dr. Douglas was born in Quebec, Canada, in 1837. He obtained his education in Edinburg, Scotland, and Queen' University, Kingston, Canada, and for several years was professor of chemistry at Morrin College, Quebec. In 1875 he was called to the United States to manage the copper works at Phoenixville, Pennsylvania, one of the pioneer copper refineries of America.

His first contact with Arizona was in 1880. The original Copper Queen Company of Bisbee was organized in that year by San Francisco capitalists to exploit the rich oxidized copper outcrop of the Copper Queen claim. The mine was shortly afterwards optioned to Professor Siliman, a mining engineer and promoter of the day. He engaged Dr. Douglas to examine the mine.

In the spring of 1881, members of Phelps Dodge and Company, at that time engaged in a general metal brokerage business in New York, were approached by William Church, one of the owners of the Detroit Copper Company of Clifton, Arizona. Church offered the firm an interest in the mine in return for funds with which to build a smelter. Dr. Douglas was retained by Phelps Dodge and Company to examine the property and to pass on the advisability of the investment. The Southern Pacific Railroad had just completed its transcontinental line, which had greatly

increased the accessibility of the mine. Dr. Douglas recommended the investment to his clients, and his recommendation was followed. This was the first venture of Phelps Dodge and Company in Arizona.

After examining the Detroit Copper Company, Dr. Douglas again went to Bisbee at the request of Mr. James of Phelps Dodge and Company to examine a group of claims then offered for sale adjoining the Copper Queen mine. Although no ore outcropped on this ground, Dr. Douglas recommended the purchase. He was then retained by the firm to manage the Bisbee property.

At this time Dr. Douglas was forty-four years old. For the next two years he remained in Arizona as agent for the firm in their two ventures. In 1884 the original Copper Queen Company and the Atlanta Company of Phelps Dodge and Company were merged into the Copper Queen Consolidated Mining Company, with the control in the hands of Phelps Dodge and Company. Dr. Douglas was retained as manager. The original San Francisco promoters' interests were bought two years later by Phelps Dodge and Company through the advice of Dr. Douglas. At that time, the copper industry was suffering from one of the worst depressions in its history. Copper was selling for 9 1/2 cents a pound, and the demand was very slight. In spite of this Dr. Douglas advised the firm not only to buy the outside interests in the company, but to spend large sums in enlarging the smelting plant and in further purchases of claims.

In the next five years Dr. Douglas in spite of having most of his time taken up in developing the two properties of his clients in Bisbee and Morenci, was also very active investigating possibilities in other districts in Arizona. He was attracted first by the rich outcrop at Jerome. The United Verde Copper Company was organized by Governor Tritle and associates in 1883, but operated only a year and a half,

during which time almost four million pounds of copper were produced and a very important amount of bi-product silver. After the mine was closed on the collapse of the copper market, Dr. Douglas obtained an option on the property in 1884, which was renewed in 1886. He realized the worth of the property but finally recommended dropping the option for the reason that he did not judge the high necessary capital expense in railroad construction to Jerome was justified by the surface showing. Subsequent developments of the mine by Senator Clark showed that his judgment in this instance was faulty. The mine was at that time about as inaccessible as it could well be. The nearest railroad point was Ash Fork, eighty miles away. It is situated on the side of a steep mountain, and was accessible at that time from Prescott by an excessively rough wagon road over a high mountain pass. Dr. Douglas's judgment was prejudiced also by the smallness of the outcrop as compared with those of Bisbee and Morenci, and did not recognize the difference in the type of ore occurrences. The property was finally purchased by Senator Clark whose experience had been chiefly with the vein deposits of Butte, much more like those of Jerome in that the greater dimensions of such ore bodies are vertical rather than horizontal, as at Bisbee and Morenci. An interesting wide light on this early mistake of Dr. Douglas is that twenty years later Senator Clark optioned a large group of claims in the Bisbee district, sank a 1000-foot shaft, and gave up the option to the property due to his unfamiliarity with the Bisbee type of ore occurrences. This Bisbee group was immediately purchased by the Copper Queen, and the shaft was sunk deeper and passed through 100 feet of ore, the top of which was only 50 feet below the 1000-foot level where Senator Clark had stopped work.

Dr. Douglas was very early attracted to the camp of Globe, and in 1891, on his advice, the Buffalo Mine was purchased and served as a nucleus for the organization of the United Globe Mining Company. For ten years this property was actively developed and a large smelting plant was erected. The property adjoins that of the Old Dominion, and in 1901 the two properties were merged under the control of the Old Dominion Company which in turn is controlled by Phelps Dodge and Company.

One of the ventures in which Dr. Douglas was interested was the San Carlos Copper Company organized in 1883 to exploit the copper deposits of Christmas. A smelter was built, and work was well under way when it was found that the mine was on the San Carlos Indian Reservation, and not subject to mineral entry. For the next eighteen years Dr. Douglas used all his influence to have that part of the Reservation, known as the San Carlos strip, thrown open to mineral location. He was finally successful in 1902, but lost the fruits of his work as the property was relocated by others before he could reach the ground.

Dr. Douglas was early interested in the possibilities of the winning of copper through leaching and precipitation of copper from solution. He was joint author with Dr. T. Starry Hunt of the Hunt-Douglas Leaching Process, one of the earliest to be patented. In 1891 he was attracted to the oxidized copper outcrops of Copper Basin west of Prescott as a possibility in the application of his leaching process. A large group of claims was purchased and the Commercial Copper Company was organized, financed by members of Phelps Dodge and Company. Dr. Douglas's dream was to own a mine capable of being operated without the inherent risks of most mining ventures, and thought he had such a property in that of Copper Basin. A leaching plant was erected, but operating difficulties

soon developed, and the venture was unsuccessful. Other properties were acquired in the Bradshaw Mountains, more notably the Senator, Boggs and Hackberry mines, and a custom smelter was erected at Arizona City between Humboldt and Mayer to treat the ores of the surrounding districts. The mines did not prove profitable. The smelter, however, very much stimulated the districts centered at Prescott. It was continued in operation until 1897 when it was sold. It was finally abandoned in 1899 and replaced by a smelter known as the Val Verde, which in turn was replaced by the Humboldt smelter.

Besides all this activity in Arizona Dr. Douglas actively investigated properties in Old Mexico in the state of Sonora. The Pilares Mine at Nacozari was acquired and a large mine in the Cananea district.

Dr. Douglas became interested in railroads at an early date to service his different mining ventures. The first line built was from Fairbank to Bisbee. This line was operated by the Copper Queen Consolidated Mining Company and was known as the Arizona and Southwestern Railroad. In 1901 after the development of the Nacozari property, the decision was made to establish a separate smelting town for the Bisbee and Nacozari ores, and a subsidiary railroad company was organized to operate from Benson to El Paso through Douglas. A branch road to the company-owned coal mine in northern New Mexico was purchased later. The two lines were operated as the El Paso and Southwestern Railroad. The line was finally extended into Tucson from Fairbank. Other railroad lines built during Dr. Douglas's regime were the Guthrie-Morenci narrow gage line which serviced the town and mines of Morenci, a branch road from Douglas to Courtland, a second branch line from Douglas south to Nacozari, and a branch from Fairbank to Tombstone.

Dr. Douglas was an outstanding example of the old school of mining engineers, with a marvelous stock of detailed knowledge in all

lines of mining and metallurgy and a keen business sense. In addition to his technical knowledge, he was a man with most extraordinary general knowledge and interests. He was an inspiring man to his employees and associates, and had the happy faculty of building zealous and loyal organizations. He was most modest and retiring, giving credit, even where credit was not due, to those working with him. He was a man with the highest and most scrupulous business principles, and fought all his life to better the ethics of the mining profession and industry by precept and example. Early in his career he became identified with the American Institute of Mining Engineers shortly after it was founded and was always a leader in the splendid work of that institution.

Arizona owes Dr. Douglas a very large debt not only for his keen foresight, but for the spirit of cooperation which has always dominated the industry in Arizona through his efforts. It is a great tribute to him that in none of the camps with which he was connected was there a serious misunderstanding with labor during his lifetime. During this time the most serious and disgraceful troubles occurred in other mining communities in the West. It was also due to his keen sense of proportion that the Arizona camps have been free from the bitter legal fights so characteristic of some of the larger western mining camps. It was due almost entirely to his influence that the Federal law of extra lateral rights was practically dead-lettered in Arizona through mutual side-line agreements.

Dr. Douglas's influence is still felt in the most concrete way, twelve years after his death, by the leaders of the industry trained by him in Arizona. He was the dean of the profession during his life and his good works live after him.

Senator William Andrews Clark was born in 1837 near Connellsville, Pennsylvania. He studied law at Mount Pleasant, Iowa, but never practiced.

After graduation he taught school in Missouri for a few years and in 1862 went to Colorado and from there moved to Montana in 1863. He started in business in Butte and soon drifted into copper mining. His ventures in Butte were very successful, and he was soon one of the most influential men in Montana.

In 1876 he was appointed commissioner from Montana at the centennial Exhibition at Philadelphia, in charge of the mineral exhibits. The attention of the East was then forcibly drawn to the base metal mining possibilities of the West. Arizona had no exhibit at this fair, but in 1884 at the New Orleans Exhibition, a fine exhibit was sent from the newly-organized United Verde Copper Company. Clark attended that exhibition, and immediately started an investigation. The property was then under option to Dr. James Douglas. In 1886, on learning that Dr. Douglas's option was soon to expire, he sent his engineer, Joseph L. Giroux, to report on the property, and on the expiration of Dr. Douglas's option he took it over. Due to the copper depression, the mine and smelter had been idle for about two years. The option was kept alive for the next two years, and, in the meanwhile, the Santa Fe Railroad built its first branch line from Ash Fork to Prescott, very much improving the accessibility of the mine. A seventy percent interest was then purchased, and the property was reopened. Conditions were bad, however, as the road from Prescott was rough and the grades were severe. The total haul was over thirty miles. Rail transportation was essential for the successful operation of the mine and smelting works. A survey was made in 1891 for a narrow gage line from a point on the Prescott-Ash Fork line about fifteen miles north of Prescott over the mountains to the mine. The engineering difficulties were great as the grades were severe and the topography was excessively rough. The road was started in spite of the great cost and was completed in 1894. The smelting plant was much enlarged and rebuilt during the three years of railroad construction, and

by the end of 1897 one thousand men were on the payroll and the mine had increased its production from a rate in 1891 of six and a half million pounds a year to thirty million pounds in 1898.

The mine was developed steadily for fourteen years after the completion of the railroad under adverse conditions, as great trouble was experienced with mine fires and caving ground, and further expansion was seen to be impossible without the expenditure of huge capital in a new plant. Senator Clark then decided to remove the smelter to the valley of the Verde River, over a thousand feet below the mine and over two miles away by air line, and to connect the smelter and mine by means of a 6600-foot deep extraction tunnel and connecting railroad. The plan necessitated also the abandonment of the narrow gage railroad and the construction of a new line to the smelter down the Verde River, the building of a new smelter and smelting town, and other costly improvements to the mine plant, including the excavation of millions of tons of waste rock to prepare for open pit mining of the buring and caved ore of the upper levels. The campaign lasted almost ten years. The capacity of the mine was increased thereby from thirty million in 1905 to sixty million in 1916, and has since been still further increased to over 100 millions of pounds of copper a year. The number of men employed was increased from one thousand in 1905 to over two thousand in 1915.

Although the Arizona interests of Senator Clark did not extend as widely as those of Dr. Douglas, the fame of the United Verde venture was widely broadcast and immensely stimulated mining throughout Arizona.

After the exhaustion of the silver mines, the miners of Tombstone, Silver King and Prescott started searching for gold. The search yielded six successful large mines: The Mammoth-Collins Mine in Pinal County,

the Commonwealth Mine in Cochise County, the Congress Mine in Yavapai County, the Harqua Hala Mine in northern Yuma County and the Fortuna and King of Arizona mines in southern Yuma County. Many small gold mines were reopened near Prescott, more notably the Crown King and Gladstone-McCabe.

Period of Expansion 1898 to 1930

In the late 90's, the rapid growth of the electrical industry caused a much better demand for copper. The price did not respond immediately, but capital was attracted to copper mining all over the world. During the twelve years of mining stagnation, the Territory was opened by a number of branch railroad lines, so that operating conditions were very much improved. All the old copper camps, most of which were abandoned in 1886 were reopened by strong companies. In the larger camps which had weathered the storm of low copper prices the old companies much increased their productive capacities.

The most spectacular of the new ventures was the Development Company of America, organized by Frank M. Murphy of Prescott. Although this company finally came to grief, its interests were so widespread, that its influence on the development of Arizona was very great.

Frank M. Murphy was born in Maine in 1854. He and his brother Oakes Murphy, later appointed governor of the territory, moved to Prescott in 1878. Frank Murphy followed the mining business with indifferent success for several years, his efforts being confined to the promotion of numerous small gold mines in the Bradshaw Mountains.

In 1887 he obtained an option on the Congress Gold Mine in southern Yavapai County from Dennis May. He obtained the option for one of his

clients, "Diamond Joe" Reynolds. Reynolds owed his sobriquet to the fact that he had made a fortune in Arkansas in the construction of a railroad to the diamond fields of that state. Reynolds and Murphy operated the Congress Mine together until the death of Reynolds at Congress in 1891, when the property passed by Reynold's will to Murphy.

During the lifetime of Reynolds, Murphy promoted the Santa Fe, Prescott, and Phoenix Railroad to build a road from Prescott south through the mountains to Wickenburg by way of Congress and from there south to Phoenix. This line was started in 1890 and was completed in 1893. After Reynold's death the mine ceased production pending the completion of the railroad, but was extensively developed in the interim.

In 1894, E. B. Gage and associates of the Tombstone Mill and Mining Company became interested in the venture, and the Congress Gold Company was organized with Gage as president. W. F. Staunton was appointed superintendent. The mine was successfully operated until 1910.[

In 1898, Murphy's attention was attracted to the lead-zinc-copper-silver-gold deposits of Poland and Crown King on the eastern side of the Bradshaw Mountains. Both properties had good production records for the precious metals, but their ore had become too base for amalgamation, and they were both inaccessible. Through Murphy's influence, railroad companies were organized to develop the north-eastern end of the Bradshaw Mountains. Two companies were organized, the Prescott Eastern Railroad Company from Prescott to Mayer, and the Bradshaw Railroad from Mayer to Crown King. A branch line was also constructed into Poland. These companies were largely financed by the same interests by the same interests that were in the Congress Mine. These two railroad lines and the Santa Fe, Prescott and Phoenix line had a great effect in stimulating

mining in the Bradshaw Mountains, and a mining "boom" of considerable proportions resulted.

In 1901 the copper market had improved to such an extent that Murphy and his associates decided to enter the copper business. The territory was combed for likely properties resulting in the option of the Silverbell and Christmas mines. The Silverbell Mine in Pima County was one of the earliest of the copper mines to be exploited, but was abandoned after the 1886 crash and had been worked intermittently since in a small way with poor success. At the time of option it was owned by Albert Steinfeld of Tucson. The Christmas Mine on the San Carlos Strip had just passed into the hands of the Chittenden interests after the opening of the strip to mineral location in 1902. It was decided at this time to reopen the old silver camp of Tombstone which had been dormant since the demonitization of silver in 1893.

To finance all these different projects, the Development Company of America was organized with Frank Murphy, E. B. Gage, Wallace Fairbank, and W. F. Staunton as directors. This company was the holding company of the following companies, which were financed through the sale of bonds by the Development Company of America, these bonds secured by the stock of the subsidiaries. The Congress Mine was reorganized as the Congress Consolidated Mines Company; the Imperial Copper Company was organized to operate the Silverbell Mine; the Imperial Copper Company controlled the Southern Arizona Smelting Company, organized to build a smelter at Sasco near Silverbell to smelt the Silverbell and custom ore; the Arizona Southern Railroad Company was also organized as a subsidiary of the Imperial Copper Company to construct a broad-gage line from Red Rock on the Southern Pacific to Silverbell; the Tombstone Consolidated Mines Company was organized to operate the Tombstone mines; the Gila

Copper Sulphide Company was organized to operate the Christmas Mine; the Poland Mining Company to operate the Poland Mine; the Lookout Copper Company to operate the Crown King property; and a large timber tract was purchased in Mexico.

Operations at Congress, Silverbell, Poland and Christmas were successfully started, and were continued in the next eight years. The affairs of the company were apparently satisfactory, and the financial panic of 1907 was weathered. The Tombstone venture however finally broke the back of the company through the extraordinary and unlooked for pumping expenses. At the end of 1910 the Development Company collapsed and dragged down all the subsidiary companies. Just before the debacle plans were laid for extensive expansion in railroad construction. It was planned to continue the Arizona Southern through Southern Arizona and Northern Sonora Mexico to a terminus at a port on the Gulf of California.

After the failure of the holding company, the assets consisting of the different subsidiaries were sold and acquired by others. All have been operated since except the Congress Mine which has never been reopened. The whole venture was most spectacular, but the promoters were over-ambitious, and attempted to operate with insufficient capital. The whole structure was top-heavy. Frank H. Murphy lost most of his fortune in the crash and died in Prescott in 1917.

In 1904 the success of the Utah Copper Company in the successful treatment of low grade concentrating ore started a search for similar deposits in Arizona. In rapid succession, the Ray, Miami, Inspiration, and Ajo deposits were acquired by large financial groups and were brought into production, just before and during the first years of the World War. The price of copper remained at a high level during this

huge mine development campaign and soared to unheard of heights during the War years. During the World War every copper deposit in the state was worked at maximum possible production, and the plants of the large producers were expanded to the utmost. At the end of the war most of the smaller camps much curtailed or ceased operation. The larger mines continued to operate on the expanded scale until the end of 1920. Large stocks of copper were accumulated, and the price dropped to 12 cents a pound. The mines were forced to close for about a year during which time only two large producers remained in the field.

During the shut-down drastic reorganizations and economies were introduced and early in 1921 a general reopening took place, at first on a curtailed basis. During the next nine-year period the demand for copper steadily increased, and the existing plants were enlarged to a point beyond that of the War years. Large deposits of copper ore were developed in South America and Canada, and even this new copper was absorbed by a copper-hungry world. Still larger deposits were found in South Africa during this period, which proved to be richer and larger than any deposits ever found before in the world. Due to their extreme inaccessibility, production from this field was not immediately felt, and a dearth of copper in 1928 caused the price again to soar. Still further expansion of the old mine plants and those of the newer South American and Canadian mines resulted in saturating the world with copper by the end of 1929. The bottom dropped out of the market just at the dawn of the opening of the enormous new mines of South Africa. A general curtailment and closing of copper mines became imperative. Conditions were aggravated by a major world business depression.

During the three decades of prosperous copper mining from 1898 to 1929 very little mining other than that for copper was done in Arizona. The gold deposits discovered in the 90's were short-lived and were soon exhausted. An attempt was made early in the 20th century to reopen the silver deposits of Tombstone, but it was unsuccessful due to heavy pumping expenses. Only one large camp, other than the copper camps, was discovered. Rich gold ore was found in the Gold Road Mine in the Oatman district in 1901, and this was followed by the discovery of the Tom Reed and United Eastern Mines in the same district. Over $30,000,000 was extracted from these three bonanza deposits in the next twenty years and new deposits are still being found and profitably worked in the district.

During the period of high metal prices after the outbreak of the World War, several complex ore deposits were successfully worked in a number of scattered localities, more notably at Chloride, Crown King and Washington Camp. After the break of metal prices after the war, they were abandoned, and have not been reopened.

The major metal production of the state has been and will continue to be copper. In addition, Arizona has produced gold, silver, lead, zinc and other materials, chief of which are manganese, asbestos, mercury, vanadium, molybdenum and tungsten.

It has furnished the world with three major non-ferrous mineral districts, each of which will eventually pass the billion dollar mark. These three are Bisbee, Globe-Miami, and Jerome, and probably Morenci as a fourth. As there are only 22 districts in the world, 10 of which are in the United States, the importance of Arizona as a producer of metallic wealth is readily seen.

The Arizona copper ore reserves are still very large. It is safe to assume a life as a major copper producer of at least two more generations.

CHAPTER 2

MINING HISTORY OF BISBEE

Early History

The first mining location made in the district was early in 1876 by Lieutenant Rucker and William Dunn, Cavalry officer and army scout respectively, of Fort Huachuca.* The prominent iron cropping east of the town of Bisbee, the outcrop of the Dividend Fault, contained pockets of gold and silver ore with very little copper stain. The Rucker claim was located to cover this cropping.

At this time, Rucker and Dunn knew of the rich oxidized copper outcrop later located as the Copper Queen Mine, but did not themselves locate it as it contained little silver and was deemed valueless due to the extreme isolation of the district. Lieutenant Rucker was drowned in 1877 in Dubacker Canyon north of the Rucker claim while attempting to cross the canyon during a cloudburst.

In 1877, George Warren of Fort Bowie, was grubstaked by George Staples of Eureka Springs to locate the copper outcrop of the district. This he did, naming the claim the Mercury. In 1878, the claim was relocated by Warren and George Atkinson as the Copper Queen. Legend has it that Warren's share was lost shortly afterwards on the outcome of a horse race.

Other claims adjoining the Copper Queen were located in 1878 by Atkinson and others, the principal locations being the Copper Prince, Copper Jack, Czar, Atlanta, Hendricks, and Neptune claims.

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*Verbal account of Jack Dunn, son of William Dunn.

Very little work was done on any of these claims until the completion of the Southern Pacific Railway into Benson in 1880. In the spring of 1880, Edward Riley, a lawyer by profession, then operating a mine at Elko, Nevada, came to Arizona to inspect the Ajo copper mine. Hearing of the strike at Mule Pass (Bisbee) he went there and immediately optioned the Copper Queen claim for $20,000. He offered the option to Martin and Ballard, railroad engineers of San Francisco. The mining firm of Bisbee, Williams, and Company of San Francisco was consulted and recommended the purchase. Riley retained a third interest. The Copper Queen Mining Company was organized with a capitalization of $2,500,000, a payment was made, and the firm of Bisbee, Williams and Company of San Francisco retained to operate the property under the management of Martin. Ben Williams was appointed mine superintendent and Lewis Williams was retained to erect a thirty-inch water jacket blast furnace and to operate the smelter after its completion. The camp was then christened Bisbee after the senior member of the firm.

The black copper was shipped for refining to the Chemical Works at Phoenixville, Pennsylvania, then managed by Dr. James Douglas. In 1880, Professor B. Silliman, a prominent promoter and mining engineer, obtained a short-term option on the Copper Queen and retained Dr. Douglas to examine it. Dr. Douglas arrived in Bisbee in January 1881. The option was not exercised, and Martin entered into negotations with Zeckendorf and Company of Tucson and New York, and appointed this firm financial agents to sell the stock of the company.

The following history of the early Phelps Dodge activities is from an account written by Dr. James Douglas:

In the summer of 1881, Dr. Douglas again visited the camp at the request of Mr. James of the firm of Phelps Dodge and Company of New York.

This firm had, earlier in the year, acquired an interest in the Detroit Copper Company of Morenci through the advice of Dr. Douglas. The Atlanta claim adjoining the Copper Queen to the South was offered for sale by Atkinson. No ore outcropped on this claim, and in spite of the risk of the extra lateral rights of the Copper Queen claim if ore were found, Dr. Douglas recommended its purchase.

During the next two years, the Copper Queen Company operated its smelter on the rich ore of the Copper Queen claim, and also treated the ore mined from the Copper Prince, located on the western end of the outcrop. The Atlanta Company spent a considerable sum of money prospecting with tunnels and shafts, but found no commercial ore. A little lead ore was found, and a few shipments were made to the smelter of the Tombstone Milling and Mining Company at Charleston.

Early in 1884 it was seen by the Copper Queen Company that the rich outcrop ore body was nearly exhausted. The two companies then engaged the services of Arthur Wendt to make a two-fold examination to determine the amount of ore left and the right of the Copper Queen to follow ore outside its side line. His report indicated ninety days' supply of ore, and cited legal advice based on the Richmond-Eureka decision all owing extra lateral rights to the Copper Queen claims. Both companies then started prospecting the only stringer of ore leading from the ore body into Atlanta ground, the Copper Queen with a drift on the 400 foot level and the Atlanta with a shaft from the surface. Both companies almost simultaneously penetrated a second rich ore body during the year. To avoid expensive litigation, a consolidation was effected as the Copper Queen Consolidated Mining Company. Dr. Douglas was retained as manager with Ben Williams and Lewis Williams as mine and smelter superintendents respectively. The capitalization was reduced from $2,500,000 to $1,400,000.

The Atlanta shareholders received two-sevenths of the stock and $200,000; $150,000 in mortgage bonds, and $50,000 in cash.

At the start of operations in the camp in 1880, copper had jumped from 12 cents a pound to 20 cents, but started to fall in 1881 and continued to drop. At the time of the consolidation it had reached a price of 13 cents a pound, and in 1886, reached a low of less than 9 cents for 96 percent bars. There was no profit at that price, and the Martin-Ballard-Riley interests were sold to Phelps Dodge and Company.

Two other pioneer companies were organized in 1880, the Copper Prince and the Neptune; the latter holding ground to the east of the Copper Queen and Atlanta, and the Copper Prince covering part of the original outcrop.

The Copper Prince Company was organized by George Atkinson, one of the original locators of the camp. Arrangements were made to smelt the ore at the Copper Queen works. Operations were continued by this company until 1885, when it was found that a considerable portion of the ore mined was within Copper Queen lines. To avoid a law suit, the Copper Prince and other claims owned by the company were sold by Atkinson to the Copper Queen Consolidated Mining Company.

The Neptune claim was originally located in 1878 by Joe Herring and Joe Dyer.* These two, together with George Warren and a man referred to as "Ole Kentuck", came into the district about the same time and located most of the copper outcrops of the western end of the camp. The first house in the camp was built by Herring and Dyer, a one-room stone cabin in what is now Brewery Gulch. In 1879, a man and his wife, passing through the district, were given shelter in the cabin during a rainy night, and

*From account given by Mrs. Selim Franklin of Tucson, daughter of Col. William Herring.

Herring and Dyer slept outside. Herring contracted pneumonia from the exposure and died shortly afterwards. Col. William Herring came from New Brunswick, New Jersey, to Bisbee in the following year to settle his brother's estate. He saw the possibilities of the camp and organized the Neptune Mining Company, enlisting capital from Hartford, Connecticut. A little oxidized ore was found, and a smelter was built at Hereford, fifteen miles away, on the San Pedro River. Most of the money raised was spent on roads, smelter and other superficial improvements, and little effective development work was done. In 1882, a German mining engineer, one Raht, was engaged by Col. Herring to examine the property. He reported adversely on the possibilities of the downward extension of ore in the camp. The result of the report was a vote by the directors to cease operations. The property lay idle for several years, and was attached by bond holders of the company and by the county for taxes, and in 1889 it was purchased at a tax sale by the Holbrook and Cave Company, a subsidiary of the Copper Queen Consolidated Mining Company.

No further acquisitions were made until 1888 when ground south and west of the Neptune was acquired from Goddard by Messrs. James and Dodge of Phelps Dodge and Company. The Holbrook and Cave Company was organized, and the ore found was hoisted and smelted by the Copper Queen Consolidated Mining Company. The Neptune group of claims was added to the holdings in 1889, and in 1892 this company was sold to the Copper Queen Consolidated Mining Company for $600,000 in copper and stock. The Copper Queen Consolidated capital was raised to $2,000,000 to effect the deal.

All the available ground west of the porphyry stock of Sacramento Hill was gradually acquired up to 1890 when the Gardner claim was bought, with considerable misgivings, according to Dr. Douglas.

In 1886, during the depression of that year, the only hope for profitable operations was to increase the scale of operations. The company was in debt, but Phelps Dodge and Company concluded to advance the funds necessary to build a new smelter which was blown in in May 1887. The total debt was then $300,000. At the end of the year the French Secretan Syndicate was organized and the Copper Queen copper was sold in advance for three years for 14 1/4 cents, 13 1/4 cents and 12 1/4 cents, entirely wiping out the indebtedness. New ore bodies were found while the smelter was being built, ensuring a long life ahead at a production rate of one and a quarter million pounds of copper a month. Further additions to the smelting plant were built during 1887.

In the early years of the camp the only feasible route into the district from the nearest railroad point at Benson was by way of the San Pedro Valley to Hereford, thence by a road skirting the mountains on the south to what is now Don Louis, and thence through the pass at the present settlement of South Bisbee, a total distance of 65 miles. The route was hazardous due to Apaches and outlaws and the trips were usually made after dark. After the Santa Fe had constructed the Sonora Railroad from Guaymas to Nogales, and from Nogales to Fairbanks, a toll road was constructed by the Copper Queen Company through the mountains to Tombstone which was completed in 1883. This road cut the haul to forty miles.

After the enlargement of the smelter in 1887, steam transportation was felt to be a necessity. Before deciding on railroading, Phelps Dodge and Company tried to induce the Santa Fe to extend their line from Guaymas up the Sonora River to Cananea, Bisbee, and Deming but were met with supreme indifference. The first railroad was built by the Copper Queen Consolidated in 1888 and 1889 from Fairbank to Bisbee around the

mountains. This road was known as the Arizona and Southwestern Railroad. Later it was extended to Benson. Transportation costs to Fairbanks were reduced from $6 a ton with the toll road to $1 a ton with the railroad. The railroad ownership remained in the hands of the Copper Queen Consolidated until 1901, when the El Paso and Southwestern Railroad was organized which took over the Arizona and Southwestern.

By 1892 the available oxide ore reserves were nearly exhausted, but large reserves were opened up of sulphide ores. Metallurgical losses resulted from smelting direct to black copper, and it was decided to investigate European matte smelting and converting practice. Dr. Douglas, after a trip to the Mahnes-Bessemer plant at Leghorn, installed three barrel-converters of a larger size than heretofore used, the blast being furnished by a Riedler blowing engine. The 36 inch furnaces were later replaced with 120 by 40 inch furnaces and the converters were coupled with the furnaces. This plant was installed in 1894. Still later modifications were the installation of an electric crane and the separation of the furnaces from the converters to obviate delays of one waiting on the other. By 1899, the expansion made possible by the improved metallurigical process made enlarged quarters for the smelter necessary. The railroad had been extended into Naco in order to take care of the ore hauled from the Company's Nacozari property. At first Naco was considered as the logical site for the smelter, but the poor railroad route from Naco to Nacozari, and the determination to build the railroad to El Paso, with a good railroad route feasible from Nacozari to a point on the proposed new line in the Sulphur Spring Valley, led to the picking of the site at Douglas. Work started in 1900 and the new plant was completed at the end of 1903, resulting in the scrapping of the smelter at Bisbee, carried on the books at $1,223,959. The new

plant was constructed at a cost of two and one-half million dollars with a capacity of one hundred and thirty million pounds a year.

The output of the camp from the start of production to 1901 inclusive was 324,263,978 pounds of copper and $494,600 in gold and silver, with a total gross value of $48,486,000.

Recent History

After the absorption of the principal pioneer companies of the district by the Copper Queen Consolidated Mining Company, the history of the camp was that of a slow development by this one company of the ore bodies in the western end of the camp. At no time in the early period was there sufficient ore blocked out to insure a life of more than a few years. The price of copper remained uniformly low for more than a decade. In 1898, an improved demand for copper caused by the rapid growth of the electrical industry very much stimulated the search for new copper mines, and was reflected in a better price for the metal.

The first independent venture in the Bisbee district was that of the South Bisbee Copper Mining and Townsite Improvement Company in 1898. In that year, the Haninger Brothers of Bisbee optioned a large group of claims south of the developed production area. Mr. John P. Martin of Xenia, Ohio, was approached and offered the options. After an inspection of the ground, he and his associates organized the South Bisbee Copper Mining and Townsite Improvement Company to develop the ground and to establish a residential suburb of Bisbee. The company was organized for 5,000,000 shares of $1 par. Two shafts were sunk in the next three years, the deepest shaft 1,000 feet deep. Lateral work on the bottom levels of the deepest of the two shafts encountered oxidized and enriched sulphide ore. The company developed these ore showings until 1902 when the

property was sold to the Lake Superior and Pittsburg Development Company, a company controlled by Calumet and Arizona interests.

In 1899, John Graham, a miner working in the Holbrook Mine of the Copper Queen Company brought the possibilities of the Bisbee district to the attention of James Hoatson and Gordon Campbell of Calumet, Michigan. An attempt was made to option the Irish Mag group in the early part of the year, but litigation involving the title prevented the consummation of the deal until August 1899. The owner of the group was Martin Costello. The Lake Superior and Western Development Company was organized to develop the ground, and L. P. Merrill was appointed manager. Work was started on the Irish Mag shaft in August 1900. By April 1901 it was down 850 feet. A little ore was developed and a payment due, which the company had insufficient funds to meet. Thomas F. Cole, Chester A. Congdon, and Charles d'Autremont, Jr., iron and timber capitalists of Duluth, and George E. Tenor of Pittsburg, were approached and became interested in the venture. In April 1901, the Calumet and Arizona Mining Company was organized for $2,500,000 in 250,000 shares of $10 par, of which 50,000 shares remained in the treasury, 100,000 shares went to the Lake Superior and Western shareholders, and 100,000 shares were sold at par to furnish working capital. The payment on the property was met and work was continued at the shaft. Bonanza ore was struck on the 900 and 1,000 foot levels. In 1902, the construction of a smelter, consisting of two small blast furnaces and converter-stands, was started at Douglas, which was completed in November of that year. A favorable rate was obtained from the railroad, and the ore proved so profitable that by January 1903, the first divident was paid. By the end of 1904, total dividend disbursements of $1,375,000 had been made and a surplus of $1,500,000 had been accumulated.

The future history of the camp at this time was vitally affected on the entrance of the Calumet and Arizona interests, by immediate overtures by the Copper Queen Consolidated Mining Company to all the principal new ventures to sign mutual side-line agreements, waiving extra lateral rights, under the federal mining statutes. The ruinous expense and hard feeling engendered by long-protracted law suits at Butte were the incentives of the pioneer company in proposing the agreements. An additional clause, proposed and adopted by the signers, was for free entry into the mines involved by all interested parties. Cordial relations as a consequence have always existed in the camp, and free exchange of all information had a tremendous effect in stimulating the growth of the district.

The phenomenal success of the Calumet and Arizona Company had an immediate effect in the district. Realization of the enormous possibilities for widespread ore occurrences was born. The United States Geological Survey investigated the geology of the district in 1900 and the report by Dr. F. L. Ransome in 1902 confirmed this feeling of optimism. A frenzied race for the more favorable ground of the district was the immediate result. Subsidiary companies of the Calumet and Arizona Mining Company were formed to expand its holdings, the Copper Queen Consolidated Mining Company bought many new parcels of land, and numerous new independent companies were formed. This boom in the district lasted for seven years, finally ending with the financial panic of 1907.

The principal subsidiaries of the Calumet and Arizona Mining Company were the Calumet and Pittsburg Development Company, the Lake Superior and Pittsburg Development Company, the Pittsburg and Duluth Development Company and the Junction Development Company. These companies were reorganized as mining companies as soon as ore was found, and in 1907, they were merged

into the Superior and Pittsburg Mining Company, which was operated under joint management with the Calumet and Arizona Mining Company. Finally in 1915, the two were merged by exchange of stock into the Calumet and Arizona Mining Company.

In 1901, the Lowell group was bought by the Copper Queen Consolidated Mining Company and larger ore bodies were found. This group, in 1900, had been optioned to Senator Clark of Montana, but the option was surrendered before ore was encountered.

The most successful new independent venture was the Shattuck Arizona Copper Company organized in 1904 by Lemuel C. Shattuck of Bisbee and associates to develop a group of claims south of the Uncle Sam Mine of the Copper Queen Company. The principal financial backers of this venture were Thomas Bardon and A. M. Chisholm of Duluth, Minnesota. The Shattuck shaft was started in August 1904 and was sunk to a depth of 800 feet. Drifting on the 700 and 800-foot levels encountered high grade ore in 1906. An aerial tramway was constructed and ore shipments to the Copper Queen smelter at Douglas commenced in 1906. The mine was developed and large ore bodies were blocked out in the next five years, and small shipments were made. A smelter was contemplated but in 1913 it was decided to enter into a smelting agreement with the Calumet and Arizona Mining Company. Regular shipments were commenced and were continued, except for short intervals, until the exhaustion of the property in 1930. Lead-silver ore was discovered in the upper levels of the mine in 1911, which developed into a large ore zone. In 1917, experimental work was undertaken on the sulphidizing and flotation of lower grade portions of this ore in the test mill of the Copper Queen Company, loaned for that purpose. A satisfactory method was developed and in 1918, a 400-ton mill was built near the Denn shaft. The mill was operated for a year and was closed in

1920 due to unfavorable market conditions. It was reopened in 1925 and was operated continuously until 1929.

The Denn Arizona Development Company was organized by Lemuel C. Shattuck, Maurice Denn and associates in 1905 to prospect a group of claims north of the Junction Development Company ground. This company was financed largely by Shattuck-Arizona stockholders. The company was reorganized as the Denn-Arizona Copper Company in 1907. Small bodies of oxidized copper ore were found, but due to heavy pumping expenses the mine was closed in 1910. It was reopened in 1917 and the shaft was sunk to a depth of 1,800 feet, and considerable new ore was found and shipped. The mine was again closed in 1920 due to the collapse of the copper market. In 1925, the Shattuck-Arizona and Denn-Arizona companies were merged into the Shattuck-Denn Mining Corporation. The sinking of the Junction shaft to the 2,200 foot level, and the installation of a huge pumping plant on that level, allowed for the further sinking of the Denn shaft without undue pumping burden. Sinking commenced in 1926, and the shaft was carried down to the 2,000-foot level. A drift from the 1900 foot level passed through the top of a rich sulphide ore body in 1927. Diamond drilling proved up a large ore body bottoming below the 2,200 foot level. The shaft was then deepened to the 2,200 foot level and the ore body was blocked out for stoping, which commenced in 1929.

In 1930 and 1931 diamond drilling was commenced below the 2,200 foot level in another part of the ground and a second rich sulphide ore body was encountered.

The Wolverine and Arizona Development Company was organized in 1903 by W. H. Brophy of Bisbee who enlisted financial aid from John Daniels and associates of Calumet Michigan. The gound secured is south of the Shattuck-Arizona group, and extends through the backbone

of the mountains to the south slope where it adjoins the White Tailed Deer Mine of the Copper Queen. Work was started on the southern end of the group with a shaft. Considerable lateral work was done but no ore was found. In 1905 the company was reorganized as a mining company, and diamond drilling was commenced on that part of the ground close to the Shattuck-Arizona line. Ore was encountered in one of the holes. To mine this ore from the shaft at the south of the property was not feasible. A tunnel had been driven by Thomas Higgins to develop a group of claims to the northwest of the Wolverine ground. This tunnel was leased and extended into Wolverine ground, and the ore cut by the drill was developed and mined from the tunnel from 1906 to 1911. For several years after the exhaustion of this ore body the property lay dormant. In 1917, a lease was given to local miners on a part of the ground adjoining the White-Tailed Deer Mine on the south slope of the mountains. An ore body was found and was mined intermittently from 1917 to 1930.

The Higgins or Twilight group of claims was one of the earliest groups located in the camp in the early 80's by a local miner, Thomas Higgins. The group is situated at the extreme west end of the camp. Higgins slowly developed the ground by means of a tunnel for over ten years, without encountering ore. In 1903 the group was optioned to the Higgins Development Company. This company sank a shaft near the mouth of the tunnel and did a considerable amount of drifting and diamond drilling without finding commercial ore. The option was surrendered in 1905 to Thomas Higgins, and work was abandoned. In 1912 a local group of merchants obtained a lease on part of the ground and very shortly encountered a small sulphide ore body. Shipments by the leasing company continued until 1915 when Thomas Higgins decided to develop the ground himself. The shaft was reopened, and from 1915 to 1920 two large

high grade oxide ore bodies were found near the Copper Queen line. In 1921, the ground was sold to the Phelps Dodge Corporation.

Other ventures started during the first boom period up to 1907 were the American Saginaw, Calumet and Cochise, Bisbee, Queen, Warren Development Company, and numerous other companies, none of which found ore and were abandoned in 1907 or shortly afterwards.

The American Saginaw ground was bought in 1929 by the Calumet and Arizona Mining Company. The Calumet and Cochise was bought by the Warren Development Company and this last company was absorbed by Phelps Dodge Corporation in 1927.

The Bisbee Queen ground was purchased in 1925 by the United Verde Extension Mining Company of Jerome. Considerable work was done but no ore was found, and the property was again abandoned.

Other companies which were formed to develop widely scattered groups of claims were the Bisbee West, Cochise, Copper Glance, Houghton Development Company, (operating the Solomon Springs group) and numerous other smaller ventures. Results of work were negative for all of them, and they were abandoned after short development campaigns.

In 1922, the Ivanhoe Copper Company was incorporated to develop a group of claims to the southeast of the Warren Development Company ground. After a year's development with shaft and lateral work showing negative results, work was stopped.

Porphyry Ore

The principal ore bodies of the camp have consisted in the past and continue to consist of high grade massive ore replacing limestone. The ore is, in general, intimately associated with intrusive porphyry. The largest mass of this intrusive rock outcrops in the center of the

productive area in a much iron-stained hill known as Sacramento Hill. This large porphyry core was for thirty years left unprospected and was condemned as barren. The success of the "porphyry copper" mines of Bingham, Morenci, Miami, Ray, Chino, and Nevada, led in 1909 to a decision by the Copper Queen Company, who owned the greater part of the outcrop, to explore the porphyry for comparitively low grade disseminated ore. The first work was started in July 1909. The central hoisting shaft of the company, the Sacramento, was sunk in 1904 on the southeast end of the porphyry. Its position was chosen as being safely in the footwall of any possible ore of the limestone replacement type. The shaft cut several hundred feet of 1.5 percent copper ore, but the value of this material was not recognized, and no accurate records were kept at the time. In July 1909 a drift on the 400-foot level was started to prospect that end of the porphyry mass for disseminated ore. This drift cut 120 feet of 2 percent ore. Raising and cross-cutting from this find demonstrated a considerable deposit of ore of 1 to 2 percent grade, on the edge of what was later proved by churn drilling to be a large low grade ore body known as the Sacramento Hill East Ore Body.

In July 1911 work was pushed into the western end of Sacramento Hill from the 200-foot level of the Holbrook Mine. A cross-cut from the first drift broke into a pocket of loose ore and water. 419 tons of 5.13 percent ore ran out into the drift and was shoveled up from this first run of ore. Shortly afterwards a second cross-cut, west of the first, cut good grade ore. This was the start of the development of the Sacramento Hill West Ore Body. A prospect shaft was sunk to facilitate the development of the ore body and considerable drifting and raising on two levels soon demonstrated the existence of a large comparatively high grade ore body of the disseminated or "porphyry" type. In January

1914 the decision was reached to discontinue prospecting from underground and to develop the two ore bodies by churn drills. The West Ore Body was fully developed by the end of 1915 and in 1916 the drills were transferred to the East Ore Body. The West Ore Body contained a core of rich ore surrounded by an envelope of lower grade ore. The top of this ore body was at a moderate depth from the surface. The East Ore Body, a much larger one, lay at a greater depth from the surface and consisted in general of lower grade ore. At the end of the drilling campaign in 1917, it was decided to mine the richer and shallower West Ore Body by steam shovel. In April 1927 the first shovel was installed to start stripping the cap rock, and by 1921 operations had exposed sufficient ore, and work was suspended to await the completion of the concentrator.

A 4,000-ton mill using combined gravity and flotation was constructed under the supervision of F. Kenyon Burch. Excavation for the foundation started in the summer of 1918. Due to delays in deliveries of material, the concentrator was not completed until August 1921. The rapid collapse of the copper market, which started at that time, made it inadvisable to commence production, and the closing of the smelters in 1922 still further delayed the project. The finishing work on the concentrator was started in January 1923 and the first unit was put into operation in April 1923, fourteen years after the first discovery of ore. The West Ore Body was excavated by the shovels to within about 100 feet of the bottom by 1929. The remainder of the ore body was mined by glory-holing into raises driven from a drift from the Sacramento Shaft.

The concentrator was remodeled from time to time, and the capacity enlarged and the efficiency increased by metallurgical improvements. A rich portion of the East Ore Body was prepared for underground mining in 1924 and this ore was ent to the concentrator with that of the West Ore Body. Mining of the lower grade portion of the East Ore Body commenced in 1929.

Lead Mining

The first discovery of lead ore was made on the Hendricks claim of the original Altanta Company in 1879. A few small shipments were made in 1880 to the lead smelter of the Tombstone Milling and Mining Company at Charleston and to the Benson Smelter.

No further mining was done until 1908. In that year a lease was granted by the Copper Queen Company on a showing of rich lead-silver-copper ore in the Uncle Sam Mine, and in 1910 leases were granted by the same company on lead-silver showings in the Gardner and Southwest mines. These three leases proved so profitable that, on their expiration, the development of the ore in the Southwest and Gardner mines was started on company account. Several large ore bodies were found of high grade oxidized lead-silver ore in both mines.

In 1911 lead ore was found of the same type in the Shattuck mine, the history and developments of which have been given in previous paragraphs. In 1917 smaller deposits of lead-silver oxidized ore and in 1922 sulphide deposits of lead-zinc ore were developed in the Junction and Briggs mines of the Calumet and Arizona Company, and a considerable tonnage of ore was shipped.

Until 1923 all lead ore was shipped to outside reduction works. In that year the Phelps Dodge Corporation decided to smelt its own lead ore and to compete for the custom lead business of the Southwest. A smelter was built at Douglas, and a small flotation mill to treat low grade ore was built at Bisbee in 1929. The mill was closed after a few months run and the smelter was closed in 1930 on the collapse of the metal markets.

Very little lead-silver and lead-zinc remained in 1930.

Manganese Mining

During the World War the demand for manganese ore by the steel works increased to such an extent that the price reached a very high point. Small rich phosphorous-free deposits had long been known as scattered outcrops over a large area of the camp. Mining of these by lenses and later by the Copper Queen, Calumet and Arizona, and Higgins companies started in 1917, and continued until the Armistice in 1918. The most important single operation was that of the Higgins, where the deposit proved unusually large and high grade. Mining was again started on a smaller scale by a lense on the Higgins deposit in 1925 and was continued through 1930, when work was again stopped due to large Russian importations, and to the attendant drop in the price.

At the end of 1929 there remained in the district three large operating companies: the Phelps Dodge Corporation Copper Queen Branch, the Calumet and Arizona Mining Company, and the Shattuck-Denn Mining Corporation. All three companies have ore reserves developed well in advance of production, insuring a long life for the district.

The total production from 1902 to 1929 inclusive was 3,549,961,215 pounds of copper, 1,098,094 ounces of gold, 41,125,322 ounces of silver, 148,425,188 pounds of lead, 14,169,579 pounds of zinc, and 42,397 tons of 35 to 45 percent manganese ore, with a total value of $651,320,364. Adding to this the early production up to 1902, the district produced through 1929 $699,806,377. The Bisbee district will undoubtedly yield a gross production of over one billion dollars eventually, entitling it to be classed as one of the major mining districts of the world.

The amount of dividends and profit yielded by the district is hard to obtain exactly due to the impossibility of unraveling the Copper Queen share of the Phelps Dodge dividends. The total can be

conservatively placed as at least $222,500,000.

Details of the production of the camp by years and by individual companies are shown in the Appendix.

Chapter 3

HISTORY OF JEROME

The Verde Mining District, in which are the ore deposits of Jerome, is situated on the northeastern slope of the Black Hills. This range of mountains is a northwest-trending range about 40 miles long, about 20 miles to the northeast of the city of Prescott. The range borders on the Colorado Plateau from which it is separated by the Valley of the Verde River.

At the time of the settlement of Prescott in the early 60's, the whole of that part of the Territory was most inaccessible. Gold and silver mining alone was economically possible. The nearest railroad point was Kansas City. After the building of the Southern Pacific Railroad from Los Angeles to Casa Grande and Tucson, in the middle 70's, Prescott was brought to within 150 miles of the railroad at Maricopa, but it was not until 1881 that the Santa Fe main line was built. Even this line still left Prescott 80 miles away. To add to the operating difficulties, the Apache Indians were a constant menace until the late 70's. Under these adverse conditions copper prospects were generally passed over.

It was not until 1875 that the copper outcrops of Jerome were brought to the attention of prospectors. The credit for the discovery was given to Captain John D. Boyd and Al Seavers of Fort Whipple. No locations were made until the following year when a party headed by John O. Doegherty and John P. Kelly from Prescott entered the district and on February 19, 1876, the Chrome Southwestern was located and recorded.

In the same year the Azure Northwestern, Eureka, and Wade Hampton were located. The last two locations were made by M. A. Ruffner, a prospector living at a settlement in the Verde River Valley. These two claims covered the original outcrop of the United Verde Copper Company.

Ruffner was financed by George and Angus McKinnon for a two thirds interest in the claims. A crosscut tunnel was driven to the vein by them and a 45-foot shaft was sunk on the outcrop. The claims were then sold to Hugo Richards, a Prescott merchant.

In the fall of 1879 General John C. Fremont, at that time governor of Arizona, whose capital was then at Prescott, visited the district with a party of which George W. Maynard of New York was a member. Maynard's description of the trip appeared in the Engineering and Mining Journal of March 13, 1909. His account is as follows: -

"Dr. Douglas's interesting and instructive article in the Journal of February 20, 1909, on the early history of the Copper Queen suggests that a statement about the beginnings of another great mine in Arizona may prove of interest.

"In September, 1879, I went to Arizona to examine a number of mines and prospects which Gen. John C. Fremont, at that time governor of Arizona, had brought to the attention of New York capitalists. The Southern Pacific railroad then had no connections with eastern roads at the south, so that to reach Arizona one had to travel via San Francisco, through California to Yuma and then east to Tucson, which for many months was the terminus.

"My destination was Prescott, at that time capitol of the territory, the nearest railroad to which was Maricopa, about 150 miles away. The stage was a canvas-covered hack of the variety known as a 'jerky'. We

pulled out at 8 o'clock at night. The one other passenger was a Wells Fargo messenger who produced a rifle after crossing the Gila, the reason being that the stage had been held up there a few nights before. The town of Phoenix, now the capitol, consisted of about a half dozen abode houses and the Palace Hotel, a combination of canvas and planks. In comparison with other western mining towns, Prescott was really attractive with its spacious plaza, court house, and general air of neatness.

"For about two months my time was taken up in visiting neighboring mining districts and in the examination of more or less developed properities and prospects.

"General Fremont accompanied me on nearly all my trips, which were made with exceptional comfort due to the kindness of General Wilcox, then in command at Fort Whipple, who loaned us a roomy army ambulance, a span of big mules and a driver. The daily intercourse with General Fremont, enlivened by his accounts of his early explorations, will always be treasured as the most delightful experience of my early western work.

"The work in the field was followed, on our frequent returns to Prescott, during the long evenings by the brilliant conversation and Washington reminisances of Mrs. Jessie Benton Fremont, the daughter of Senator Benton. Taken altogether that two months in Arizona was equivalent to a liberal education. On completion of the work for my New York clients, and as I was about leaving Prescott, I was asked by one of the Prescott merchants if I would go into the Black Hills, about 30 miles north of Prescott and look at a copper prospect which he owned there. As the statement about the property appealed quite strongly to General Fremont we made an early start one morning, the General's son

Frank accompanying us. We reached the foot of the mountain in the evening and camped that night. The following morning we took to the saddle and soon reached the summit of the ridge from which we had a view of the Verde Valley made brillient by the rising sun, an experience which can never be blotted from one's memory.

"As all of my note-books and copies of reports bearing upon my Arizona work at that time are burned in a store-house I have to rely on my memory for the following details of my examination. The outcrop and definition of the vein on the narrow plateau on the summit of the ridge was most impressive from a miner's standpoint. The outcrop projected well above the surrounding surface, and was made up of malachite, azurite, chrysocolla, and cuprite, a veritable flower garden, for a width of 15 feet. There had been but little surface stripping. For a short distance down the hillside the outcrop was readily traced but was finally lost sight of under a heavy growth of chaparral. The strike of the vein was apparently across a gulch but could not be definitely traced without tools for cutting down the undergrowth and breaking up the surface. About 100 feet vertically below the outcrop an adit about 50 feet in length had been driven 5 or 6 feet into the vein at right angles to the strike. My impression is that it had not passed through the vein. In this crosscut there was considerable chalcopyrite and some chalcocite.

"The outcrops and also the ore in the adit were sampled, in the latter case the copper sulphides being separately assayed. The assays showed no precious metals in the oxidized ores, but did give 10 oz. silver (with no gold) in the sulphides.

"On my return to Prescott I informed the owner that he undoubtedly had the making of a good mine but that as it was a smelting proposition

nothing could be done at present, for the reason that there was no fuel in the country and ore could not be shipped when the nearest railway was 180 miles distant. As the Atlantic and Pacific road, now the Santa Fe, was beginning to be talked about, I advised him to hold on. To this he responded, 'I am hard up and if you can let me have $10,000 within the nex 60 (?) days, I will deed you a half interest in the mine'.

"On the strength of this proposition I sent a statement of my investigation to a party in New York who, with others, was to pay me in about 90 days a considerable sum of money for some steel patents, asking for an advance of $10,000 on account for the purpose of securing the half interest in the mine. The telegraphic answer to my letter read: 'Take my advice and have nothing to do with mines'.

"That mine is the United Verde."

Governor J. C. Fremont's report of November 20, 1879, to the Secretary of the Interior, Carl Schurz, describes the trip to the Black Hills. According to his account the party consisted of his son Francis Fremont, Professor Maynard, the owner of the Wade Hampton, Mr. Hugo Richards, and himself. The party left Prescott September 29, 1879, and reached Ruffner's camp the following day. Ruffner's camp was situated about a mile from the mine and about 150 feet above. The camp was located at the site of a good spring. Fremont reported the ledge to have a north-south course and to be followable for 7 miles. The work on the ledge had been concentrated on the outcrop south of the ravine. In his report Fremont includes the following extract from Maynard's report: -

"On the line of the ledge wherever there has been any digging to the depth of a few inches, boulders of malachite and cuprite with veins

of copper glance in the cuprite are found, together with detached masses of country rock. The ledge has been exposed at two points on the surface and stripped at right angles to its course for a width of fifteen feet. Two samples of ore were selected from openings No. 1 (the upper opening), the ore mainly malachite and copper glance and the other cuprite. The assays were made by two local assayers, with the following results: copper in malachite and copper glance, 42.44 percent; one determination of silver gave 1.21 ounces and the other 7.29 ounces to the ton. Sample No. 2, principally cuprite: copper 36.60 percent; silver, 6.05 and 4.86 ounces.

"No. 2 opening is fifteen feet wide by about nine feet high, the ore mass being made up of boulders of malachite and cuprite, and is almost devoid of barren rock. The ore was samples across the entire face and assayed in copper 57.88 percent, the two silver assays being respectively 2.91 and 3.64 ounces.

"A tunnel has been driven below the lower open cut, with a due north and south bearing, one hundred and forth one feet in length. The tunnel enters the mountain through a talcose slate and a deep red clay, carrying small boulders of malachite and cuprite, and in the tunnel there are occasional boulders of quartzite. One hundred and twenty feet from the mouth angular masses of ore were struck for the first time, inbedded in red clay. At the face of the tunnel and in the roof the boulders and masses were more compacted, but I failed to find the usual characteristics of a properly constituted vein or lode either in the tunnel or short cross-cuts east and west, the former being 6 feet 5 inches and the latter 10 feet 7 inches long. I was not able to find any semblance of wall rock; the cross-cut must decide this. The appearance of the lode, if it be one, is that of a great crevice filled with highly ferruginous clay bedding huge boulders of ore. It is probable that the workings, which at the time of my visit were only eighty feet below the surface, are

still on the back of a lode, and that in the depth the copper will be found to occur as a sulphuret. This view is strengthened by the fact that small masses of sulphurets have already begun to come in. For example, in the cross-cut I picked out a nodular mass of pyrites which on assay was found to contain copper 4.88 percent, and silver, by one assay, 43.74 ounces, and by an other, 49.84 ounces, an unlooked-for result. I could not find any other similar masses. The red clay from the west drift assayed copper 172 percent, silver 2.43 ounces, and a very ferruginous piece from the roof at the end of the tunnel, copper 9.04 percent, and silver 3.93 ounces and 3.64 ounces. At the mouth of the tunnel on the dump there must be 25 to 35 tons of boulders of the same character already mentioned, extracted from the tunnel in the course of the driving. I do not consider that these are sufficient data to determine whether this is a true lode or not, but that there is a very large body of exceedingly rich ore there can be no question.

"I am informed that several tons of surface ore were smelted at a rude works on the Agua Fria Creek, two tons of ore being smelted for one ton of block copper. This product I have had assayed for the purpose of determining in a larger way the amount of silver contained in the surface ore, the result, 17.10 ounces = $21.99; too small an amount to be paid for by the copper smelters. There has been too little development to determine if the tenure of silver will increase in depth, but it may be well to make two grades of ore, one rich enough in silver to pay for parting, and the other as free from the silver-bearing ores as possible. Future developments can alone determine the true course to be adopted. It may safely be assumed that the ore will average 25 percent in copper without any close selection, and that, consequently four tons will produce one tone of black copper containing 95 to 96 percent."

Fremont reported a second parallel ledge 150 feet away and a third ledge a quarter of a mile away. He also reported that by the time of writing his report, November 20, 1879, the tunnel had been extended a total distance of 262 feet, with the face and sides in solid ore, that the workings showed a width of at least 40 feet, and that the limits had not yet been reached.

The extreme isolation at that time of that part of Arizona is well brought out be the foregoing accounts. In 1881 the Atlantic and Pacific Railroad, later absorbed by the Atchison, Topeka and Santa Fe system had built a second transcontinental road through Arizona, making Prescott and the neighboring mining districts more accessible. Even then the Verde District was very far from transportation, being about 80 miles by rough roads to the nearest railroad point at Ash Fork.

The United Verde Copper Company was organized in 1882 by Governor F. A. Trittle and associates, who enlisted New York capital. The secretary and treasurer of the company was Eugene Jerome of New York. Early in 1883 two 42-inch water jacket furnaces were built and a camp established on the hill slopes south of the outcrop. The camp and mine hitherto known as Wade Hampton, was rechristened Jerome, after the New York officer in the company.

The first two years were spent in developing, mining, and smelting the rich oxidized ore of the outcrop. The smelter turned out black copper and matter rich in silver.

The report by H. C. Burchard, Director of the Mint, for 1884 states: "The mines owned by the United Verde Copper Company, at Jerome, have proved a series of surprises to the owners. The properties were purchased and worked as copper properties, but as they have been developed they are found to contain silver in large quantities, in fact so large that the silver is sufficient to pay all the running expenses of the mine, leaving

the copper as a profit to the owners.

"Superintendent Thomas writes that another rich strike has been made on the Wade Hampton, one of the company's mines, on a drift from the 100-foot level, 25 feet north of the last body of ore struck on the same level. The extent of it has not been ascertained, but the first samples taken assayed 20% copper and rich in silver. In every direction that drifts or crosscuts have been run, ore bodies have been encountered. The furnace has run up to October 1st, 1884, and Superintendent Thomas gives the product by assay at the mines 4,396,951 pounds of refined copper and 237,951 ounces of silver. Estimating the average price of copper at $250 per ton, the gross yield of copper amounts to $548,500, and the silver at its coining value, $1.29 per ounce, amounts to $307,655". In the same report Burchard stated that a divident was paid of $60,000 in 1884.

The copper production for the United Verde is given in the Engineering and Mining Journal of January 3, 1891 as follows:-

1884	3,680,000	pounds
1885	---------	"
1886	---------	"
1887	272,124	"

The figure given by Burchard probably includes the 1883 production. The account of the property by Maynard, in which he reported sulphides at about 100 feet in depth, probably accounts for the shutting down of the smelter at the end of 1884, as matte smelting was a process little understood in Arizona, although practiced early in Butte.

No work was done on the property until 1887 when Governor Tritle obtained a lease and operated the smelter and mine for a short period at a financial loss.

The property was visited at frequent intervals by James Douglas for Phelps Dodge and Company, and in 1886 he obtained an option on the property. At that time the nearest railroad point was Ash Fork. The large outlay in railroad building seemed to him unjustified and the option was not taken up.

According to T. A. Rickard, writing in the Mining and Scientific Press, Vol. 116, 1918, the mine was first brought to the attention of Senator Wm. A. Clark of Montana by seeing samples of the ore exhibited at the New Orleans Exhibition of 1884. In 1886 he, as chief creditor of the Post Orford Copper Company of New Jersey, took over and operated its refining works. In the records he found that shipments of black copper had been made from the United Verde Mine. He then sent Joseph L. Giroux to examine the property. The mine was, at that time, optioned to James Douglas. On the expiration of the option Giroux recommended it to Clark. In 1888 the Santa Fe completed the railroad from Ash Fork to Prescott, bringing the mine to within 30 miles of the nearest railroad point. In that year Clark purchased a 70% interest, and started further development and mining. Operating conditions were bad as roads were poor. During the winter months the works had to be shut down, and freight was very costly. Nevertheless, the production for the first four years was large, according to the Engineering and Mining Journal of January 2,1892, and amounted to the following:-

1888	3,200,000	pounds	of	copper
1889	1,923,738	"	"	"
1890	5,475,573	"	"	"
1891	6,591,182	"	"	"

Clark early foresaw that improved transportation facilities were necessary for successful operation, as the ore was rapidly changing from

oxide to sulphide. A narrow-gauge railroad was completed in 1894, operated by Clark under the name of the United Verde and Pacific Railroad connecting the mine with Jerome Junction on the Ash-Fork-Prescott branch of the Santa Fe Railroad.

In 1891 a new smelter of 160-tons capacity was started, completed April 1st, 1892, and a 1200-foot extraction tunnel connecting with the 500-foot level was completed by the end of the year.

After the building of the railroad in 1894, the smelter was further increased by adding an additional 150-ton unit, making a total of 310 tons, and by 1895, 400 men were employed at the camp.

In 1896 a reverberatory furnace was built which was enlarged in 1897. The mine then produced between 30,000,000 and 40,000,000 pounds of copper a year, and treated about 60 tons a day of rich chalcocite and oxide ore. About 1,000 men were employed.

The surface works, including the smelter, were all built over the ore-body. In 1894 the first mine fire broke out on the 400-foot level. This did not cause much trouble at the time, but new fires started in 1897 on the same level, and on October 7, 1900, the first serious trouble was experienced when a bad cave-in occurred, causing $100,000 damage to the surface equipment. In August 1902 a new fire started on the 500-foot level, which gained such headway that it was found necessary in September to shut down the mine and smelter. A few men were kept on to bulkhead the burning area. The mine was not reopened until January 1903. No further trouble was experienced until the spring of 1905, when the exceptional spring rains of that year caused an explosion in the burning stopes. Several miners were killed and the smelter foundation was damaged.

In 1905 the mine had been developed to a depth of 900 feet. Considerable ore above the 500-foot level was tied up by the fires and although

this ore was being mined by the plenum system, whereby the smoke was held back by working under air pressure, this method was expensive. The smelter and other surface equipment were continuously in danger from subsiding ground. The decision was made to drive a 6600-foot extraction tunnel to connect with the 1,000-foot level, and on its completion to build a new smelter in the valley of the Verde River, and scrap the old surface equipment. It was then contemplated to mine the fire stopes above the 400-foot level by steam shovel. The extraction tunnel was started that year, but was not put in operation until 1914. In the meantime, a new shaft was sunk and raised, and haulage levels laid out at regular intervals. These were electrified, and a series of staggered ore passes were driven from each haulage level. The new shaft was equipped with skips and was concreted throughout.

In 1911 the firm of Repath and McGregor, which had designed the new Calumet and Arizona smelter at Douglas, was retained to build a new smelter on the Verde River. Construction started in 1912.

The old narrow gauge line connecting Jerome with Jerome Junction could not serve the new works, and in 1911 the Santa Fe was induced to build a broad gauge line from Cedar Glade, down the Verde River Valley to the site of the smelter. This was completed in 1912. The United Verde Company constructed a broad guage line from the mouth of the extraction tunnel, christened the Hopewell Tunnel, to the smelter. Clarkdale, a model townsite, was established on the river, and a crushing plant was built at the tunnel portal. This work was all completed in 1915, and the old smelter abandoned. The new works, consisting of reverberatories and blast furnaces had a total capacity of 3,000 tons.

Before the changes were made, the mine for many years had maintained a steady yearly production of between 30,000,000 and 40,000,000 pounds

of copper. In 1916 the output was increased to 58,299,573 pounds, and 2,200 to 2,500 tons were treated daily. In 1917 the output was further increased to 71,726,634 pounds.

In February 1918 work on enlarging the smelter was started, and completed in 1919. Six large reverberatories fired by powdered coal were added to replace the blast furnaces. Twelve new roasters, and two Great Falls converter stands, and additional waste heat boilers were also added. When complete the capacity was nearly double that of the old plant, permitting the treatment of 5,000 tons of ore a day.

During 1917 and 1918 a winding broad guage railroad was under construction between Clarkdale and Jerome. When this road was finished, the old narrow gage, United Verde and Pacific line, was abandoned, and the tracks pulled up. Work on excavating the side of the hill at the elevation of the 500-level entrance tunnel was commenced to make room for a new surface plant, to consist of machine shops, power plant, charge house and mine offices. At the same time work was started cutting back into the hill for slopes above the proposed pit which was to start at the 300-foot and continue to the 400-foot level.

In April 1921 the United Verde together with most of the larger copper producers of the country decided to entirely cease copper production until the large copper surplus was reduced. On May 1st the smelter was closed, and only development work kept up on the mine. Advantage was taken of the shut-down to expedite the work on new construction and the stripping of the overburden over the fire area was vigorously pushed. The smelter was reopened June 1st, 1922, and was operated during the remainder of the year on a curtailed basis. In 1923 the output of the mine and smelter was increased to about 8,000,000 pounds of copper a month. In 1921 a new crushing plant was started above the smelter. This was completed

in December 1923. By this time the shovels had reached the burning stopes and a large tonnage of chalcocite ore and natural calcines was smelted.

In 1924 experiments were started on the treatment of silicious sulphide ore by flotation, the object being to eliminate excessive silica. Experiments were conducted at the mill of the Southwest Metals Company at Humboldt. In August 1925 the design of a 1,000-ton concentrator was started by H. Kenyon Burch, and the plant situated above the Crushing Plant, at Clarkdale, was completed in 1927.

In 1928 a research department was added to the organization, looking towards further metallurgical improvements.

The mine has been developed to a depth of 3000 feet below the outcrop, and at the bottom level shows no diminution in either grade or size. Waldemar Lindgren in Bulletin 782, U. S. G. S., "Ore Deposits of the Jerome and Bradshaw Mountains Quadrangles, Arizona", states: "The United Verde deposit is beyond doubt the largest pyritic deposit in the United States, and certainly one of the largest in the world. . . . I know of no other single primary pyritic mass of ore which equals it in size and richness. The mechanical equipment of this mine is probably better than that of any other copper mine in the world"

The mine, in the early years of the Clark regime, was developed under the management of Joseph L. Giroux. In 1904 he was superceded by Will L. Clark, and the recent improvements have been made under the supervision of Robert E. Tally who assumed the management in 1921. Throughout, all operations were under the careful scrutiny and general supervision of Senator Clark until his death in 1926. Until 1899 the only company operating in the district was the United Verde Copper Company. A little work has been done in outlying small deposits by the company or allied

interests. In that year George W. Hull, a prominent mining man and banker at Jerome, secured control of a large group of claims surrounding the United Verde ground to the south, west and east. A part of this ground, embracing a group of four claims to the east, he retained in his own name as the King Development Co. The remaining claims he used to organize the United Verde Extension Gold Silver and Copper Company, an Arizona Corporation, with 300,000 shares of $10 par value. Louis E. Whicher, of Schofield Whicher and Company of Boston, underwrote 190,000 shares, of which $100,000-worth were purchased by himself. The first work done was to sink a shaft close to the main shaft of the United Verde and to the west of it. No ore was found. In 1900 J. J. Fisher, a United States deputy mineral surveyor, located a small fraction lying to the east of the United Verde ground, adjacent to Hull's King Copper Company ground. This fraction was called the Little Daisy. After failing to find ore or favorable ground in the first shaft, Whicher became convinced that if an extension of the United Verde ore existed it would be to the east of the Verde Fault. The United Verde ore occurs as part of a pipe of massive pyrite replacing schist. This schist is overlain on the hill west of the mine by sandstone and limestone, capped by a flow of basalt. To the east of the ore-body is located a fault known as the Verde Fault, striking northwest, the course of which runs through the town of Jerome. The eastern side is down-thrown, exposing basalt and limestone on the surface east of town. The ore-bearing shist lies under the covering of limestone and basalt. Any ore which might occur on the down-thrown side of the fault in the schist would thus have its outcrop masked by the later formations. Prospecting in this ground is therefore entirely blind. The most favorable of this ground east of the fault is that opposite the United Verde ore-body which was covered by Hull's King

Development Company ground and by Fisher's Little Daisy fraction. Whicher was unable to obtain the King Development Company claims but optioned the Little Daisy for $50,000, and sank a shaft 300 feet deep, 125 feet of which, near the fault, was copper stained. In the fall of 1900 he persuaded Hull to trade all his shares in the United Verde Extension Gold, Silver and Copper Company (110,000 shares) and his King Development Company claims for all the other United Verde Extension claims. A reorganization was then effected, as the United Verde Extension Mining Company, a Maine corporation, for 300,000 shares of $10 par. Fisher accepted 5,000 shares for his Little Daisy claim and was put in as manager.

The shaft was sunk to the 800-foot level, and considerable lateral work was done on the 700- and 800-foot levels. In 1907 C. C. Burger was appointed consulting engineer, serving in this capacity until the end of 1911. By that time sulphide ore of low grade had been encountered in a winze 65 feet below the 800-foot level, a patch of 19% chalcocite ore 5 feet wide and 15 feet long uncovered on the 700-foot level, and a large area of low grade leached ore blacked out on the 800-foot level. In 1911 Fisher's health gave out, and he died at the end of the year. He was succeeded by Thomas A. Varden. In 1910 a further reorganization took place, the new company retaining the old name but increasing its capitalization to 400,000 shares of $10 par.

In 1908 A. J. Pickrell of Prescott purchased stock in the Company from Fisher and served for several years as director. In 1911 the Company's finances again became low and he brought the property to the attention of James S. Douglas, the son of Dr. James Douglas of Phelps Dodge and Company. After an inspection of the workings in December 1911, Douglas obtained an option and offered it to Phelps Dodge and Company. After an investigation, the offer was refused.

Douglas renewed his option, and in the summer of 1912 interested George E. Tener of Pittsburg, one of the organizors and directors of the Calumet and Arizona Mining Company and they took up the option together. The company was reorganized as the United Verde Extension Mining Company for 1,500,000 shares of 50 cents par value, of which the old shareholders received 400,000 shares for the property, Douglas and Tener kept 150,000 shares as promotion stock, paid into the treasury $25,000 for 50,000 shares more, and optioned 400,000 shares, leaving 500,000 shares in the treasury. The 400,000 optioned shares were offered at par to their friends and associates and were quickly subscribed for. The venture thus started with $225,000 cash.

An option was taken on the Jerome Verde Copper Company ground to the north and northeast - ground of great strategic value, lying as it does due east of the United Verde ore body. To prospect the ground to the best ability it was decided to sink a new shaft, 1900 feet east of the Little Daisy. This, the Edith Shaft, was started in June 1913, and it was sunk to the 1200-foot level of the Little Daisy. The first work done was to drive north into Jerome Verde ground. This work proving a disappointment, the shaft was sunk to the 1400-foot level, and work done in Jerome Verde ground on this level. Work was also done to the south and east in U.V.X. ground. No ore was found by any of this work, and the Jerome Verde option was surrendered. The treasury was nearly exhausted, and 50,000 additional treasury shares were offered at $1.00 a share and promptly subscribed for. After considerable work on the 1200 and 1400 foot levels, the treasury again became depleted in the fall of 1914, without any commercial ore having been found. Douglas and Tener advanced $25,000 personally. To satisfy themselves and their friends, a thorough geological examination was made before further work was done. The result of the examination was

adverse, and advice was given to abandon the venture. Douglas still had faith in the property, and he and Tener decided to at least spend the remaining money they had advanced. Shortly after, a crosscut, on the 1200-foot level, went through 5 feet of 45% chalcocite ore. This developed into a narrow ore body 120 feet long which was stoped to a point just above the 1100-foot level, and returned $600,000 gross revenue in 1915. An aerial tramway was built from the bins at the Edith Shaft to a point on the United Verde Railroad, between the Hopewell Tunnel and Clarkdale. Before work could be started on the 1400-foot level under the ore, new pumps had to be installed, as a flow of water greater than the existing pumps could handle was encountered north of the ore on the 1200-foot level. In 1916 cross-cutting off the main drift on the 1400-foot level was started, to try and pick up the 1200-foot level ore. The first three cross-cuts under the north and middle of the ore on the 1200 failed to find ore. Towards the end of the year, a crosscut was started under the south end of the ore, which entered high grade chalcocite at 40 feet and continued in ore for 200 feet. Developments in 1917 showed that this was part of an ore body having a maximum width of 260 feet and a length of 440 feet, with a core of massive chalcocite and pyrite, averaging better than 40% copper. The narrow 1200-foot level ore body was later found to continue to the 1400-foot level further west than anticipated, and to be an offshoot of this large ore body. The main ore body extended to within 40 feet of the 1200-foot level.

While this work was being done, in 1917 a large additional group of claims was acquired; a new shaft, the Audrey, was sunk and raised; a long standard gage extraction tunnel driven, connecting with the 1300-foot level; a 1000-ton smelter designed by A. G. McGregor built in the Verde River Valley, south of Clarkdale; a 3.2 mile railroad built from the mouth

of the tunnel to the smelter; and the townsite of Clemenceau laid out at the smelter. This work was completed in July 1918. During the construction high grade ore was stoped and hoisted at the Edith Shaft, sent down to the railroad over the tramway, and shipped to customs smelters.

At the end of 1919 ore reserves were estimated at 571,400 tons of 15% copper, .025 ounces of gold and 3 ounces of silver above the 1400-foot level. Development work on the 1500-foot level started in 1919, followed in 1920 and 1921 and 1922 by work on the 1600-and 1700-foot levels. The main ore body proved to bottom between the 1600-and 1700-foot levels. By the end of 1922 the reserves were estimated as 1,036,166 tons, averaging 9.7% copper, 2 ounces of silver and 0.03 ounces of gold, above the 1600-foot level.

On May 1st, 1921, the smelter was closed and remained down until March 1st, 1922. Prior to the reopening, an option was taken on the adjoining Jerome Verde ground and considerable prospecting was done in this ground without finding ore. A few extensions of the main ore body were found, but by the end of 1925 the mine had reached the stage of steady mining from blocked-out reserves, and the life was definitely limited to the mining-out of this ore. The reserves at the end of 1927 were estimated at 960,000 tons of better than 8% ore, and there were mined during 1925, 1926, and 1927 a total of 630,591 tons, an average yearly rate of 210,197 tons.

With the initial expenditure by the Douglas regime of $275,000, the mine has yielded dividends of $26,592,500 to the end of 1929 besides a substantial reserve of over $4,000,000 a return on the investment of over 145 to 1. If no further ore is found, the yield should be about $42,000,000, a return on the original investment of over 156 to 1 in a period of about 20 years. The venture has proved one of the most spectacular mining ventures on record.

One of the earliest ventures after that of the United Verde Copper Company was the Iron King Mine, about 4 miles south of Jerome. Ground covering a large gossan outcrop with a maximum width of 600 feet and a length of 1,000 feet was acquired in 1895 by Senator Clark, and work was started in 1896, when a tunnel was driven, under the outcrop, showing copper silver ore. Work was carried on under the direction of Joseph L. Giroux. In March 1900 the Equator Mining and Smelting Company was organized as a West Virginia corporation. In the next four years the property was developed to a depth of 300 feet, a 250 ton smelter was built a mile down the hill, and the smelter and mine connected by aerial tramway. Production started in 1904 and continued to September 1st, 1905. During this time about 1,300,000 pounds of copper were produced, and considerable gold and silver. Since 1905 no work has been done, and the smelter has been dismantled.

In 1899 Col. D. P. Bosworth and associates acquired a group of claims, partly through location, east and southwest of the United Verde ground. These claims were used by Bosworth to organize the Verde Queen Copper Mining Company, capitalized at $1,000,000. On two of the claims there outcropped oxidized copper ore in limestone and basalt. A 40-ton smelter was built in 1900 which was operated a short time, but did not prove profitable. According to Stevens' Copper Handbook Vol. X, p. 1007, the smelter produced two carloads of low grade black copper of about 93% tenor and a small quantity of matte. The mine was developed by the 568-foot Columbia shaft and considerable lateral work.

In 1906 the company was reorganized as the Jerome Verde Copper Co. an Arizona corporation, for 5,000,000 shares of $1 par, the Verde Queen shareholders being given a block of 2,501,000 shares in a single certificate in the new company. Work continued to 1909 when the property was

closed. The mine was reopened in April 1910 and continued working from the Columbia Shaft, which was further deepened to 700 feet.

In 1913 the property was optioned to the United Verde Extension Mining Company, the option running to June 15th, 1915. During this time development work was done on the 800, 1200, and 1400-foot levels of the Edith Shaft. No ore was found and the option was surrendered.

In April 1916 an arrangement was made with the United Verde Extension Mining Company to do 150 feet a month of development work on a cost plus 15 percent basis. Under this arrangement development work was done until December 23, 1917, from the 1400-foot U. V. X. level. In May 1917 the capital was increased to 5,500,000 shares, and 500,000 shares sold at $1.50 each to provide further funds to prospect the ground contiguous to the bonanza U. V. X. ore body. The Columbia Shaft was sunk to a depth of 1060 feet, corresponding with the 1400-foot level of the Edith Shaft of the U. V. X. A small chalcocite ore body was found in the Maintop claim, and in October 1917 shipments were started, and 1,596 tons of 8.8 percent copper ore carrying about 2 ounces of silver and .06 ounces of gold were shipped in 1917 to Humboldt. Shipments were resumed in October 1918, and 3500 tons of 6.7% were mined up to July 1919. Shipments of 300 to 400 tons a month continued to March 1920, when the falling copper market caused suspension of work. All the ore shipped was from the Maintop ore body. Extensive development work on the 1400-foot U. V. X. level and some diamond drill work failed to find further ore.

The total production to March 1920 was about 1,500,000 pounds of copper, 18,000 ounces of silver, and 500 ounces of gold.

On April 18, 1921, a reorganization was effected as the Jerome Verde Development Company, a Delaware corporation, for 1,500,000 50¢ shares, 1,151,000 shares outstanding. The old shareholders were offered one share

of Jerome Verde Development Company for 10 shares of Jerome Verde Copper Company, and an option on 628,078 shares was given to the United Verde Extension Mining Company for $464,039 to be used in settling the indebtedness of Jerome Verde Copper Company and to develop the ground. Over 9,000 feet of drifting and considerable diamond drilling had been done to the end of 1925 without finding new ore. A survey of the ground was made with the Eotuos torsion balance but this work proved negative. A little ore was found near the Verde Fault on the 500-foot level, but has not proved to be of any size. The Maintop ore-body was developed to greater depths and ore stoped and smelted at the Clemenceau smelter. This small ore-body has proved to be the only commercial ore in the ground, and has proved to be the northwest extension of the United Verde Extension ore body.

From 1900 to 1908 several companies were started to prospect ground in the vicinity of the United Verde ore body. The more prominent of these were the Cleopatra Copper Company, the Consolidated King Development and Columbia Copper Company, and the Hull Copper Company, organized by George W. Hull, the original promoter of the United Verde Extension Gold Silver and Copper Company. These three groups, to the south, southeast and west of the United Verde Copper Company ground had considerable work done on them, and produced a few car loads of ore. They were absorbed, after the death of Hull, by the United Verde Copper Company or allied interests. Three other companies were organized and were developed during this period. The Verde Grande Copper Company, one mile south of Jerome, did several thousand feet of development work but found no ore. The Arkansas and Arizona Copper Company was organized in 1906 to prospect ground to the northeast of the United Verde ground, sank a 770-foot shaft, and did several thousand feet of diamond drill work without finding commercial ore. The Pittsburg-Jerome Copper Company was organized in 1904 to develop

a group of claims between Jerome and the Iron King Mine. A 358-foot shaft was sunk and low grade ore reported, none of which was mined.

In 1917, after the United Verde Extension bonanza was found, a rush to the camp resulted and claims were staked for many miles in all directions and dozens of promotions started, most of which were short-lived. Of these the more prominent and better advised were:- The Dadsden Copper Company, sponsored by the Calumet and Arizona Mining Company, the Verde Combination, the Green Monster, the revived Arkansas and Arizona worked by the Goodrich Lockhart Company, and the Duridee and Arizona, which shipped some oxidized copper ore occuring at the surface in limestone and basalt. Except for the last named company, none of the others found commercial ore, and very little work has been done since 1920.

In August 1916, W. F. Starenton, formerly manager of the Congress Mine, and Tombstone Consolidated acquired a group of 20 patented claims known as the Verde King group southwest of the United Verde ground, and organized the Verde Central Mines Inc. for $2,500,000 of $1 shares. Work was started in 1918, sinking an old 200-foot inclined shaft on one of the claims. In June 1921 the Calumet and Arizona Mining Company of Bisbee optioned 1,000,000 shares of the 1,600,000 shares outstanding in return for financing further development work. Additional ground formerly owned by the Venture Hill Mining Company and the Verde Apex Copper Mining Company was acquired bringing the total holdings to 33 claims. In July 1925 5 claims of the Verde Syndicate Copper Company were purchased for $50,000, bringing the holdings to 38 claims.

Most of the work up to the first part of 1924 was done from the inclined shaft sunk to a depth of 1050 feet. On February 1, 1924, a new vertical 3 compartment shaft was started, put down 1476 feet by the end of the year, with levels commencing 125 feet below the collar. By the

end of 1927 this shaft had been further deepened to 1900 feet. A pyritic ore body was developed, with included lenses of commercial copper ore.

In 1928 it was decided to start preparing for production, and a 300-ton concentrator was built and a contract entered into with the United Verde Extension Mining Company to treat ore and concentrates at the Clemenceau smelter. Production started in January 1929 and continued to 1930, and the property was sold to the United Verde Company in 1931.

Shortly after work on the Iron King Mine was started, the neighboring group, covering part of the outcrop, was acquired by Arthur Hendy. He enlisted Connecticut capital and organized the Copper Chief Mining Company to develop the ground. Before 1908 a short tunnel had been driven under the outcrop, opening up oxidized gold and silver ore containing a little copper. The mine had little further work done until 1901, when the tunnel was driven still further and a shaft sunk 380 feet opening up low grade pyritic ore at the bottom. Work was continued on the tunnel under the direction of Hendy and by the end of 1914 had connected with the shaft. A 125-ton cyanide plant was erected in 1915, and production started September 1st. During 1916, 1917, and 1918, the property was operated with the shaft. A 125-ton cyanide plant was erected in 1915, and production started September 1st. During 1916, 1917, and 1918, the property was operated under bond and lease by the Hayden Development Company. In November 1918 the bond was surrendered, and work was continued by the Copper Chief Company. During this time most of the ore was treated in the mill, but some low grade silicious ore was shipped. The mine was closed in 1920 and 1921, but reopened in 1922 and operated through the year. It was closed down during 1923, after running the mill for 3 weeks. The production is given in Weed's Mines Handbook, Vol. XVI, 1925, as follows:-

1916-1918: 71,849 tons yielding $875,800, mostly gold and silver;

3 weeks run May 1923: 780 ounces gold, 12,000 ounces silver

Assuming the proportion of silver to gold the same in 1916 to 1918 as in May 1923, the total, including 23,861 tons milled in 1923, was as follows:-

gold	32,130 ounces
silver	509,240 "

Besides this there was a small yield of copper, gold and silver from ore shipped direct to smelters in 1922.

The property continued development work until the end of 1926, but no work has been done since, and the mill was dismantled and sold.

The Shea Copper Company was incorporated in 1916 to operate a vein west of the Copper Chief-Equator ground. In 1922 a consolidation was consummated with the Grand Island Mining Company owning contiguous ground. Development work was continued to June 1924, and during this time small shipments of copper-silver ore were made to Humboldt in 1918,. 1920, 1921, and 1923. No work has been done since 1924.

The total production of the Jerome district to the end of 1929 has been 2,495,600,000 pounds of copper, 36,223,500 ounces of silver, and 1,049,250 ounces of gold, with a gross value of $458,107,600. The ore reserves at the United Verde mine are very large, and a long life is insured. The district will without doubt eventually produce at least one billion dollars worth of metallic wealth. It is one of the first class mineral districts of the world, and one of Arizona's three districts of this class.

CHAPTER 4

HISTORY OF GLOBE-MIAMI MINING DISTRICT

The mines of the Globe-Miami district are situated near the center of the state. The two principal settlements are the two of Miami, built in the valleys of Pinal Creek and Bloody Tanks Wash. Pinal Creek has its head-waters a few miles southeast of Globe and drains northwestward into Salt River above Roosevelt Lake. Bloody Tanks Wash rises in the Pinal Mountains southwest of the town of Miami and joins Pinal Creek about five miles northwest of Globe. To the east of Globe is the low divide between the headwaters of Pinal Creek and Aliso Creek, the latter flowing southeast into San Carlos Creek and thence into the Gila River into the lake back of Coolidge Dam. To the south and southwest of Globe and Miami are the high and rugged Pinal and Mescal ranges. To the north are the Globe Hills and Apache Mountains beyond. The mineral deposits are found in the Globe Hills to the north and northwest of Globe and Miami. The only good approach to the district is by way of the Gila River and its tributaries. A distance from the Southern Pacific main line of about 120 miles. From all other directions there are high mountain barriers.

Early History

The first prospecting in the district was done in 1874. In that year a truce with the Apaches was effected, and prospectors started into the mountains from Florence, one of the early Gila River farming settlements. The most accessible trail led up the valley of Queen Creek through what is

now Superior, then passed the Silver King mine following the steep Stoneman's Grade. Over the high dacite covered plateau and down into what is now Miami by way of Bloody Tanks Wash. The Southern Pacific had its eastern termines at Yuma, and did not complete its line across the State until ten years later.

One of the first locations in the district was on the Globe lode north of Globe, but no work was done on it after the discovery of the silver ledges of McMillen and Richmond Basin, twelve miles north of Globe. After the first locations were made, Apache warfare again broke out under Cochise and Geronimo, and little work was done until 1878 when, at the death of Cochise, comparative peace again reigned. In that year central and southern Arizona was brought nearer to railroad transportation by the completion of the Southern Pacific from Tucson to Casa Grande.

Active work on the silver mines started in 1879, and a great number of small stamp mills were erected. The principal production was from the Stonewall Jackson and MacMorris mines. The Stonewall Jackson started production in 1878, and was worked continually to the end of 1887. The MacMorris mine started active production in the spring of 1880, and its production period was spectacular but shorter. By May 20, 1881, it had produced $191,400.67 according to the Arizona Weekly Star of that date. The Star reported a total production from the Globe district for the year 1881 as $726,000. By June 1882 the MacMorris was credited with a total of $558,664.98, and the shaft had attained a depth of 600 feet. Shipments were made at the rate of $5000 a week. By November 1882 the shaft had reached a depth of 785 feet. At that depth the value became impoverished. During the remainder of the year 1882 the mine was stripped of all ore and closed down after a total production of $281,024 for the year and a grand total of $636,345.72. The mill was kept running a short time in 1883 on tailing.

Other silver properties operating during the period from 1878 to 1893 were the Centennial, Fame, Democrat, Mexican, Comet, Grand Prize, Silver Era, Turk, East and West Richmond, LaPlata, Silver Nugget, Hannibal, Washington, Robert E. Lee, Little Mac, Stonewall Jackson No. 2, Carlilse, Black Prince, Esperanza, and Providence. Most of these mines either had mills of their own or treated their ore at small custom mills at McMillen or at Bloody Tanks near the site of Miami. According to the Globe City Chronicle there were twenty organized companies in the district in 1880, and the following mills building or operating:

MacMorris	10	stamps
Golden Eagle (gold)	10	"
Champion	10	"
Stonewall Jackson	3	"
Isabella	5	"
Silver Nugget	6	"
Townsend	5	"
Silver Era	5	"
Miami (custom)	10	"
Irene	10	"
McMillen	3	"
Wheatfield	5	"

The U.S. Treasury Report for 1880 credited the district with the following production:

Silver Bullion	$448,000
Silver Ore	21,000
Miscellaneous mines	149,738
Golden Eagle Mill (gold)	80,000
Estimated miscellaneous	200,000
Total	$901,738

The silver production of the district as recorded by the U.S. Treasury Reports and by the Arizona Weekly Star was about $3,650,000 during the period 1878 to 1893. After 1893 the drop in the price of silver and the exhaustion of the rich surface ores caused practically a complete cessation of silver mining in the district.

Early Copper Mining, 1881-1893

The importance of copper in the Globe district was recognized very early, and one of the first locations recorded was in 1874 on the Globe copper ledge north of Globe. Active copper mining however was not done until 1881 after the assurance of the completion of the Southern Pacific across the state, allowing for an easier haul of coke and supplies into the district down the San Simon and Gila River valleys from Willcox. In 1881 tunnels were driven in the Old Dominion ledge in Bloody Tanks, and in the New York and Illinois No.1 claims on the present Old Dominion vein system. The Old Dominion Copper Mining Company was organized that year to work the Old Dominion ledge in Bloody Tanks, and two 30-ton water jacket furnaces were erected.

In 1882 the Old Dominion Copper Mining Company produced 1,940,000 pounds of copper, and two other companies, the Long Island Copper Company and Buffalo Mining and Smelting Company, were organized to work ledges on the present Old Dominion ground north of Globe. Each of these companies built small water jacket blast furnaces and produced about 450,000 pounds of copper.

In 1883 the Old Dominion Copper Mining Company purchased the holdings of the Long Island Copper Company site. The original Old Dominion mine was abandoned. By 1884 Burchard in the U.S. Treasury Report for that year reported the enlarged Old Dominion Smelter as turning out copper at the rate of 10 tons a day. John A. Church reported in 1887 a total production for the Globe district as 2000 tons of copper for the year 1886, chiefly from the Old Dominion Copper Mining Company.

In 1887 the Buffalo mine and smelter was leased to Alex Trippel and was worked by him and his associates until November 1891. At that date, Phelps Dodge and Company purchased the mine and operated it under the name of the United States Mining Company.

In 1891 the Old Dominion Copper Mining Company under the supervision of Arthur L. Walker started a campaign of expansion. A new smelter consisting of three 42-inch round water-jacket furnaces was built, and the smelter and mine connected by Bleichert Aerial tramway. Phelps Dodge and Company started at the end of the year a similar program for the United Globe Mining Company. Operations were conducted at both properties under the greatest of handicaps. English coke was used and all supplies had to be hauled in by teams from Willcox, a distance of over a hundred and twenty miles. Frequent shut downs due to coke shortage were the rule, and only the richest oxidized ore could be mined at a profit. The difficulties were well described in an article in the Engineering and Mining Journal of April 21st and 28th, 1928, by Arthur L. Walker. In the years 1891 and 1892 the production of the district was given by the Engineering and Mining Journal of January 2nd, 1892, as follows:

	1891 Pounds of copper	1892 pounds of copper
Old Dominion	7,030,771	8,019,059
Buffalo	2,302,765	
Total	9,333,536	8,019,059

In 1894 the Gila Valley, Globe, and Northwestern Railroad was organized and started building from Bowie toward Globe. The line was completed to Geronimo, fifty miles from Globe on January 1896, thus shortening the haul by about seventy miles.

In July 1895 the Old Dominion Copper Mining Company was sold for $1,000,000 to the Lewisohn-Bigelow interests of Boston and reorganized as the Old Dominion Copper Mining and Smelting Company. Arthur L. Walker was superceded by S. A. Parnall as superintendent. The mine was closed pending the building of new works costing $35,000. A concentration and leaching plant was added and layer hoists at the mine. Production started in January 1896 on the completion of the railroad to Geronimo. The days

of pioneering and hardship were over.

The copper production of the district in the early period prior to January 1, 1896, was approximately 69,817,523 pounds from 1882 to 1895 inclusive.

Modern History

On the completion of the railroad to Geronimo activities were greatly extended in the district. The principal new field developed was near the site of the present town of Miami, 7 miles west of Globe. As this part of the district is quite distinct from Globe, its development will be treated separately.

I. Globe Copper Hill

After the purchase of the Old Dominion by the Bigelow-Lewison interests, attempts were made to reduce expenses. Wages were cut from $3 to $2.50 and in June 1896 a second cut was made to $2.25. A Miner's Union was formed and a strike declared. Demands were made for a return to the $3 rate and for recognition of the Union. The strike lasted a month. On July 6th work was resumed. The wage scale was put back to $3 but recognition of the Union was denied. Considerable feeling was exhibited against the new superintendent Parnall.

During 1896 the Old Dominion mine was developed to the 8th level, and the first serious trouble with water commenced. The mine continued to produce until April 1892 when the smelter was closed and the construction of a new plant started. The United Globe, operated by Phelps Dodge and Company, continued a campaign of plant construction during 1896, and completed an aerial tramway from the mine to the new 120-ton smelter. Production started in January 1897, and considerable custom ore was treated from the Black Warrior mine near Miami.

During the greater part of 1898 the Old Dominion and United Globe companies renovated and enlarged their smelting plants and in 1899 the Old Dominion installed a large Nordbuy-Corlis compound pump, a new hoist capable of hoisting 2000 feet was installed, and the smelter enlarged by the addition of a 100-ton unit. The mine at the end of the year had been developed to the 850-foot level.

In November 1898 the railroad was completed into Globe from Geronimo.

Towards the end of 1901 the Old Dominion shareholders, led by Towle and Fitzgerald of Boston, gained control of the company from the Bigelow-Lewisohn interests. S. A. Parnall was superceded by F. W. Hoar as superintendent. Charles S. South was elected president of the company.

During 1902 further difficulty was experienced at the Old Dominion with handling the water in the mine. Production was somewhat curtailed on this account. New pumps were installed on the 1200-foot level and the mine was finally drained to this level in 1903.

In December 1903 the Old Dominion Copper Mining and Smelting Company and the United Globe passed into the hands of the Old Dominion Company, a holding company under the control of Phelps Dodge and Company. The two properties were placed under the management of L. D. Ricketts.

The new management started a new smelting plant and extraction shaft in 1903, on the completion of which in 1904 the tramway was abandoned, the ore being loaded directly into railroad cars for delivery to the smelter bins. In 1904 a concentrator was started and completed early in 1905.

After the completion of the new plant the mine produced at a rate of 2,000,000 pounds of copper a month, a yearly rate of 24,000,000 pounds---as compared with approximately 8,000,000 in 1902.

During the prosperous copper market of 1904-1907 capital was attracted to all the older copper districts. In Globe the territory adjoining the Old Dominion holdings was acquired by several development companies, and work started in 1905.

The first of these ventures was the Arizona Commercial Mining Company, organized in 1904 to work a group of claims immediately adjoining the end line of the Old Dominion ground to the northeast. Several shafts were sunk and high-grade ore found at shallow depths. Shipments started early in 1905 and by June 1906 the main Copper Hill shaft had reached a depth of 750 feet and regular shipments of 100 tons a day were being made to the Old Dominion smelter and 50 tons a day of silicious ore to Cananea.

In 1906 a second company was organized to develop the Iron Cap mine, in the same general territory. Work was started in April.

Late in 1906 a third company was organized, the Superior and Boston Copper Company. Work was started in January 1907. Three shafts were sunk during the year and ore developed in the Black Hawk vein.

The Old Dominion during this period was rapidly developed, and its plant still further renovated and enlarged. In 1907 Dr. Ricketts was superseded by G. H. Dowell as manager. The mine at the end of the year had been developed to the 16th level.

During the short panic of 1907, the only mine to close was the Arizona Commercial. All operations ceased at this property in July and work was not resumed until January 1909. The National Mining Exploration and the Superior and Boston continued developing and the latter started shipping ore to El Paso in November 1908.

In 1909 the great activity at Miami, together with a marked improvement in the copper market, had a greatly stimulating effect on the Globe district. In June the Arizona Commercial commenced work on a 500-ton

matting furnace, completed and in operation by October. A railroad spur was built into Copper Hill during the year. The November output of this property jumped to 400,000 pounds of copper.

The Superior and Boston Company increased its capitalization in April 1909 to add to its holdings by purchasing the Collins and Doyle group. Work was done from two shafts, the McGaw and Great Eastern. Regular shipments of ore were made during 1909, and in February 1910 a contract was let to treat the ore at the Arizona Commercial smelter.

The Arizona Commercial smelter continued operations until May 1910 when it was closed, and work confined to development during the remainder of the year. Great expense had been incurred handling the large flow of water late in 1909, and by the end of 1910 2,000,000 gallons a day were being pumped. During the greater part of 1910, the National Mining Exploration Company continued prospecting its ground and in June exposed a 30-foot vein. To finance operations a $100,000 loan had been made from N. L. Amster, president of the Arizona Commercial Mining Company, secured by a mortgage on the property. In September this note was called and the mortgage foreclosed. All work ceased. After negotiations, a re-organization was effected by the incorporation of the Iron Cap Copper Company for $1,500,000 of common shares and $500,000 of 7% cumulative preferred shares retirable at $10 to common. The National Mining Exploration Company stock was assessed 20 cents a share, payable January 19, 1911, and was exchanged share for share for Iron Cap common and received preferred shares for the assessment. The reorganization plans were completed January 1, 1912, and the mine reopened under the management of F. A. Woodwald.

In 1911, due to the financial failure of President N. L. Amster, work at the Arizona Commercial was confined to the first half of the year to developing the property. Negotations were entered into with the

Superior and Boston to sell a one-half interest in the smelter to that company in return for assuming a part of the bonded indebtedness. On the failure of this plan all work ceased in September. In October the company was reorganized and the holders of the $1,000,000 6% bonds were offered shares in the new company. A large block of shares was underwritten to insure working capital. Charles S. Smith, president of the Old Dominion Company, was chosen president. The plans were completed in December.

In February 1912 the Arizona Commercial was reopened under the superintendency of R. R. Boyd. Work was confined to their 800-foot Copper Hill shaft. This shaft was retimbered and equipped with the Eureka steel head frame and large hoist. The shaft was sunk to the 1200-foot level on 1913 and the property developed. An arrangement was made with the Old Dominion Company to treat the ore at the new concentrator on its completion. Regular shipments commenced in October 1914.

The Iron Cap mine reopened in August 1912, and work was confined to the Williams shaft. Ore was encountered on the 600-foot level within a month and shipments started at a small rate to the Old Dominion smelter in September. A contract was let early in 1913 with the El Paso Smelting Works and shipments made of development ore at the rate of a car a week.

The Old Dominion Company in 1912 started work on a new concentrator to use flotation process. This was designed by H. Kenyan Busch, and was completed in October 1914.

The Superior and Boston under the superintendency of C. S. Stoddard encountered high-grade ore in 1912 and regular shipments at the rate of four cars a month were started in April, increased to twenty cars a month in June. Early in 1913 a contract was let with the El Paso Smelting Works and shipments at a rate of a car a day were made in March and a maximum rate of 4000 tons a month in October. By June 1914 ore was shipped at a rate of 100 tons a day.

On the outbreak of the World War in August 1914 a general curtailment of all the Globe mines was effected, lasting until early in 1915 when the unusual war demand started to be felt.

During the war years and up to the break in copper prices in 1921, the Old Dominion, Arizona Commercial, and Iron Cap greatly increased their production rates. In 1917 the Old Dominion and United Globe properties were more closely united. The Iron Cap high-grade ore continued to be shipped to the El Paso Smelting Works and in 1907, lower grade concentrating ore was treated at the Old Dominion concentrator.

During the summer of 1917 operations were much retarded by labor troubles, fostered by the I. W. W. A strike was called July 2nd resulting in almost complete cessation of work until August 16th.

In 1919 the Iron Cap company started constructing a 350-ton concentrator, and during the construction leased one section of the Inspiration mill. This concentrator was completed in June 1920.

From 1915 to 1921 the Superior and Boston mine developed continuously and shipped a small tonnage of ore to the Old Dominion and International Smelter. In 1921 shipments of ore with high silver values were commenced and continued through 1926. Early in 1927 the property closed down due to exhaustion of ore.

In 1921 on the sharp break of the price of copper due to accumulated stocks, all the Globe properties except the Superior and Boston ceased production. The Old Dominion Smelter was closed April 12th, the Arizona Commercial closed in January and the Iron Cap on February 15th. The Old Dominion mine reopened in February 1922 and the smelter was blown in April 15th, having been down a little over a year. The Arizona Commercial resumed production in March and the Iron Cap February.

In 1920 suit was started by the Arizona Commercial against the Iron Cap involving ownership of the western part of the Iron Cap ground. This suit was finally settled in 1925 in favor of the Iron Cap.

In 1926 the Iron Cap concentrator was run only eight months, and for the remainder of the year and during 1927 only high grade ore was shipped. The mine was closed at the end of 1927 due to exhaustion of known ore reserves. The equipment was dismantled and the greater part was moved to Christmas, where the company had acquired control of the Christmas copper deposit. The total dividends paid during the period 1914 to 1926 was $1,060,189.

The Arizona Commercial continued to operate through 1929 but closed down in 1930 due to exhaustion of ore reserves. The property was sold to the Old Dominion late in 1930. The total dividends paid from 1914 to 1928 amounted to $2,345,250.

At the beginning of 1931 there remained at Globe only one producing mine, the Old Dominion Company. This mine had been developed at this time to the 2700-foot level. The grade of the ore was much reduced but cheaper mining methods had been introduced allowing for profitable operations at normal prices. During 1926 the concentrator was remodeled and enlarged to a capacity of 1400 tons a day. In November 1924 the smelter was permanently closed and shipments of ore and concentrator were made from that date on to the International Smelter at Miami. The dividends paid by the Old Dominion and United Globe from 1905 to 1930 inclusive totaled $14,405,260.

II. Miami-Inspiration

The first serious work on the copper-stained outcrops near Miami, seven miles west of Globe, was done in 1896. In August of that year the Black Copper Group in Webster Gulch, 8 miles west of Globe, owned by Havaly, Higdon and Beard, was bonded to James A. Fleming and J. N. Ford of Phoenix. The owners had sunk a 100-foot shaft all in chrysocolla (copper silicate) ore. In October of that year the Black Warrior Copper Company was incorporated by Fleming, Ford, and others for $1,000,000. A quarter of the stock was sold in the east to furnish working capital.

A blast furnace and leaching plant were contemplated. James A. Fleming acted as manager of the company. The Selby and Jewell Mines, located on the Continental Ledge four miles west, were acquired. The ores on this ledge are rich in iron and were to be used as flux for the siliceous Black Copper ore. Development work was started at the Black Copper group by sinking two shafts, and the Jewell tunnel was started on the Jewell claim. The Eagle group, ten miles north of Globe, was purchased during the year. In May 1898 five more claims were purchased from Beard and Howie adjoining their original Black Copper group. Ore from development work in 1897 and 1898 was hauled to the United Globe smelter at Globe. In 1899 the leaching plant was completed. 100,000 tons of ore were reported blocked out by September. The plant operated a month but was not successful and was closed.

In 1900 a reorganization of the Black Warrior Copper Company was effected by consolidation with the Donellan Company. The new company was called the Black Warrior Company Amalgamated. A 100-ton concentrator was started to be run in connection with the leaching plant. The new plant, consisting of concentrator, leaching plant, and reverberatory smelter, was completed in February 1901, but difficulties were encountered and it was not put into commission until early in 1902 after the addition of a sulphuric acid plant. This plant also proved a failure and operations ceased in June, leaving 85 tons of refined copper and 800 tons of sulphuric acid on hand. The plant was reopened in October and run intermittently until August 1903, when all operations ceased.

In June 1898 the Live Oak Copper Mining and Smelting Company was organized to work a group of four claims owned by J. J. Marshall, seven miles west of Globe. This company was promoted by John Kasser of Globe. A 160-foot shaft had been sunk by Marshall showing oxide and silicate ore.

The company, under the superintendency of Kasser, sank a 2-compartment 40-foot shaft and in 1897 shipped a little ore to the El Paso and Silver City smelters. The property then closed down.

In September 1905 Joseph C. Herman obtained a lease on the property from the Company and commenced shipping the silicious oxidized ore to the El Paso Smelting works, obtaining a favorable treatment charge as silicious flux. Herman continued to ship ore until late in 1906, when legal proceedings were instituted by Forest J. Kalsenberg, president of the company, against Herman to oust him from his leases. The suit against Herman was settled in 1907. The property was then again closed. During this period nearly three million pounds of copper were produced from the shipment of high-grade sorted ore.

In 1897 work was commenced on the Keystone Group adjoining the Live Oak to the east. From 1897 to 1905, 1067 tons of sorted rich surface oxidized ore were mined and shipped to various reduction works, with a profit of $37,267.98. In 1905 Joseph C. Herman obtained a bond on the property and sold it for $300,000 to G. C. Campbell of St. Louis. A 25-ton chlorination leaching plant was erected but did not prove an economic success. The company ceased operations in 1907. A judgement of $65,000 was obtained against the property.

In 1904 the Inspiration Mining Company was organized to develop a group of claims adjoining the Keystone. Two tunnels, the Mercer and Woodson, were driven under the iron stained capping, and encountered low grade chalcocite ore. The property was developed under the management of John D. Coplen. In 1906 a 50-ton concentrator was erected to treat the ore developed, and a small tonnage of ore was partly blocked out and a very large tonnage indicated of three percent copper ore and better, and a still larger tonnage of leaner material.

In 1905 Frank C. Alsdorf was sent to Miami by the General Development Company, controlled by the Lewisohns, to examine the Keystone mine, then offered for sale. Alsdorf called the attention of the district to J. Parker Channing, consulting engineer of the General Development Company. He was commissioned to option the most likely-looking group available. A group of thirteen claims adjoining the Inspiration was bonded from "Black Jack" Newman, known as the Oaks-Newman group. Work was commenced in 1905, at first with discouraging results, but in 1906 three percent concentrating ore was penetrated in No. 2 shaft sunk under an iron stained cropping, and a large tonnage of this ore indicated. The property was transferred to the General Development Company in 1907, and the Miami Copper Company was organized to operate it. Channing realized that to make a profit on low grade ore of this type operations on a large scale would be necessary. The company was capitalized for $3,000,000. The stock was put on the market and advertised widely in the press throughout the country. The 200,000 shares advertised were oversubscribed. By 1908 over 5,000,000 tons of three percent ore were indicated. A campaign of churn drilling and underground development was laid out under the direction of J. Parker Channing.

The success of this promotion attracted immediate attention to the district and in 1908 the Inspiration Mining Company was bought for $1,500,000 by William Boyce Thompson, Henry Krumb and associates, who organized the Inspiration Copper Company.

In January 1909 the Live Oak Copper Mining and Smelting Company was bonded from "Black Jack" Newman, then holding an option on the property, by Hoval A. Smith, Henry B. Hovland and associates, who organized the Live Oak Development Company with a capitalization of $500,000. The two compartment shaft was sunk further to prospect under the silicious

oxidized copper stained ore developed by the process operator. Work was done under the supervision of Michael McCarthy.

In 1909 the Keystone Copper Company ground lying between the Live Oak and the Inspiration passed into the control of "Black Jack" Newman on payment of the $65,000 judgement and on signing a bond for $400,000. Newman then sold the property to the General Development Company. The new Keystone Copper Company was organized to further develop the ground.

In October 1909 the Warrior Copper Company was bonded for three years for $1,250,000 to Hoval A. Smith, Henry B. Hovland and associates, who organized the Warrior Development Company.

The Miami Copper Company started plans for production on January 1909. Railroad connections were completed in September, and by the end of the year Channing reported 14,000,000 tons of 2.75 percent ore blocked out in a compact ore body 400 feet thick. A working shaft was started in November.

In 1900 Britton B. Gottsberger was employed as manager of the property and the first working shaft known as no. 4 shaft sunk to the 700-foot level, and the 370-foot working level was completed during the year. A power plant and a 3,000 ton gravity concentration plant were started, designed by H. Kenyon Burch. Work of developing the continuation of the Inspiration ore body in Miami ground was commenced by churn drilling and underground development. In order to forestall apex suits, side-line agreements patterned after those entered into at Bisbee were signed early in 1911 by the Miami, Inspiration, New Keystone and Live Oak Companies.

The first unit of the concentrator was started in March 1911 and the second unit in April, the total capacity of the two units being 1,000 tons. A 5-year contract was signed with the Cananea Construction Copper Company to smelt the concentrates, and the first shipment of three cars of 40

percent concentrates was made April 4th. By the end of the year five units were completed and put in commission. 16,000,000 tons of 2.58 percent ore were blocked out. The sixth and final unit of the concentrator was completed in March 1912 bringing the capacity to 3,000 tons a day. The power plant and the Inspiration-Miami hospital were completed in October.

In 1913 the development of the low grade captain ore body (the continuation into Miami ground of the Inspiration ore body) was completed, bringing the total reserves of ore at the end of the year to 20,500,000 tons of 2.4 percent copper, 17,000,000 tons of low grade sulphur, and 6,000,000 tons mixed oxide and sulphur ore.

In 1909 the Inspiration Copper Company was organized with a capitalization of $10,000,000 with William Boyce Thompson as president, George E. Green as manager and Henry Krumb as consulting engineer. Work started in April with churn drills and shafts, and in July the Black Copper group was optioned, bringing the total acreage held to 550. The principal working shafts were the Jo Bush, Scorpion (Black Copper) and Bull Dog, and work was pushed on the Woodson, Columbia, Taylor, Clipper and Bull Dog tunnels.

In September Thompson sold his interest in the company to the Cole-Ryan interests, and Green was replaced by Thomas R. Drummond as manager.

In 1910 a tunnel was started in Keystone Gulch and the Colorado shaft was started 2500 feet west of the Jo Bush shaft, and by the end of the year the ore body had been proved for a total length of 3800 feet. In December Drummond reported 14,983,000 tons developed and 3,502,100 tons partly developed of 2 percent ore. A test mill was started at the Jo Bush shaft in November to treat 20 tons a day.

The Live Oak Development Company Shaft No. 1 penetrated sulphide ore at a depth of about 300 feet in 1909 and passed through 150 feet

of ore. Blocking of this ore by drifts had developed an ore body 861 feet long and 150 to 200 feet thick by June 1910, and by October there was blocked out 10,000,000 tons of 2 percent ore. In December the capitalization was increased to $1,000,000. A drilling campaign was started in 1910 proving substantial increases in tonnage, and in April 1911, Shaft No. 2 was started to the west of Shaft No. 1. This shaft penetrated ore at 705 feet and continued in high grade ore to a depth of 890 feet. At the end of the year there was blocked out 12,000,000 tons of 2.25 percent ore. Early in December the property was optioned by John D. Ryan and early in 1912 the Inspiration Consolidated Copper Company was organized as a Miami corporation with a capitalization of $30,000,000 to operate the Inspiration and Live Oak Mines. The total ore developed by the two mines was 42,000,000 tons. In July 1912 Thomas R. Drummond was superseded by Charles S. Mills as manager, and the work of equipping the property for production placed under the supervision of H. Kenyon Burch. Twin hoisting shafts were started in June, contracts were let with the Salt River Water Users Association for electric power for Roosevelt and the power line started during the year. After considering numerous sites for the concentrator, the Warrior mill site was purchased from the Warrior Copper Company in June 1912, and excavation started in January 1913. In April of that year the Mineral Separation Company started to test the ore to show the applicability of flotation. In May a 600-ton experimental mill was started to test the flotation process on a large scale. This test plant was completed in December and was turned over in January. During 1914 all railroad spurs and the Roosevelt power line were completed to the mine and concentrator.

In May 1912 negotiations were entered into by the Inspiration looking towards the purchase of the New Keystone ground which separated the Inspiration from the Live Oak. Not being able to reach an agreement,

a connecting drift was started by the Inspiration through New Keystone ground. A suit was filed by the New Keystone seeking to enjoin the driving of this and other drifts. The suit was finally settled in December 1914 adverse to the Inspiration. The New Keystone was then purchased by the Inspiration Consolidated by exchange of nine shares of New Keystone for one share of Inspiration Consolidated, confirmed by New Keystone stockholders in January 1915.

In November 1913 the International Smelting and Refining Company, an Anaconda Copper Company subsidiary, purchased 32 acres of ground from the Miami Copper Company on which to erect a smelter to treat Miami and Inspiration concentrates. Construction started early in 1914 under the supervision of Repath and McGregor. The smelter, consisting of roasters, reverberatories, and converters, was blown in May 8, 1915.

Early in 1914 construction started on an eighteen-unit 14,400 ton concentrator for the Inspiration. The 600-ton experimental unit was run continuously through 1914 and up to the completion of the first unit of the permanent plant in July 1915, having treated a total of 257,272 tons of ore. The last unit of the concentrator went into commission February 21, 1915, and two additional units were added, bringing the final rated capacity to 18,000 tons.

During the development of the Miami, and various units of the Inspiration, numerous other properties were developed principally by churn drilling. The most successful of these was the Southwestern Miami, holding a group of claims adjoining the Live Oak to the west. It was anticipated that any ore found would be deep. A large drill, capable of drilling to a depth of 1500 feet, was purchased in September 1911 and drilling started. The first hole penetrated disseminated sulphide ore at 1110 feet in November and passed through 175 feet of ore. 18 holes

were drilled from 1911 to 1914, averaging 1200 feet in depth and 3,000,000 tons blocked out of 1.25 percent copper. No attempts were made to develop this ore by shafts, and the ground lay idle until 1929 when it was purchased by the Inspiration Consolidated Copper Company.

The Warrior Development Company actively mined the silicious oxide ore of the Black Warrior Mine from October 1909 to October 1911 at the rate of from 75 to 100 tons a day, most of the shipments going to the El Paso Smelting works. The option was surrendered in October 1911. After an attempt at working the mine on company account, it was leased in January 1912 to Fiske and Snell of Globe who mined steadily until January 1920, when the property was sold to the Inspiration Consolidated Copper Company.

In 1910 the Barney Copper Company was organized by J. D. Coplon of Globe to work a group of claims owned by himself and associates. Churn drilling was done in 1911 disclosing a little low grade ore. Early in 1912 the group was optioned to the General Development Company. Three drill holes were put down, none of which found ore, and the option was surrendered in August.

In 1917 a part of the Barney ground was sold to the Porphyry Copper Company organized to work it. The ground of the Porphyry lies immediately north of the Live Oak mine. A shaft was sunk in 1917 and penetrated feet of oxidized ore. On further sinking 85 feet of sulphide ore was penetrated. Considerable work was done in 1919 on the ore and in June 1919 a reorganization including Barney and Porphyry was effected, known as the Porphyry Consolidated Copper Company. In 1921 the property was sold to the Inspiration Consolidated Copper Company for $1,000,000.

III. Schultze, Castle Dome, Pinto Creek, Cactus

These various groups, all lying northwest of Miami, were first developed in 1908 and 1909 by shafts and tunnels, the most extensive

work being done on the Cactus group in 1909 by a 500-foot shaft and lateral work. In 1910 the management claimed to have developed 2,500,000 tons of low grade ore. The Pinto Creek Copper Company, after doing over 2,000 feet of development work, constructed a 100-ton concentrator in 1908, but it was not a success. In 1909 the Cactus and Pinto Creek properties were merged.

In 1912 the South Live Oak Development Company was organized to develop the Schultze group and Castle Dome group. Churn drilling on the first front south of Live Oak proving negative, the drills were moved to Castle Dome ground, and two holes encountered low grade sulphide on below copper stained croppings. The options to the ground were forfeited in October 1913.

From 1914 to 1920 intermittent work was done by all these properties under the direction of T. R. Drummond, formerly manager of the Inspiration at the start of operations. In 1926, experiments were made on modified heap leaking by ferric sulphate and sulphuric acid, and further development work by churn drilling and tunneling was done. A contract was signed with Inspiration in 1928 to treat the ore at the Inspiration concentrator, but the plan was not carried through.

In 1909 the Lost Gulch United Mines Company was organized to develop a group of claims in Lost Gulch, northwest of Globe, as a gold mine. This group had been developed previously by the Girard Mining Company in 1896. The company was promoted by Girard and Kasser. This company was reincorporated in 1897 as the Lost Gulch Mining Company. A mill was erected and a $900 brick shaft was sunk and a 10-stamp mill was erected, but lack of water forced suspension. A reorganization as the Louis d'Or Gold Mining Company was effected in 1912, and this company was again reorganized in 1916 as the Louis d'Or Mining and Milling Company

on the strength of the possibilities of a part of the holdings developing into a porphyry copper mine. Churn drilling was started in 1917 and at the end of 1922 twelve holes had been sunk and there was reported as partly developed, 150,000,000 tons of 1 to 1.5 percent disseminated copper ore, underlying an area 5000 feet by 2000 feet. A two-compartment shaft had been sunk to a depth of 362 feet. Additional ground was acquired in 1923. In 1926 the company was reorganized as the Porphyry Reserve Copper Company. Further drilling was done in 1929 and 1930, under the supervision of T. R. Drummond.

The Miami Copper Company continued uninterrupted operation of the mine during the war years with the exception of a seven weeks shut-down in 1917 due to the strike called by the I. W. W. A new extraction shaft was sunk in 1918 and further drilling was done to delimit the large tonnage of low-grade ore. In 1920 the new extraction shaft was equipped with a crushing plant. During the general shut-down of all major copper mines and plants in 1921, operations were continued on an 80 percent basis, and concentrates stacked at the International Smelter. At the end of 1923 only two years' supply of high grade ore was left. A large tonnage of very lean ore remained, together with a smelter tonnage of mixed oxide and sulphide ore. In order to treat the low grade at a profit, it was seen that a larger daily tonnage would have to be mined and treated. Plant renovations and underground development started in 1924. These plans were completed in the summer of 1925, and by the end of the year it was found that costs were under expectations. The low grade ore body was refigured to meet these low operating costs in 1926 and at the end of the year there were reported 84,576,743 tons of 0.93 percent sulphide ore and 7,000,000 tons of 1.83 percent mixed oxide and sulphide ore. The capacity of the plant had been stepped up to 12,000 tons a day. Further economizings were put into effect in 1927

and the concentrator capacity was increased to 10,000 tons a day, by the addition of a new crushing unit and remodeling the grinding plant. Economies resulting allowed for further refiguring of resources which, at the end of 1927, were reported as 99,609,400 tons of 0.86 per cent sulphide and 7,000,000 tons of 1.83 per cent mixed oxide and sulphide ore assay a life of seventeen years.

The Inspiration Consolidated Copper Company, except for a short shut-down during the summer of 1917, continued uninterruptedly until the break in the copper market early in 1921. The mine and concentrator were closed in March 31st of that year and operations were not resumed until February 11, 1922, and then on a reduced scale. Nearly normal production was reached at the end of 1922. Experiments were started in 1922 on leaching a large tonnage of mixed oxides and sulphides on Keystone and Live Oak ground. These experiments continued in 1923 and 1924 and were carried to a successful conclusion. A 9000-ton leaching plant was started in 1925 to treat the ore by sulphuric acid and ferric sulphate leach, and to precipitate the copper from solution by electrolysis. This plant was completed and put into operation in November 1926, the first ore being charged into the tanks in September. The plant proved so successful that in 1930 it was decided to discontinue concentration and the mill was closed indefinitely, all ore being charged into the leaching tanks. Through the purchase in 1920 of the Warrior and in 1921 of the Porphyry Consolidated and in 1929 of the Southwestern, Miami ground had greatly increased resources. By the end of 1929 costs had been so materially reduced that refigured reserves at a lower copper tenor insured a long life for the mine.

In 1928 the Van Dyke Copper Company, owning a group of claims adjoining the Miami Copper Company to the south and southeast, unwatered

the 1692 foot Rice shaft sunk in 1919 and 1920 and started action exploration work. This group of claims is covered by Quaternary Gila Conglomerate. Diamond drilling in 1917 had demonstrated the existence of oxide ore in the schist underlying the conglomerate. Developments in 1929 and 1930 proved up a large body of oxide ore, and shipments of high grade ore from development work were made in 1929 and 1930 to various reduction works. A large body of lower grade ore was partly blocked out also.

There remained in 1931 five operating companies in the Miami end of the Globe district: The Miami Copper Company, the Inspiration Consolidated Copper Company, both with long production leases assured, the Van Dyke Copper Company with promise of developing into a major producer, the Pinto Valley Company, and the Porphyry Reserve Copper Company, with large reserves of low grade ore in the development stage. The dividends paid by the Miami Copper Company and the Inspiration Consolidated Copper Company from the start of operation up to and including the year 1930 totaled $90,499,928. The total copper produced up to and including the year 1928 amounted to 2 billion pounds, worth $345 million.

Summit District

The Summit district is considered as a part of the Globe-Miami mining territory although generally reported as a separate district. It is in Gila County about 15 miles west of Globe and 16 miles west of Miami. The principal work has been confined to the Gibson vein system. These veins are narrow fissures cutting schist. The ore mined has been rich chalcopyrite, and most of it was hauled to Globe and treated at the Old Dominion Smelter.

The first work done in the district was in May 1904 by the owner of the Gibson mine, S. L. Gibson. It is reported that with an initial

investment of $90 he started stoping and hauling the ore by teams to the Old Dominion Smelter. From May 1st 1904 to May 1st 1906 he had shipped ore with a gross value of $253,194.43. The tenor of the ore averaged 20 percent copper.

The Gibson Copper Company was organized in 1906 by Gibson, Henderson and Copeland, and the mine was opened up. During the years 1906 to 1909 inclusive, a total production of 6,384,493 pounds was made.

In June 1910, the mine was bonded to the Summit Copper Company, organized by W. A. Eaton of Duluth, Minnesota. A vertical shaft was sunk and the vein system opened up at depth, proving a limited quantity of low grade ore in addition to the high grade streaks. A 200-ton concentrator was contemplated but not started. After seventeen months of work, during which a small tonnage of ore was shipped, the bond was relinquished in December 1911.

The Gibson Copper Company reopened the mine early in 1912 under the superintendency of T. Henderson, and a few high-grade shipments were made. In March the mine was leased to Sultan and Wayne of Globe. They shipped a small tonnage of hand-jigged concentrates during 1912 and 1913, and ceased operations in 1914. The owners reopened the mine in 1915 and 1916.

In May 1917 the mine was sold to the Gibson Consolidated Copper Company, virtually a reorganization of the old company. Carefully selected ore was shipped during the high copper market of 1917 and 1918 at a very high operating cost. In 1919 a 150-ton concentrator was built to treat the low grade ore remaining in the mine and stocked in dumps. The mill started in August 1919, but after a short run was closed and the mine abandoned. The equipment was sold in 1926 after a foreclosure suit was filed by bondholders of the company.

In 1928 and 1929 a lease on the dumps of the property was obtained by Harman E. Keyes, and a small concentrator was erected. A few shipments of table concentrates were made in those years but operations ceased in 1930 on the drop in the price of copper.

The total production of the mine from 1904 to 1918 inclusive was about 11,452,000 pounds of copper with a value of about $2,500,000.

By the end of 1929 the older mines of the Globe end of the district were approaching exhaustion after long productive careers. The mines of the Miami end of the district were still in their prime with large ore reserves insuring a long life.

The total production of the district since the start of operations in the early seventies to the end of 1929 has been 3,078,945,952 pounds of copper, 11,104,702 ounces of silver and 112,686 ounces of gold with a total value of $539,776,922. This district is the third major mineral district of Arizona whose output will undoubtedly pass the billion dollar mark.

The detailed production figures are shown in the appendix.

CHAPTER 5

HISTORY OF THE CLIFTON-MORENCI DISTRICT

Early History

The Morenci copper deposits situated as they are near the border of Arizona and New Mexico and far from the early Arizona settlements of Tucson and Prescott were discovered and exploited by prospectors and miners from the closer settlements of Silver City, and Las Cruces New Mexico. The first party to visit the district was an expedition organized by Captain Chase in 1870 to pursue a band of Apaches which had raided a ranch near Silver City. Accompanying the party were two prospectors, Jim and Bob Metcalf. The Indians were trailed up the San Francisco River as far as Chase Creek, near the site of Clifton, and here the party stopped to reconnoiter for fear of an ambush. While searching the hills for signs of the Indians, the Metcalf brothers discovered good gold showings and the rich copper outcrop of the Longfellow and Metcalf copper mines.

The Apaches at this time were on the war path under the leadership of Cochise and Geronimo. Prospecting away from the largest settlements was so hazardous that little was attempted. In 1872 a truce with the Apaches was declared. A prospecting party was organized in Silver City that year by the Metcalf brothers. This party consisted of forty-six men. The party went to the site of Clifton, attracted by the gold outcrops reported in 1870 by the Metcalfs. The gold showings proved disappointing but Bob Metcalf located three claims on the

copper deposits of Morenci: the Arizona Central, Yankee, and Longfellow. Later in the same year he located the Metcalf, Shannon, Montezuma and other claims, and returned to Silver City.

In 1873 the Lesynskys, the principal merchants of Silver City, visited the district and purchased the better holdings of Metcalf in the district, and organized the Longfellow Copper Company. The nearest railroad point was then at La Junta, Colorado, seven hundred miles north of Clifton. The road to La Junta was very rough and led through high mountain passes. The only feasible way to ship supplies in and out of Clifton and Silver City was by bull teams north to Santa Fe following the Rio Grande, and from there following the old Santa Fe Trail east to Kansas City. The total haul was over 1200 miles. Crude ore transportation was out of the question. The Lesynskys had to haul in their merchandise to Silver City from Kansas City, and return empty. Copper was selling at a good price. They decided to smelt the net ore to black copper and haul it to Kansas City as ballast. A small stone furnace was erected near the Longfellow Mine, which was charged by hand and used a hand bellow as blast. This furnace treated two tons a day of 25 percent oxidized ore and turned out about 900 pounds of black copper. a day. In 1874 a new stone furnace was erected at Clifton on the San Francisco River. The copper bars assayed 88 percent. This second furnace treated about ten tons a day and the blast was furnished by a blower run by a water wheel. Operations on this crude scale continued until 1879 when the stone smelter was discarded and three 60-ton and two 30-ton copper-lined furnaces were built on the River. A dam was built to furnish power. A 20-inch gage railroad was built from the smelter up Chase Creek to the mine dubbed the "Baby Gage", and the mine output was increased to forty tons of 20 percent ore a day. The

mining cost was $10 a ton. Chinese miners were used. Clifton was then one of the most lawless settlements in America. Shooting frays and murders were literally everyday occurences. The Chinese miners were paid off periodically, and were almost invariably murdered if they attempted to leave camp for Silver City.

In 1881 the Southern Transcontinental Railroad, now the Southern Pacific, completed its link towards the west as far as Lordsburg, thirty-six miles south of Clifton, and connected with the eastern extending link near Willcox in the same year. Transportation costs were greatly reduced. The richer ore was nearly gone, and the Lesynskys realized that railroad connections were a necessity for further profitable work. The mining of the Longfellow ore body had been by room and pillar method with pillars reduced to a minimum. The mine was about to collapse. At this junction, the property was placed in the hands of F. L. Underwood of Kansas City for sale. The services of William Farish were engaged to examine the mine, and it was sold to Scotch capitalists, organized as the Arizona Copper Company, Ltd. A part of the remaining holdings of Metcalf were bought at the same time. The output of the Longfellow - Copper Company was truly remarkable considering the crude methods employed and the transportation difficulties. 24,914,000 pounds of copper were shipped from 1873 to 1882.

The Arizona Copper Company started with working capital of $4,000,000 and had as its first manager A. E. Campbell. A 36-inch gage railroad was started from Lordsburg to Clifton, the "Baby Gage" road was extended to Morenci and Coronado, a new smelter was started, and the Longfellow mine was extensively timbered and filled to prevent losing a large tonnage of ore. At the end of a year the working capital was nearly exhausted and the mine was mortgaged for $1,800,000 to provide additional

funds. To aggravate the situation the mine caved in 1883, and the last part of the railroad construction up the San Francisco River from its junction with the Gila at Gutherie proved excessively costly. In spite of all difficulties, the railroad and smelter were completed in 1884. The price of copper then started to fall and the company had a hard struggle to make ends meet. In 1892 A. E. Campbell was superseded by James Colquohoun as manager. Colquohoun had previously served as smelter superintendent. A leaching plant to treat the mine rejects was designed under his supervision. It was constructed at a cost of $100,000 and was put into commission in 1895. It proved so satisfactory that it paid for itself in a year and turned out copper delivered in New York at 6.09 cents a pound.

In 1875 the Arizona Central, Yankee, and Montezuma claims were acquired by Captain E. B. Ward of Detroit and William Church of Denver. The Detroit Copper Company was organized to exploit the deposits. After six years of development, a smelter was decided on but the company had insufficient funds to build one. William Church in 1881 went to New York to interest capital in the venture. Phelps Dodge and Company were then engaged in a general metal brokerage business in New York. Although a complete stranger to the firm, he entered the office and boldly asked for funds to build a smelter at Clifton. The firm engaged the services of Dr. James Douglas to report on the mine and to advise them on the worth of the venture. This was the first contact of Phelps Dodge and Company and Dr. Douglas. Dr. Douglas had been to Arizona the previous year and had heard of the Morenci deposits. He then went to Clifton and after an inspection, advised his clients to furnish the desired funds for a minority interest in the mine.

A smelter was built on the San Francisco River three miles south

of Clifton. In 1884 Church decided to abandon the first smelter and build a new one at the mine at Morenci and to pump the necessary water from Eagle Creek, a tributary of the Gila River, six miles east of Morenci.

In 1886 the first exploration of the porphyry was started by the Detroit Copper Company in Copper Mountain, resulting in the development of the first porphyry copper mine in the world. An ore body of 6 percent enriched sulphide and oxide ore was found. To treat this ore a crude concentrator was built by the Fort Scott Foundry, composed of six jigs and four Cornish Bottles. This crude concentrator produced 35 percent concentrates. It was not a financial success however and when the richer contact ore bodies were nearing exhaustion in 1892, Church became discouraged, sold out his interests to Phelps Dodge and Company and retired.

In 1893 the Arizona Copper Company started searching for prophyry ore and discovered large ore bodies in Humboldt Mountain. The first, or No. 1 Concentrator, was started using Blake Crusher, Huntington Mills, and Frue Vanners. The capacity, originally 500 tons, was increased to 700 tons a day and the plant went into commission in 1895. It produced 20 percent concentrates, and the tailing, 1.25 percent copper, was remarkably clean for the type of plant. This concentrator proved a great financial success, and by the end of the year the $1,800,000 mortgage of the Arizona Copper Company was paid off and the first dividend of 5 percent was paid to the stockholders.

Recent History

On the retirement of William Church from the management of the Detroit Copper Company, Dr. James Douglas took charge of the mine for

Phelps Dodge and Company. Charles P. Mills was transferred from the company's Commercial Copper Company to Morenci to act as manager. In 1900, after larger ore bodies had been found in Copper Mountain, a new concentrator was built, designed by Dr. L. D. Ricketts, and a new smelter was built at Morenci. In 1901, a narrow gage railroad was built from Guthrie to Morenci. At the time, this road was one of the engineering wonders of the world. It was built up the sides of a steep canyon. To overcome the excessive grades, the rails were partly laid on high curved trestles, and the track looped over itself repeatedly. The curved trestles were later replaced by switch-backs.

In 1899 a group of claims north of Metcalf, whose position was extremely inaccessable, was acquired by Nathan L. Amater and associates of Boston. The group was further augmented by purchase of claims from the Arizona Copper Company. The Shannon Copper Company was organized to exploit the ground. Nathan L. Ameter was president of the company and John W. Bennie was appointed manager. For two years the property was developed by tunnels and shafts and the mine was connected to the Coronado Railroad of the Arizona Copper Company by a long incline. A smelter site was purchased north of Clifton and a concentrator and Smelter were constructed. The smelter was blown in May 1902 but was shut down in September to await the completion of the concentrator. Both plants went into commission early in 1903.

In 1909 an auxiliary railroad company was formed to connect the bottom of the mine incline with the reduction plant at Clifton, known as the Shannon-Arizona Railroad Company, built at a cost of $600,000. The line was very costly, necessitating a great deal of rock work and a 900-foot tunnel.

In 1901 two groups of claims in Metcalf were acquired by English capitalists, who organized the Standard Copper Company (reorganized in 1903 as the Standard Consolidated Copper Company, and the Clifton Consolidated Copper Mines of Arizona, Ltd. The Standard Copper Company was managed by Col. D. S. Casey. The mine was connected to the Coronado Railroad by a 3200-foot wire-rope tramway with a drop of 800 feet. A little rich ore was shipped by burros to the railway in 1902 and was treated at the Shannon smelter. Regular production started on the final completion of the Shannon reduction plant early in 1903. The property shipped regularly until the end of 1910 when it was closed. The total production was about 3,000,000 pounds of copper.

In 1902 a third company was organized to develop a group of claims adjoining the Clifton ground. This company was financed by Boston capitalists and was known as the New England Copper Company. The chief promoter was Arthur F. Ayling who was president and manager of the project.

In 1903 the Clifton and New England properties were consolidated and placed under the management of Ayling with C. C. Burger as consulting engineer. A 20-inch gage thru-mile incline was built in 1904 and 1905 to connect the mines and the Coronado Railroad, and the different veins of the two properties were developed. Production commenced in 1906, and the ore was smelted at the Shannon Smelter. Shipments were continued through 1909 at the rate of about a million pounds of copper a year. In 1910 the mine was bonded for eighteen months to the general Development Company, but the option was not exercised.

In 1912 the New England and Clifton Copper Company and the Standard Consolidated Copper Company were purchased by the Detroit Copper Company in the Coronado Mining Company, controlled by the Shannon Copper Company.

The Coronado Mining Company, whose principal mine was the Emerald, was promoted by William Boice Thompson, and was managed in the first two years by Harry L. Westlake. T. H. Probert was retained as consulting engineer.

The three larger companies of the district continued to produce regularly until the outbreak of the World War when they were closed for six months. All three reopened early in 1915. Due to the restlessness caused by the war and by the revolution in Mexico, the Mexican employees of the camp started trouble during the early part of 1915. Conditions went from bad to worse during the year, and in September conditions became so chaotic that the mines were closed. The properties were reopened February 1916, and were operated through the year under considerable difficulty due to threatened labor trouble. The situation became steadily worse and culminated in July 1917 in a general strike and threatened violence. The mines and reduction works were closed and the managers were forced to leave camp. Martial rule was declared and the mines were reopened in 1918.

The Shannon Copper Company at the end of 1918 had exhausted its better ore, and closed down. In 1919 its Morenci and Clifton holdings were sold to the Arizona Copper Company. The total production of the Shannon from 1902 to 1918 inclusive was 197,500,000 pounds of copper, 2,761,741 ounces of silver and 19,372 ounces of gold.

The Arizona Copper Company and the Detroit Copper Company continued to produce until the end of 1920 when the post-war depression forced suspension. The ground owned by the two companies were interlocked in a complicated way which prevented the exploration of the ore bodies to the best advantage, and necessitated much duplication of work. The

relations of the two were always cordial due to the waiving of the Federal mining statute by signing of mutual side line agreements. The Arizona Copper Company was a British Company and as such had a heavy double taxation burden to meet. Taxes in both England and the United States were much increased during the war. During the 1920 shut-down negotiations were entered by both companies towards a consolidation, and early in 1921, the Phelps Dodge Corporation absorbed the Arizona Copper Company by exchange of A. C. stock for Phelps Dodge treasury stock. This left one large company in the district, thereafter known as the Phelps Dodge Corporation Morenci Branch.

Operations were resumed in 1921 under the management of H. P. Hodgson. The old Detroit Copper Company concentrator and smelter were abandoned, and the Coronado mine of the Arizona Copper Company was closed. Operations were concentrated at the Humboldt Mine, and the ore was treated at the Arizona Copper Company concentrator, the sixth to be built by that company since concentration was started in 1895. The concentrates were smelted at the Arizona Copper Company smelter at Clifton. The railroad line from Lordsburg to Clifton was transferred to the El Paso and Southwestern, the Phelps Dodge owned railroad, and the narrow-gage Guthrie-Morenci line was abandoned.

Under the new management drastic economies were introduced in mining the large Humboldt ore body formerly shared by the two companies. A caving method was evolved that embraced new features in that type of mining method. Safety work was stressed amongst the Mexican employees, which resulted in vastly improving the morale of the camp.

Before the consolidation it was known that a large low grade ore body existed in the porphyry northeast of the Humboldt mine. This ore body, known as the Clay, was also owned jointly by the two companies.

After the consolidation it was systematically developed by churn drilling and has proved to be one of the largest ore bodies of the porphyry type in the world. In 1926 experiments were started in the treatment of the ore, and a satisfactory process was evolved. There has been proved over 300,000,000 tons of ore which will warrant the eventual construction of a very large plant to exploit it. When this is accomplished Morenci will rank as one of the world's largest copper mines.

From the start of operations in 1873 to the end of 1929 the camp has produced 1,896,008,600 pounds of copper, 2,674,300 ounces of silver, and 76,500 ounces of gold, with a gross value of $305,543,900.

After the exploitation of the Clay ore body, it is almost a certainty that Morenci will have produced well over a billion dollars worth of minerals, adding another district of the first order to the State, which already boasts of three of this class.

CHAPTER 6

HISTORY OF THE RAY-HAYDEN CHRISTMAS DISTRICT

This district or region is composed of two separate mining districts, and a milling and smelting town. The principal mining center is at Ray, situated in the valley of Mineral Creek, a tributary of the Gila River. The mining camp of Christmas is fifteen miles southeast of Ray at the southeastern end of the Dripping Spring Mountain Range which forms the eastern boundary of the Ray district. The town of Hayden, on the Gila River at its junction with San Pedro River, is eighteen miles by road southeast of Ray and seven miles southwest of Christmas. Here is located the concentrator of the Ray mine and the smelting works for both camps.

The mineral deposits of the district were comparatively inaccessible in the early period of prospecting, and were in the midst of the principal mountain strongholds of the Apaches. It was not until after the cessation of active Indian warfare that they were found by prospectors.

The first locations made in the Ray District were in 1879 or 1880. In 1880 it was reported that rich oxidized copper ore was being developed, carrying a high percentage of native copper. The first prospectors entered the district from the Silver King mine fifteen miles north. During the first copper mining boom in Arizona in 1881 after the completion of the Southern Pacific Railroad, a company known as the Pinal Copper Company was organized to exploit the deposits, financed by New York capitalists. A smelter was erected at Ray and a small production in bullion was made in 1881. The feed for the furnace was carefully cobbed native copper and black oxide ore and was reported as running between 50 and 60 percent copper.

In 1883 the company was reorganized as the Ray Copper Company. The mine was further developed and a substantial tonnage was reported of ore of 7 to 15 percent grade. A smelter and concentrater were built at Riverside on the Gila River, about at the site of Kelvin. No production was made as the price of copper started to drop in 1884, and continued on its downward course to a low of 9 1/2 cents in 1886 when all work was discontinued at the camp.

The copper deposits of London and Christmas Mountains east of Mineral Creek were discovered about the same time as those of Ray. The holdings were acquired in 1883 by Dr. James Douglas of Phelps Dodge and Company, and the San Carlos Copper Company was organized to exploit them. A small blast furnace was erected at the Christmas Mine in 1884, but all work was abandoned after a small production had been made. The boundary of the San Carlos Indian Reservation was known at the time of location to be near the property, but the exact boundary was uncertain until 1884 when surveys showed that the mines were within the Reservations and not subject to mineral location.

No further work was done in the area until 1898 when the Ray Copper Company claims were purchased by a British syndicate organized as the Ray Copper Mines Ltd. The property had been further developed in the interim and a developed tonnage was reported of 190,000 tons of 4 percent ore. This company expended a large sum of money in road construction between Red Rock and Kelvin, a distance of 43 miles, built a 5-mile narrow-gage railroad from the mine at Ray to the Gila River, constructed a 250-ton concentrater and shops at the River, and established the town of Kelvin there. A smelter to treat the concentrates was built at Kelvin which was never blown in. A few shipments were made of concentrates, hauled to Red Rock. About 16,000 tons of ore were treated. The grade of the ore,

however, had been greatly overestimated and was found to be about half that reported. An examination of the property was made in 1901 and thorough resampling established the grade beyond question as about two percent instead of four percent as originally estimated. There was no profit in treating material of this tenor on the scale of operations planned, and the company closed the mine and plant after the smelter at Kelvin had been partially destroyed by fire.

After the abandonment of work at Christmas in 1884, Dr. Douglas attempted to have that part of the San Carlos Indian Reservation known as the San Carlos Strip, containing the mineral showings and Deer Creek coal fields, taken off the Reservation. Influence was brought to bear in Washington, but no action was taken when the Strip was divorced from the Reservation by the decree of President Roosevelt until December 1902. The claims at Christmas and London Mountains were relocated by the Chittendons who organized the Saddle Mountain Mining Company to exploit the copper showings and to develop the Deer Creek coal fields south of the Gila River. The old smelter was blown in and a test run on Christmas ore proved it to be virtually self fluxing. A new smelter was built of the Mitchell Hot Blast type with a capacity of 225 tons a day. The Christmas mine was further developed and superficial work was done at the coal deposits.

In 1905 the development of the mines and coal fields was responsible for the organization of the Arizona Eastern Railroad Company to build a line from Phoenix to Florence and from Florence up the Gila River to the junction of the San Pedro River at Winkelman, five miles southwest of the Christmas mine.

After the completion of the railroad the whole district became very active. The success of the new porphyry deposits of Utah, Nevada, and Miami, in exploiting low grade concentrating ore, together with the great improvement

in the copper market added further incentives to an investigation by capitalists of this mineralized area.

In the Ray district, the first work done was by the Big Lead Mining Company organized in 1905 by H. B. Twitchell to develop a group of claims adjoining the Ray mine. A small production of high grade surface ore was made in 1906. In 1907 the Kelvin Reduction Company was organized to lease the ground of the Big Lead and to leach the oxidized ore by a patented process known as the McIntosh Process. A final reorganization as the Kelvin-Calumet Copper Company was consummated in 1907. A leaching plant was erected between Ray and Kelvin and a small production was made of precipitates, but the venture was not a financial success.

In 1907 D. C. Jackling and associates of the Utah Copper Company obtained control of most of the holdings of the British Company and organized the Ray Consolidated Copper Company. Philip Wiseman and Seely Mudd were engaged to develop the mine. The remaining part of the ground was acquired by the same interests, organized as the Gila Copper Company. The Kelvin-Calumet ground was purchased in 1909 by the General Development Company through the advice of J. Parks Channing, and the Ray Central Copper Mining Company was organized to develop this area. A fourth company, the Arizona Hercules Copper Mining Company, was organized in 1906 to develop ground adjoining the Ray holdings to the east.

The Ray Consolidated and Gila Copper Company ground was partly developed by churn drills in 1907 and 1908 and a reserve of 3,000,000 tons was reported of between two and three percent ore by June 1908, and 50,000,000 tons by the end of 1909 of 2 percent ore. The Ray Central ground was prospected by drills in 1909 and in 1910 and over 7,000,000 tons of ore were developed.

In 1910 the Gila and Ray Consolidated companies were merged, and in 1912 the Ray Central Copper Mining Company was absorbed by the Ray

Consolidated, thus bringing the greater bulk of the mineralized ground under one ownership.

In 1909 plans were started by the Ray Consolidated to bring the property into production. Three large operating shafts were sunk and about 30 miles of underground work was driven in the succeeding two years.

A large tract of land was purchased on the north bank of the Gila River at its junction with the San Pedro River, and three 1000-ton units of an 8000-ton concentrator were completed by the end of 1910. The old narrow-gage line between Ray and Kelvin was rebuilt as a standard-gage line and was operated by a subsidiary Railroad Company known as the Ray and Gila Valley Railroad Company. Plans were laid by the Ray Consolidated to build a smelter at Hayden in 1909, but arrangements were eventually made with the American Smelting and Refining Company whereby that company agreed to build a custom smelter at Hayden to treat the concentrates at a satisfactory rate. The first unit of the concentrator went into commission in March 1911, and the smelter was blown in early in 1912. The total expenditures of the Ray Consolidated was about $10,000,000 in mine and plant, before production started.

In 1905 after the completion of the railroad, production started at Christmas, by the Saddle Mountain Mining Company. A production of four and a half million pounds of copper was made in the form of 65 percent matte. It was planned to construct a narrow-gage railroad line from Winkelman to a point on the river a mile and a half below the mine and to construct a 500-ton smelter there. Part of the grading was done on the railroad, but the work was not completed.

In 1909 the property was sold to the Development Company of America, controlled by Frank Murphy of Prescott. A subsidiary company known as the Gila Copper Sulphide Company was organized. The Arizona Eastern

Railroad Company extended its line three and a half miles up the river from Winkelman and the mine was re-equipped. On the failure of the Development Company of America in 1912, work was discontinued.

In 1915 a lease on the property was obtained by the American Smelting and Repairing Company to supply the Hayden Smelter with lime much needed to flux the Ray concentrates. An aerial tramway line was built about a mile long, connecting the mine with the railroad terminal, and production started in 1916. The lease was discontinued in 1918 although a favorable smelting contract was continued. About 14,500,000 pounds of copper was produced under the A. S. & R. lease, all produced during the abnormal War prices.

The company, after the failure of the Development Company of America in 1912, found itself in financial straits and in 1913 issued $1,000,000 in mortgage bonds, underwritten by the Union and New Haven Trust Company, due in April 1918. Part of this issue was retired, but the company went into voluntary bankruptcy in April 1918 and was run by the receivers until late in 1919 when a reorganization was effected. The new company reopened the mine in 1920 and shipped ore at the rate of about 250 tons a day until April 1921, when the property again closed. The bonded indebtedness outstanding was underwritten by the State Street Trust Company of Boston, due in October 1926. One of the stipulations was that an annual sinking fund was to be deposited of $100,000. On the failure to meet this condition the bond-holders started foreclosure proceedings in 1925, and the property was sold at sheriff's sale and bought by a committee of the bondholders. The property was reopened under the management of F. A. Woodward, Manager of the Iron Cap Copper Company of Globe, acting for the committee. Shipments were started under the old smelting agreement with the Hayden Smelter. The principal bondholders were the Mineral Products Company, a subsidiary

of the Iron Cap Copper Company. In December 1926 after the exhaustion of the Iron Cap Mine, the stockholders of the Iron Cap organized the Christmas Copper Company to take over the assets of the Gila Copper Sulphide Company. The new company re-equipped the mine, and in 1929 started the construction of a 400-ton flotation concentrator at the mine, connected by a mile pipe line with a filter-plant at the railroad terminal. The company continued to ship a small tonnage of ore as flux to Hayden, but after the completion of the mill most of the ore was concentrated. A large diesel-run electric power plant was erected at the railroad terminal. The mine continued to produce at the expanded rate until late in 1930 when the plant was closed, and only a small tonnage was shipped to Hayden to fulfill the Smelter contract.

The Ray Consolidated Copper Company concentrator was completed to its full capacity early in 1912, and the mine continued to produce until April 1921 when the property was closed, together with most of the copper mines of the United States. The property again went into production in 1922, at first on a reduced scale, and continued to operate as the Ray Consolidated until May 1926, when it was merged together with the Chino Copper Company and the Nevada Consolidated Copper Company. Due to economics in mining and milling introduced since 1921, the grade of profitable mill heads has been greatly reduced, allowing for the inclusion of a large tonnage of material not originally estimated as ore. The present reserves of this lower grade ore are very great ensuring a long life for the mine.

The Arizona Hercules Copper Company which was organized at the same time as the Ray Consolidated started developing its ground adjacent to the Ray ore body in 1910. After drilling 27 holes and proving the existence of an ore body of about 3,000,000 tons, no further work was

done until 1915 when the property was reorganized as the Ray Hercules Copper Company. An examination of the property was undertaken by Henry Krumb who reported about three and a half million tons of 2.36 percent ore. Further drilling was started and by the end of 1917 a developed reserve of 10,000,000 tons was claimed and an added tonnage expected. Work was started in 1916 to bring the mine into production. A working shaft was sunk, a mill-site two and a half miles north of the Gila River was purchased for a concentrator, a railroad was built connecting with the Ray and Gila Valley Railroad near Kelvin, a diesel-run electric power plant was built, with transmission lines to the mine and mill, a 1200-ton flotation concentrator was constructed. Production started in August 1918 and continued at irregular intervals until May 1920. A total of about 6000,000 pounds of copper was produced, but the costs were high and the venture was not a financial success. In 1922 a reorganization was effected as the Ray Hercules Mines Company. The new company re-opened the mine in 1923 and increased the capacity of the concentrator to 1800 tons. Production started in March, but was discontinued in August and the property was again closed.

In 1924 the property went into bankruptcy and was sold at sheriff's sale in November and was bought by a stockholders protection committee. In February 1927 it was purchased by the Nevada Consolidated Copper Company.

In December 1916, a group of claims 2 miles east of Ray on the southwest slopes of the Dripping Spring Mountains was acquired by the Ray Silverhead Company, organized by J. H. Page. Geologically the ore occurences on the property are quite different from those at Ray. The ore occurs as replacements of limestone by silver bearing lead ore. Production started in June 1917, and was continued regularly until

December 1918. Intermittent production was made in 1919, 1920, 1921 and 1924, and the property was leased in 1929 to the Phelps Dodge Corporation and a small tonnage was shipped.

At the end of 1929 there were two operating companies in the area: the Ray mines of the Nevada Consolidated Copper Company at Ray and Hayden, and the Christmas Copper Company at Christmas. Both companies have ample reserves to ensure their operation under normal conditions for many years. The total production of the Ray-Christmas district from 1881 to 1929 inclusive, most of which was mined after 1911 was 1,121,669,300 pounds of copper, 741,660 ounces of silver, $26,450 and 23,199,690 pounds of lead, with a total gross value of $200,970,700.

CHAPTER 7

HISTORY OF THE AJO DISTRICT

Ajo enjoys the distinction of being both the oldest and the youngest of the large copper districts of Arizona. It is the oldest in that the first attempt at mining copper in historical time was made there, and it is the youngest in that it contains the last large copper mine to be developed into a successful venture.

The green-stained hills of the Little Ajo Mountains attracted the attention of the prospector at an early date. They were probably first noticed by those forty miners who took the Camino del Diablo route to California. This route, one of the shortest by most hazardous of the many early trails, started from the Sonora towns of Magdalena and Ures through the altar country to Sonoita on the present international border, 35 miles south of Ajo. From Sonoita, the last watering place, the route followed the present international border to Yuma through the most inhospitable of deserts with no reliable water holes and sparse forage. The route was used in preference to the longer one following the Santa Cruz and Gila Rivers to avoid hostile Apaches, and also to save time.

The first American locations were made in 1854 after the Gadsden Purchase ceded that part of Arizona south of the Gila River. In 1855 the first incorporation on Arizona soil was made at Ajo, by San Francisco capitalists, known as the Arizona Copper Mining and Trading Company. The principle promoters of this venture were Major Robert Allen, Colonel Porter and J. Downer Wilson. Work was started before the completion of

the survey of the Boundary Commission. The correct location of the International boundary was not known. Ajo was claimed by the Mexican authorities to be south of the line, and troops were sent from Ures, the capital of Sonora, to Ajo to oust the Americans. An eye witness, Peter R. Brady of Florence, thus described the episode to Professor Blake, and was reported by him to the governor in 1880.

The Arizona Mining and Trading Company first tried careful hand-sorting, and shipped ten tons of high grade oxidized ore to Yuma by ox team whence it was transferred to flat boats and went to Guaymas, and was shipped to Swansea, Wales. This shipment is said to have yielded $400 a ton. Expenses were however greater than the yield and in 1856 a reverberatory furnace was built at the mine at a cost of $30,000. Due to lack of suitable flux, and to the great expense of coke and charcoal, this furnace did not prove successful and only 100 pounds of copper was produced. Freight rates were very high. The rate to San Francisco was nine cents a pound or $180 a ton. At the end of 1856 the property was abandoned and eventually sold at sheriff's sale to satisfy the caretaker's lien of $5000.

The inaccessibility of the deposits and the lack of a visible water supply prevented any real work from being done for many years. The fame of the deposits, however, brought many to Arizona in the late 70's and early 80's, and thus contributed to the exploitation of the other Arizona copper camps. It was not until 1894, forty years later than the first venture, that a second attempt was made to exploit the deposits. A number of stock companies formed in that year, and a little shallow work was done, and stamp mills and small concentrating plants were erected to treat the high grade oxide and enriched sulphide stringers on the edge

of the present New Cornelia disseminated ore body. By 1904 two companies remained in the field, the Ajo Copper Mountain Mines Company, controlling the original Ajo Mine, and the Cornelia Copper Company, controlling the Shotwell Mine. Both companies held options from Thomas Drak and Sons.

The Cornelia Copper Company was incorporated on May 14th, 1900, by St. Louis capitalists, headed by C. W. Chamberlain, H. W. Mann, and J. T. Boddie. A. J. Shotwell was manager of the property. Shallow development work was done for six years in the area covered by the disseminated ore body and by 1906, 25,000,000 tons of 10 percent ore was claimed in sight. In that year, the directors of the company, St. Louis business men with no mining experience, were made the victims of a most fantastic patent smelting scheme by the "inventor" and promoter of the scheme, a "Professor" F. L. McGahan of Fort Worth, Arkansas. Quoting the prospectors of the Cornelia Copper Company, as reported by the 1907 Copper Handbook, McGahan described his "process" as follows: "In treating and smelting mineral ores and iron in a vacuum, the nitrogen in the air is excluded from coming in contact with same, practically eliminating all slag and the necessity of fluxing, furthermore none of the vapors or fumes being allowed to escape, the full values contained in the ores are secured, thus every bit of carbon and other volatile substance forming fuel quantities uniting with pure ox-hydrogen, whereby great economy is secured in the reduction of all ores.

"In addition to this many other minerals are saved which under the present systems of smelting are destroyed or allowed to escape through the stacks.

"Ox-hydrogen gas is produced out of water by super-heating steam and by introducing this gas combined with a small amount of carbon into a vacuum, the phenomena of perfect combustion is produced - the hydrogen

flame - at once the greatest heat agent known to science and the cheapest fuel obtainable.

"This gas will burn in the vacuum, forming a perfect heat arc (similar to that in the present electric furnace) and will produce a degree of heat sufficient to volatilize any known material.

"The ores are treated just as taken from the mines and there is no expense of crushing, and the values are extracted as chemically pure and condensed metals. The gold and silver being pure bullion bars, can be sent direct to the mints, and coined when properly tempered.

"Five to twenty percent more of the values in the ores are extracted and at a cost not exceeding one-half as compared to the present methods of smelting.

"Iron is also treated by this system and a homogeneous steel of the finest grade made out of the same at a great reduction of the present cost, or it can be run out of the furnace, moulded and cast into a maleable iron requiring no annealing."

The company spent about $30,000 building a McGahan plant at Ajo in 1906, but finally realized the utter worthlessness of the scheme, and in May, 1907, submitted charges in the federal courts against McGahan on three counts, charging that he obtained funds under false pretenses. A nephew of McGahan attempted to dismantel the plant, and was shot three times.

In 1907 the company entered into negotiations with a second inventor, and electrician, named Anderson, who had organized the Anderson Electrolytic Reduction Company. A plant with a supposed rated production of five tons of metallic copper a day was constructed at the mine, consisting of three terraces of five-ton leaching tanks followed by three settling tanks and four terraced rows of electrolytic tanks. Carbon anodes and copper

cathodes were used, and a current density of 100 amperes at 110 volts. The ore was crushed to 20 mesh and charged at the rate of from two to five tons per tank, according to the copper content. It was then subjected to an eighteen-hour leach. The cathodes were built up to about 80 pounds. The acid used was termed "hydrofluorsilicic" and was made up of one third each of sulphuric acid, quartz, and fluorspar, plus a small amount of secret ingredient. The acid strength was about 15 percent. Nearly complete regeneration of acid was claimed in the electrolytic tanks, and the special acid was claimed not to attack the carbon anodes. A small production was made but the capacity proved to be less than ten percent of rated capacity, and the plant was closed in October, and never reopened.

On September 10th, 1909, the Cornelia Copper Company was reorganized as the New Cornelia Copper Company, and further capital was enlisted in St. Louis. The new officers were C. E. Neeley, president, George H. Augustine, vice president, John R. Boddie, secretary, and C. A. Bowman, treasurer. H. C. Chamberlain was appointed superintendent. The capitalization of the new company was $6,000,000, in $5 shares with $2,650,000 issued, and $50,000 in 8 percent debentures were sold, due June 21st, 1914. Very little work was done, and in 1910, the General Development Company bought 20,000 shares of stock at $1 a share, and secured an option on the stock control. Five diamond drill holes were put down on the edge of the disseminated area. A small tonnage of oxide and enriched sulphide ore was developed, and the option was surrendered.

On the surrender of the option, a short-term lease was obtained by the superintendent, H. C. Chamberlain, who shipped 800 tons of 4 percent ore in the latter part of 1910 to a smelting plant at Douglas.

In September 1911 on the recommendation of John C. Greenway, manager, and L. D. Ricketts and Ira B. Joralemon, consulting engineers, the Calumet

and Arizona Mining Company, owning mines in Bisbee, obtained a year's option on all the treasury stock and 65 percent of the issued stock at $2.50 a share, and took possession of the property in October 1911. The mine was energetically prospected by diamond drills, followed by test pits and connecting drifts, and a large tonnage of oxodized ore of 1.5 percent grade, underlain by a larger tonnage of the same grade of sulphide ore was blocked out. The option was exercised and the Company was re-organized under the same name with a capitalization of $8,000,000 in $5 par shares with $6,000,000 issued, and in September 1915 an issue of $4,000,000 6 percent 12-year sinking fund gold bonds were sold, maturing in twelve years, convertible into stock at $10 per share. 76 percent of the issued stock and $3,100,000 of the bonds were held by the Calumet and Arizona Mining Company.

An experimental leaching plant was built in Douglas in 1912 which proved the feasibility of sulphuric acid leaching of the oxidized out-cropping ore, and the electrolytic precipitation of the copper.

In 1915 work was started to bring the property into production. During the next two years a subsidiary railroad company was organized and a broad-gage road was built from Gila Bend to Ajo, a distance of about forty miles, an ample water supply was developed in wells six miles north of the mine, a model townsite was laid out, a 5000-ton crushing, leaching, and electrolytic plant was constructed, together with a power plant, and the mine was prepared for open cut stripping, and large steam shovels, locomotives, and cars were installed. An acid supply was secured by the construction by the Calumet and Arizona Mining Company at Douglas of a large Chamber acid plant, utilizing waste sulphuric dioxide fumes from the smelter. The railroad was completed in 1916 and the first charge of ore went to the tanks in April 1917.

The Ajo Mountain Company owning the original Ajo Mine was purchased in 1907 by the Rendall Ore Reduction Company with Charles Ashley, president, Leonard L. Allen, vice president, H. Carleton Slack, secretary, and A. D. Lee, superintendent. A 50-ton patent reduction plant using the Rendall process was installed. This consisted of a special upright furnace practically air tight, with a suction draft operating above the charge. The ore was heated to low incandescence by gases from wood, ore or coal, and at a proper degree of heat, the combustion draft was increased, the fuel supply shut off, and a specially fluxed hot blast admitted to the furnace, causing chemical reactions by which the volatile elements were supposed to be drawn off. The special fluxing gas was said to prevent oxidation, carbonization and chlorination of the ores. The process claimed that the copper, gold, and silver were left in suspension and that the gangue was not fused. After voltilization the charge was plunged into a vat of water to shock the gangue and assist in breaking it up. It was then crushed in rolls, and the copper minerals concentrated. The process did not prove successful and all work ceased in 1908.

In 1909 the mine was taken over by the Ajo Copper Company. A small tonnage of ore was mined, sorted and shipped by this company, and on December 5, 1912, a further reorganization was effected as the Ajo Consolidated Copper Company with James P. Gaskill as mine superintendent. Small shipments were continued to Douglas, which were increased at the end of 1916 on the completion of the railroad. In 1917 the property was purchased by the New Cornelia Copper Company, and the higher grade ore was shipped by that company for two years as smelter flux to the Calumet and Arizona smelter at Douglas.

By the beginning of 1919 the reserves of oxidized ores were nearing exhaustion, and the shovels had reached sulphide ore. An experimental

concentrator was built in 1919, and after a six months' test run was shut down, and work was started on a 5000-ton flotation concentrator and subsidiary crushing plant. This was completed in 1924 and further enlarged and renovated in 1928 and 1929 to a final capacity of 16,000 tons a day.

The leaching plant was run continuously from April 1917 until early in 1930, when it was closed.

In April, 1929, the New Cornelia Copper Company was consolidated with the Calumet and Arizona Mining Company by exchange of stock, and in 1931 was absorbed by Phelps Dodge Corporation.

The camp of Ajo has had a production of approximately $110,000,000, up to the end of 1929, most of which was made after 1917. The New Cornelia Copper Company paid $18,630,000 in dividends up to its absorption by the Calumet and Arizona Mining Company in April 1929. Detailed production figures are shown in the Appendix.

Gunsight District

In this isolated district east of Ajo, the principal activity was from 1881 to 1884. The Gunsight Company under the management of Bivens actively developed the Gunsight Silver mine, sank a shaft 380 feet deep on the ledge and developed a large tonnage of $23 to $60 lead-silver ore. A large camp was laid out, a steam hoist installed, a 48-stamp amalgamating mill built, and a water supply assured by connecting a series of wells with the mine by a three inch pipeline. The company also entered other fields, the principal outside holding being in Silverbell. A production of at least $150,000 was made in silver.

In 1883 the Burro-Burro Copper mine, a mile from the Gunsight silver mine was acquired by a Philadelphia Company under the management of C. R. Craige. A small smelter was built, which made one run and closed down through faulty construction.

In 1928 the Gunsight Mine was reopened and construction started on a small mill. The work was never completed. The district has produced about $150,000 from the Gunsight Mine, chiefly in the period 1881-1884.

CHAPTER 8

HISTORY OF THE PIONEER DISTRICT

This district and the mountains to the East were not prospected to any extent until after 1870 due to their being in the heart of the hostile Apache strongholds. After General Crooke had persuaded the Apaches to leave the war path and remain within the reservations set aside for them, prospecting started, resulting in the location of the copper and silver deposits of Globe and the copper-silver deposit of the Silver Queen, the present Magma mine. This first discovery was made about 1874, and a small blast furnace was erected at Pinal, west of the present town of Superior, known as the Queen Creek smelter. A small production was made up to 1882 when the smelter was destroyed by a flood and was never rebuilt.

Early History

Silver King Mine

On February 1, 1875, Pinal County was created out of Pima and Yavapai counties, the county seat was established at Florence, and March 1, 1875, set as the date for the election of county officers. From the Eighth Annual Report of the Mineral Resources West of the Rocky Mountains, issued in the year 1876, by Rossiter W. Raymond, the following account appeared of the discovery of the Silver King Mine:--

"Four farmers, living near Florence -- Regan, Copeland, Mason and Long -- to relieve the monotony of agricultural labors on the Gila, made occasional prospecting visits in the adjoining Pinal Mountains, and had discovered a copper-vein about 40 miles back in the mountains called the

Globe Mine. When Tully, Ochoa & Co. started their copper furnace in Tucson, Regan and his partners concluded they would have their Globe Mine tested, and fitted out at Florence to go after some ore.

"A discharged soldier, who happened to be in Florence, enjoying the festivities of the election day aforesaid, came to the Regan party and 'held them with his glistening eye'. 'I have a tale to tell', said he; and then he told them a dead comrade's story. 'When you go up the Stone-man grade', said he, 'you will pass the tanks; you will pass old Camp Pickett; then some five miles on, you will come into a mountainous country; you will see a little valley-like, hemmed in with mountains; near the head of the valley you will see some immense boulders on the side of the road; off just a little bit, you will see a little brown hill rising up all by itself, and in that hill, if what my old comrade said is true, you will find the richest mine in the world.'

"The Regan party heard the stranger's story, but were not much affected by his recital. They went on their preparations for the copper expedition, passed up the grade, recognised the valley, saw the boulders and the little brown hill beyond, and laughingly said, 'There's one big mine, boys.' But not one of the party stopped or appeared anxious to verify the stranger's tale. They had started for copper, and with the dogged persistence and easy incredulity of the old pioneer stock, were not to be turned aside by any tale, no matter how eloquently it might be told. They toiled along up and down the rugged side of the Pinal Mountains until they got to their Globe Copper Mine, dug out what they wanted, loaded their pack animals and returned, and then again they met the little brown hill, which the story said contained endless wealth for the fortunate possessor of its contents. Regan, who was the leader of the party, looked at the little brown hill and meditated. It might be as well to look into

the matter a little. Having more confidence in Copeland's judgement than his own, he turned to him and said, 'Copeland, let's look at this thing; give me the lead-mule, and the rest of us will go on to camp, five miles below, and you go over and see what you think of it.' Copeland went over and found croppings immediately. The next day they all went to Florence. Copeland took his rock to a blacksmith's forge and melted out a fine bar of pure silver.

"The party had been in great haste to get some copper out from the Globe to test their mine, but it was concluded now that the copper could wait. They procured a wagon, a few mining tools and returned next day to the little brown hill, broke off 1,500 pounds of rock from the surface, and took it to Tucson with their copper. The Tucson people admired the ore; so much so, that one of them offered $800 for the 1,500 pounds, which offer was immediately accepted.

"Regan and his party named their discovery the Silver King, and began sinking on it about the 15th of April. There is now a lively little camp near the mine, with a four horse stage making regular trips to and from Florence, 35 miles away."

Raymond reported that by the end of 1875, the shaft was down 42 feet, and a 12 foot drift had been driven from the bottom. The shaft was reported as starting in ore and to have cut a network of stringers 3" to 18" wide in "granite". The vein matter was quartz and the mineral consisted of silver chloride and "black sulphurites" with nuggets of nearly pure maleable silver, which when sorted out ran $20,000 to the ton. A small furnace of the cupel type was erected at Florence by Cury and Hughes to treat the ore, the pig lead being obtained from the Mowry or Patagonia mine in the Patagonia mountains. The first lot of selected ore of 500 pounds obtained from the first 14 feet of the shaft yielded over $5 a pound.

Raymond reported an estimated production from this furnace of $50,000, making the yield from the shaft and drift over $1000 a foot.

As soon as the news of the discovery reached San Francisco, mining "experts" were sent from there, representing Comstock interests, and in 1876 the mine was sold to a corporation known as the Silver King Mining Company. This company started developing, and erected a small stamp and amalgamating mill at Pinal, on Queen Creek, five miles from the mine. The ore was so rich that most of it was shipped without milling, only the lower grade ore being treated. The Southern Pacific had then completed their railroad to Casa Grande, and this was the nearest shipping point.

In 1879 Arthur Macy E. M. was appointed superintendent. By this time the richer free-milling ore had been exhausted, and it became necessary to change the method of treatment. It was decided to concentrate the ore and ship the concentrates to lead reduction works. This change was made in 1882. The ore was crushed at the mine in a Blake crusher, and the crushed ore hauled to the concentrator at Pinal. There it was further crushed by stamps, of which there were 20, and concentrated over 12 Frue Vanners. The concentrates were sent to the Dome Mining and Smelting Co., Melrose, California, the Selby Works at San Francisco, and the Omaha Smelting Works. The mill treated in 1883 from 50 to 57 tons a day with a concentration ratio of about 20 to 1. The average grade of the heads was for that year $61.08, and 92.31 percent extraction was reported. The concentrates assayed, besides the silver content, 21 1/2 percent lead and 18 percent zinc.

The success of the Silver King caused active prospecting in the adjoining ground, and in 1883 fourteen groups were being actively worked, and at least three mills had been erected, the largest being that of the

Windsor Consolidated. During this time a small yield of black copper was made from the Queen Creek Smelter, treating Silver Queen ore, until September 1882, when a severe flood badly damaged it.

In 1884 the Windsor Consolidated mill was leased to treat a part of the Silver King ore not amenable to concentration. The mine had been developed over 800 feet deep and most of the ore was obtained from the 800 and 700 foot levels. The grade for that year had fallen to $43 for the concentrating ore and $46.40 for that amalgamated at the Windsor Consolidated mill.

The year 1887 was the last year of profitable operations. The grade of the ore had fallen in that year to 21.08 ounces for the concentrating ore and 32.47 ounces for that amalgamated. Lixination was tried on a part of the ore-body on the 800 foot level high in copper, and during the year, old tails were reconcentrated yielding low grade concentrates.

The report of the superintendent for the year 1887 gave the costs as follows:--

Mining	$10.97 per ton
Milling including Roasting	9.69 " "
	$20.66

Fuel cost $9 to $10 a cord.

In the first six months of the year 1888 the mine was run at a loss, and the company in July was reported by the president, H. H. Noble, to have been in debt $75,000. The first assessment was levied and drastic cuts were made. By the end of the year operating costs were reduced from $40,000 to $5,000 a month. Noble reported in December that the indebtedness had been paid, that sufficient ore was in sight to run to January 1, 1889, and that there was $74,000 in the treasury to be applied to further prospecting.

In 1889 and 1890 a prospecting campaign failed to find commercial ore and the mine was closed in January 1891. It was reopened in September after 44,000 delinquent shares had been bought, and a small production was made. In October a new strike was made at 20-foot depth, in a new shaft to the east of the old workings. This ore was developed in 1892 with indifferent success. By August 1892 the company was again in debt $5,000. Ten stamps of the concentrator were moved from Pinal to the mine and a small production was made of concentrates during the remainder of the year. On the decline of the silver market in the beginning of 1893, the mine was again closed.

In the fall of 1895 the property was reopened by the superintendent, W. S. Champion, the work being confined to the new shaft. He reported a strike of a pocket worth $40,000 at a depth of 75 feet. A contract was let to sink the shaft 200 feet but this work was never done and the mine was finally abandoned in 1896.

During its active life from 1876 to 1896 the company declared $1,950,000 in dividends, the last being paid in 1887. Starting in 1888 with its first assessment, a total of $300,000 in assessments were levied up to 1895, making the net operating profits $1,650,000. The dividends were paid on 100,000 issued shares, and the assessments were collected on 56,000 shares, 44,000 shares being called in.

Reymert Mine

The mine was first developed in 1887 by the J. D. Reymert Mining Company. An account of operations for that year is found in the U. S. Mint Report for that year. The Arizona mines were reported by Alex Trippel of Globe. The vein was reported as averaging fourteen feet wide and to carry an average of 30 ounces of silver. A ten-stamp mill was built and operated during the year with a production from 849 tons of ore of 22,827 ounces of silver. The mining cost was reported as

$3.60 and the milling cost $8 a ton. A production of $90,000 was reported in silver bullion for the year 1890. The mine was closed in 1892 due to the drop in the price of silver.

Production The total production of the Superior or Silver King district in the early period ending with 1896 was approximately six and a half million dollars, mostly from the Silver King Mine. Detailed production figures are found in the appendix.

Recent History

Lake Superior and Arizona Company After the abandonment of the Silver King Mine in 1896, very little work was done in the district until 1902. In that year, the Golden Eagle Mine, an old gold-silver-copper producer, was purchased by Calumet, Michigan capitalists, who organized the Lake Superior and Arizona Mining Company, with Frank S. Carlton as President and Alfred C. Siebeth as superintendent. Considerable work was done by this company. Several tunnels were driven and a little superficial shaft work was done. The company contemplated the building of a railroad from Florence, but the plans were never carried out, and but very little production was made.

Magma Copper Company In 1910 the Old Silver Queen mine was optioned by William Boyce Thompson and George E. Gunn, and the Magma Copper Company was organized. A two year option was taken on the Lake Superior and Arizona ground which adjoins the Silver Queen. Work was started on both groups. In 1912 the Silver Queen option was exercised, but the Lake Superior option was surrendered.

From 1912 to 1921 the Magma Copper Company actively developed the Silver Queen vein, and in 1914 organized a subsidiary railroad company known as the Magma Arizona Railroad Company and built a 30.4 mile narrow

gage road from Magma Junction on the Arizona Eastern Phoenix-Kelvin division to Superior. A 200-ton flotation concentrator was built in the same year and production started. The mine was developed ahead of mining operations by diamond drilling. In 1920, after protracted negotiations, the Lake Superior and Arizona ground was purchased.

Early in 1921 on the collapse of the copper market, the mine was closed. A depth of 2000 feet had been attained, and a reserve of about a half a million tons of high grade copper-silver ore was developed.

During the shut-down, in 1921 and 1922, the narrow-gage railroad was enlarged to a broad-gage line, and work on a 700-ton reverberatory smelter and converter was started. The concentror was enlarged to a capacity of 600 tons a day. The mine was reopened in 1922, but did not reach full production until March 21, 1924, when the smelter was blown in. From 1924 to 1931, the property produced steadily and by the end of 1929 had been developed to a depth of 2800 feet. A large reserve of ore was developed ahead of mining, and well-equipped extraction shafts were completed, ensuring a long profitable life. The ore contains an unusually high precious metal content, which allows a very low cost per pound of copper produced.

After the surrender of the Lake Superior and Arizona option by the Magma Copper Company in 1912, the company was reorganized as the Superior Arizona Copper Company, and was placed under the same management as the Magma Copper Co. After the completion of the narrow-gage railroad, small shipments of high grade oxidized copper ore were made to various reduction plants until 1920 when the property was purchased by the Magma Copper Company.

Belmont Mine

In 1911 a group of claims south of Superior, covering the outcrop

of the Belmont vein, was acquired by Daggs and Newman of Globe. This group was optioned by the Calumet and Arizona Mining Company of Bisbee in 1912 and considerable work was done from a tunnel and shaft. After a depth of 740 feet had been attained without the disclosure of ore, the option was surrendered in 1915.

In 1923 the property was optioned by the North Butte Mining Company of Butte, and development work in the shaft was started. The shaft was sunk to a depth of 1200 feet, and lateral work was done on the 700, 1000, and 1150 foot levels. In February 1925 the Belmont Copper Mining Company was organized by interests allied to the North Butte to take over and operate the property. Chester Boatson was appointed vice-president and manager. A little lead-zinc-silver ore had been developed on the 1150-foot level. Active development work was done in the next three years, and the shaft was sunk to a depth of 1650 feet. In 1928 a 100-ton flotation plant was constructed to treat the lead-silver ore developed on the 1150-foot level, but it was run for only a short time. The property was closed indefinitely in 1930, and has since been turned over to leasers.

Silver King Mine

The Silver King Mine, after abandonment in 1896, remained dormant for nearly twenty years. It was not until after the successful exploitation of the Silver Queen mine by the Magma Copper Company that attention was again levelled at the Silver King. In 1916 the property was acquired by a company known as the Silver King of Arizona Mining Company, a Delaware corporation, with A. W. Hildebrand of New York as president, and John Fowle as manager. Work started in 1917 with the repairing and unwatering of the old main shaft, sunk to a depth of 987 feet by the old company. Prospecting on the 120-foot level encountered small high grade ore bodies overlooked by the former operators. A small flotation mill was started

which was completed in July 1918 to treat this ore, together with a considerable tonnage of low grade dump material. About 35 tons were treated a day with a claimed extraction of 90 percent. The shaft repairing and unwatering continued, and by the time the mill was put in operation a depth of 400 feet had been attained, and a small streak of rich ore was found on the 400 foot level, from which shipments were made to the smelter. Shipments of concentrates and ore continued intermittently until July 1919. The management claimed a developed tonnage at that time of 10,000 tons of ore better than $20 in value. The concentrates were reported to assay $1500 a ton chiefly in silver. 95 percent extraction was claimed.

In July 1919 it was decided to abandon further attempts at unwatering the old shaft and to sink a 1000-foot shaft 150 feet outside of the old ore chimney, and to prospect under the 400-foot level from this shaft. At the same time it was contemplated enlarging the mill to 500 tons capacity. The old shaft was kept unwatered and ore from the 400- and 120-foot levels continued to be treated at the mill after the new shaft had started. To finance the sinking of the shaft a $500,000 bond issue was floated. About 200 feet was sunk under contract until August, when a third shaft was added, and further sinking was done on company account. In October a cross-cut on the 400-foot level from the old shaft connected with the 415-foot level of the new shaft.

In January 1920 a reorganization was effected whereby the capitalization was reduced to allow for further financing. Shaft sinking continued in 1920 until June, when a depth of 635 feet had been reached. A cross-cut on the 615-foot level had been advanced 110 feet, where the old workings were tapped, together with a heavy flow of water. The company went into bankruptcy shortly afterwards. A reorganization as the Silver King Mine, Inc., was effected, but no further work was done. The total tonnage

treated amounted to 12,546 of ore averaging approximately $20 a ton in silver. The concentrates produced contained from 1000 to 1980 ounces of silver, 20 percent lead, and from 7 to 8 percent copper.

Reymert Mine

In 1925, William Forbach and associates obtained a lease on the old Reymert silver mine, opened up in the late eighties. This mine is about six miles southwest of Superior. The Reymert vein is a persistent vein carrying silver chloride in a ferruginous calcite gangue. The mine had never been extensively worked, and the values rapidly diminish with depth. From 1926 to 1930 the old workings were reopened, and a considerable tonnage of ore was hauled to Superior and shipped as flux to the Magma Smelter. On the drop in the price of silver in 1930, the lease was relinquished.

Production

The total production of the Superior District from 1902 to the end of 1929 was 244,600,000 pounds of copper, 8,124,000 ounces of silver, and 83,980 ounces of gold, with $47,390,750 gross, mostly from the Magma mine. The total production from 1875 to the end of 1929 has been 244,600,000 pounds of copper, 14,156,000 ounces of silver, and 83,980 ounces of gold, with gross value of $54,006,000. The total dividend dispersement has been $1,650,000 for the Silver King Mine and $8,438,557.50 from the Magma mine. The detailed figures are shown in the appendix.

CHAPTER 9

TOMBSTONE MINING HISTORY

Before the purchase of southern Arizona from Mexico, only a small portion of the territory had been settled and explored, except by transitory Spanish expeditions. The Santa Cruz and Colorado River valleys had been partly settled for a hundred miles north of the boundary, and the flanking ranges prospected for mineral. The rest of the state was overrun by the wild Apache tribes.

After the Mexican War and Gadsden Purchase, the American pioneer miners quickly started expanding, and one location was made before the Civil War near the site of Tombstone. This location was made in 1857 by Frederick Brunckow, one of the engineers of the Sonora Exploring and Mining Company of New York. C. D. Poston, one of the pioneers of the Territory and a contemporary of Brunckow's, writing in the Arizona Weekly Star of February 19, 1880, gave the following biography:

"Frederick Brunckow was born in Berlin, Prussia about 1830 of Russian father and German mother. He received a classical education at the University of Westphalia, and graduated as an "eleve" of "l'ecole des Mines" at Freiburg, in Saxony. With the enthusiastic students of German-Prussia, he engaged in the revolution of 1848, and upon the failure of these aspirations, emigrated to the United States in 1850. Landing in New York, he wended his way down the Mississippi, working on a steamboat as a deck hand. In 1856 he was working near New Braunfels, Texas, as a shingle-maker, at two dollars and a half a week with board, when he was solicited to join the Sonora Exploring and Mining Company, then being

outfitted in Texas for Arizona. He gladly accepted a more congenial field of operations and accompanied the expedition to El Paso, where the 4th of July, 1856, was celebrated, and arrived at Tucson at the Feast of St. Augustin, in August of the same year. The company established its headquarters at Tubac, in the autumn of 1856, and commenced an exploration of the adjacent mountains for mineral deposits.

"Mr. Brunckow was accomplished in social education, spoke English, German, and French fluently. As a mining engineer he was remarkably adept with the blow-pipe, and his German colleagues highly appreciated his perception in instructive knowledge of the value and quality of the ores submitted to his inspection. He was a keen sportsman, fond of the chase, and added to his accomplishments the pleasing quality of being an excellent dresser of wild game. The mustang horse frequently formed a favorite dinner at Tubac. In 1858, Brunckow, Ehrenberg, Mohrman and other engineers and employees of the company were called to New York to give information about the mines of Arizona, and from realization of the results of their enterprise and hardships were enabled to transfer the festivities of Tubac to Delmonicos, where the pioneers unfolded to the capitalists of Gotham the wonders of the Arizona mines. Brunckow returned to Arizona in 1859 and entered upon the development of the Brunckow Mine, in that is now called the Tombstone district, where he was killed by one of the Mexican employees.

"The incidents of the Civil War and its consequences prevented any further discoveries in the Tombstone district until a recent period, when the indomitable explorers of the western mountains discovered mines of such marvelous richness that it now comes to the front as the bonanza of Arizona.

"Poor Brunckow's remains repose in the Tombstone district without a

tomb, and this sad tribute to his memory is offered by his only surviving companion."

This old mine, later known as the "Bronco" mine was relocated after the rediscovery of the camp by Schieffelin, but did not prove profitable and was abandoned.

After the outbreak of the Civil War, the withdrawal of the garrisons in the mountains and the subsequent Apache and outlaw Mexican raids killed practically all mining and prospecting in the southern part of the state until the early '70's.

The Tombstone deposits were rediscovered in 1877 by Ed. Schieffelin, one of the pioneer miners of the Pacific Coast. An account furnished by Schieffelin to Bancroft for his history of the Pacific Coast is the basis for the following facts. He was the son of one of the Forty-Niners, his father settling in Oregon. After several years of fruitless prospecting in Nevada, Montana, and California following up the various mining booms, he decided early in 1877 to come to Arizona and prospect in virgin country. He followed a tropp of cavalry destined for Fort Huachuca, starting from San Bernardino, California, and traveling by way of Fort Mohave. The Apaches were then giving considerable trouble under Cochise. After spending some time prospecting near Fort Huachuca, he decided to go further and outfitted and started alone down the San Pedro Valley. On this trip he visited the old Brunckow Mine, then owned by Tucson parties, and helped on the annual assessment work. He noticed the direction of the ledges there and made several trips towards the site of Tombstone, finding a little rich float. His permanent camp was on the San Pedro at a cabin used as a stopping place by the prospectors and cattlemen passing through. He would make his trips by day, and would return to camp each night. He was accompanied by Griffith, one of the miners

employed to do the assessment work on the "Bronco" as it was then called.

They finally located a small ledge of rich ore about nine miles from Tombstone on which were staked the Tombstone and Graveyard claims, and went to Tucson, the county seat of Pima County to record them. Neither had any money, and could not interest any one in financing them. No assay office existed in Tucson at the time, so that the worth of the samples could not be determined. They were declared of little value by those to whom they were shown. The two claims were recorded, however, in August, 1877, but the location work was not done. Griffith lost interest and decided to locate a ranch near where Benson is now situated.

Schieffelin still had faith in the value of his find, and decided to hunt up his brother Albert, whom he had last heard of at the Silver King Mine. Literally with nothing but his pack outfit, gun, and ammunition, he started out for the Silver King. On his arrival near the mine he heard that his brother had left, and was at the Signal Mine at Signal, 300 miles west, north of the Bill Williams River. He could not leave immediately due to lack of funds, and finally obtained work at a mine near Globe. With the money obtained for this, he outfitted and made a start for Signal, arriving there in the early winter of 1877. There his brother obtained work for him. Ed showed him his samples and asked him to go back with him, but Albert and other miners there declared his samples "leady" and low grade. Shortly after his arrival at Signal Richard K. Gird was sent out by the San Francisco company operating the mine, as assayer, and he was later offered the job of superintendent. Albert took Ed's samples to Gird and asked him to run them for him. Gird immediately recognized them as high-grade and offered to go back with the two brothers to locate the ground. Ed. demurred for several months, but after the samples were assayed and proved to run from $40 to $2000 a ton, he was persuaded by Albert to accept Gird as a partner

and to all return to the find. Gird then financed the outfit, included in which was a small assay furnace, and the start was made with a buckboard, and three mules on February 1878.

Gird was well known as a mining engineer, and his refusal of the superintendency of the Signal Mine to go on a mysterious mission with Schieffelin caused considerable comment in camp. A party consisting of three San Francisco men, J. S. White, Parsons and Smith, secretly left before the start of the Schieffelin-Gird party. The White-Parsons-Smith trail was followed to the San Pedro River near the site of Benson, where it was seen to go towards Apache Pass in the Chiricahua Mountains. The Schieffelins and Gird then went direct to the Bronco House, established camp there and started to reconnoiter. Gird set up his assaying furnace at the cabin. The first month's work was disappointing, as Ed's Graveyard location proved to be of no value and Ed. had difficulty in persuading his brother and Gird to remain. Finally the Lucky Cuss ledge and later the Tough Nut were found, both proving large and rich. This was the real discovery at Tombstone. Camp was then moved from the Bronco House to the site of Tombstone.

Shortly after their establishing camp two other prospectors came in, Oliver Boyer and Henry D. Williams. Gird offered to assay their ore for a half interest in anything they located. These two then started prospecting and located the Grand Central ledge, but did not write in the Schieffelins and Gird on the location notice. After Gird reminded them of their agreement, a part of the Grand Central claim was relocated as the Contention claim by the Schieffelins and Gird. Shortly after this the White-Parsons-Smith party, learning where Gird had gone, appeared at their camp. Parsons and Smith left shortly but White remained, and offered to buy out all the Schieffelin-Gird locations. He finally

bonded the Contention Claim for $10,000. He then left for San Francisco, raised the money, organized the Western Mining Company and returned and started developing the Contention claim. This was in the summer of 1878.

The fame of the rich discoveries rapidly spread and by the end of the year a rush to the camp took place. One of the earliest to arrive was E. B. Gage. He bought out the Williams interest in the Grand Central and bought the other half interest from a man named Austin. Several years later the Austin interest was the basis of a novel lawsuit. Boyer was arrested at Tucson shortly after making the Grand Central location, for the murder of a man named Sweeney. Austin went to Boyer in jail and offered him $1000 for his interest in the Grand Central, paid him $500 and connived at his escape from jail. Boyer escaped to Mexico but was later recaptured, was tried, found guilty and sent to the penitentiary at Yuma for life. Boyer's father then started suit against the Grand Central Mining Company, organized by Gage, for a third interest, maintaining that his son being legally dead and not having been paid his full share by Austin, he as his heir was entitled to his son's remaining interest on the amount left unpaid by Austin. The case was settled out of court.

Gage after buying the Grand Central claim interested C. D. Arms, N. K. Fairbank, Frank Struthers and others and organized the Grand Central Mining Company.

About the time Gage arrived, the Schieffelins and Gird were offered $100,000 for their interests by William Tosier of San Francisco, then in Tucson. After several months negotiations, this deal fell through.

Early in 1879, Governor A. P. K. Safford visited the camp from the capitol of the Territory, then at Tucson, and promptly offered to build a ten-stamp mill on the San Pedro River, the nearest water supply, for a

quarter interest in the Tough Nut claim. He then went east to raise the money and returned with Frank Corbin of New Britton, Conn. The Tombstone Mill and Mining Company was then organized and Gird was commissioned to purchase and erect the mill. Gird then went to San Francisco, and superintended the building of the mill at the Fulton Iron Works, and returned with it. This first stamp and amalgamating mill was completed in June, 1879. It was run at first by water power from a dam several miles up the San Pedro from the mill site. A steam plant was put in later, in 1882.

Corbin then organized the Corbin Mill and Mining Company, and built a second mill of 20 stamps near the Gird Mill, for an interest in the Lucky Cuss claim. This mill was completed at the end of the year.

In March, 1880, the Schieffelin brothers interest in the Tombstone Mill and Mining Company and the Corbin Mill and Mining Company was purchased for $600,000 by a syndicate of eastern capitalists consisting of the Corbin brothers of New Britton, Conn., the Disstons of Philadelphia, the Hulings brothers of Oil City, Pa., and Simmons and Squiers of Boston. The two companies were merged as the Tombstone Mill and Mining Company. Gird elected to accept shares in the new venture and remained for about a year as manager. The three original locators thus realized handsomely on their discovery. Ed. Schieffelin remained in the Territory until 1882 when he left on a prospecting trip to Alaska. On his return in 1883, he married and settled down in Alameda, California.

Albert bought a large ranch near Los Angeles, and moved as soon as the deal was consummated. He died from tuberculosis in 1885.

Gird remained as manager of the T. M. and M. Co. for about a year and then bought a large ranch in southern California known as the Chino Ranch and put in sugar beets. The venture proved very successful. He went into the sugar refinery business later and was known as the sugar

beet king of southern California. He died in Los Angeles in 1910.

Ed. Schieffelin died a wealthy man and his remains were shipped to Tombstone and buried about a mile from the town. A granite boulder monument was erected to his memory, one of the landmarks of the country.

By the end of the year 1879, Tombstone was the most famous mining camp in the West, and capitalists were visiting it in great numbers. A great many of them came from the newly exploited oil fields of Pennsylvania, and several of them acquired claims from the Schieffelins and Gird and others of the early pioneers. One of the spectacular ventures was the Luck Sure and Sunset Mines, purchased by Asa Say from Joe Walker, a cousin of Gird's. The Sunset proved a bonanza, the ore running from $400 to $1600 a ton.

T. E. Farrish purchased for himself and associates the Head Center claim from Jerry Acherson early in 1880. After developing the mine, he built a 10-stamp mill on the San Pedro in April, 1881. Farrish was replaced in June, 1881, by C. C. Batterman, and this company produced profitably until May, 1884.

In March, 1880, the Vizina claim was purchased by H. Filkins of Bradford, Pa. This claim adjoins the Tough Nut and covers part of the townsite of Tombstone. This mine produced over a half a million dollars in the three years of its active life.

In February, 1880, the Boston and Arizona Smelting and Reduction Company was organized by Boston capitalists to erect a custom mill to treat the ore of the Vizina and other small mines of the camp. The mill was completed in July, 1880, and on the San Pedro River. It had 20 stamps. Later, concentrating machinery was added and a patent roasting furnace in 1882. This installation was a great stimulation to the district, allowing an outlet to numerous small producers. The company in October,

1881, purchased the Stonewall Mine for $100,000, and mined on its own account besides treating custom ore.

The Contention or Western Mining Company started the construction of a mill in October, 1879, at a point on the San Pedro further down stream than the Gird and Corbin Mills. In 1880, the Grand Central Mining Company put up their mill still further down stream. Charleston was at the site of the Gird and Corbin Mills, which were quite close together, while the Boston and Arizona Mill was several miles down the San Pedro River, between Charleston and Fairbank. Several months later, Contention City was started, between the sites of the Contention and Grand Central Mills, near where Fairbank now stands.

The growth of the camp was very rapid. Shortly after the discovery, sometime in 1878, at the first miners meeting, the name of the camp and district was christened Tombstone, from the first location. Schieffelin wrote in his account that the name of the location was suggested to him by the bantering remarks of the soldiers at Camp Huachuca after his first trips. On asking him what he had found and on his replying nothing yet, they would say that he would find nothing but a tombstone. He wrote that the name was constantly in his mind, so that the first locations made by him in Arizona were named the Tombstone and Graveyard claims. The name was retained although after the growth into a city, many attempts were made to change it.

The Arizona Weekly Star of Nov. 2, 1879, described Tombstone as a lively settlement of 1000 to 1500 people. Two settlements had sprung up on the San Pedro, one at the Gird and Corbin Mills, known as Charleston, with a population of between 600 and 800 people, and a second called Contention City near the Contention Mill then building. The same issue of the Star recorded that the incorporation petition of the City of Tombstone

had been granted at a meeting of the Board of Supervisors of Pima County and the election of municipal officers ordered for November 24th.

At the time of the discovery of the camp, the Southern Pacific Railroad had started to build eastward from Los Angeles. The road had been completed as far as Casa Grande, which remained the terminal for several years. On March 20, 1880, the road was formally opened into Tucson, and a large celebration was held which President Crocker and other officials of the road attended. Building was pushed rapidly and by the end of 1880 had reached the San Pedro River, and the town of Benson was started. In 1883 and 1884, the Santa Fe Railroad constructed a line from Benson to Fairbank, and from Fairbank through the Sonoita Valley to Nogales, and from Nogales to Guaymas. A line was projected to go from Fairbank through Tombstone and the Sulphur Springs Valley, but it was never built. The Santa Fe holdings in the south were later bought by the Southern Pacific interests.

By the beginning of 1881, Tombstone was reported to have had a population of 4000 people, had 600 dwellings, 100 scholars at school and two churches, and was the largest city in Arizona. There were about 650 men working in the mines, and 150 in the mills at Charleston and Contention City. Most of the miners were American and Cornish. At both Tombstone and at the two mill towns, the wealth of the camps had attracted a large number of gamblers and other undesirable characters, who migrated to Arizona from the older frontier towns in Kansas and Texas. Trouble soon started culminating in the Earp-Clanton feud and an epidemic of stage robberies, cattle thieving, and miscellaneous murders and acts of outlawry. By the end of 1882, after a stronger governor and U. S. Marshall had been appointed, the unruly element was subdued, and comparative quiet again reigned. The mines and mills continued to run

through all the disturbances without any serious interruption. The miners took but very little part and were solidly on the side of law and order. This period of lawlessness, spectacular as it was, has been given undue weight in the histories of the state. The effects, other than a bad reputation with the rest of the country were very slight, involving as they did, only a very small minority of the residents of the Territory.

The total production of the camp to November 1st, 1881, was about 103,092 tons with a total value of $7,438,361, an average value per ton of $72,25, according to detailed figures published in the Arizona Weekly Star of December 9, 1881. Dividends aggregating $2,895,000 had been paid, $1,000,000 by the T. M. and M. Co., $1,375,000 by the Western (Contention), $500,000 by the Grand Central, and $20,000 by the Vizina. Besides these, substantial profits had been made by numerous smaller operators, especially the Sunset and Head Center.

The first water encountered was in the Sulphuret shaft of the Contention Company in July 1881, at a depth of 560 feet. The seriousness of the water problem was not realized, however, until April 1882, when the Grand Central shaft sinking was stopped at the same depth, and the first extensive pumping equipment ordered to combat it. In 1882, after the Contention Company had sunk the main shaft to the water, the largest pump installation in the camp was installed, designed by J. F. Thompson. The pumps were of the old Cornish type. The pump shaft of 6 ft. by 8 ft. in the clear, timbered with 10" x 10" Oregon pine was equipped with two main stations, one 234 feet and the second 486 feet down, with a bob station 84 feet above each. The sinking pump of 18-inch diameter, 8 foot stroke, built for a lift of 300 feet was operated with 3 inch iron rods working inside a 20 inch pipe. The main pump rods were 13 inches by 13 inches by 60 feet long, strapped with 2000 lbs. of iron at each joint.

and worked through iron guides 25 feet apart. The pumping engine was compound direct acting, with an initial cylinder of 26 inch diameter and 8 foot stroke, and the compound cylinder of 42 inch diameter and 10 1/2 feet stroke. The beam was of wrought iron and weighed 70,000 lbs. and was 30 feet 6 inches overall. The pump hoist had double engines connected, and was capable of handling 12 tons at a load. The balance bobs were 32 feet over all, and carried 60,000 lbs. each. This installation drained the mine in 6 hours after starting, running at half speed, and allowed for rapid sinking of the shaft. The ledge in the winze below the 600-foot level was reported to have been studded with horn silver. After the pumps got under way with two pumps working, one at the Contention and the other at the Grand Central, some headway was made in sinking on the ledges, but the flow proved too great to allow for drifting or stoping. Ore was proved to extend to a depth of at least a hundred feet below the water table, and some stoping was done to a depth of about 50 feet. United pumping action was never achieved.

The finding of the water at Tombstone spelled the doom of the town of Charleston. The first mill to be erected in Tombstone was the 20-stamp Girard Mill, started in July 1881, and completed in Fe. 1882, using the water of the Sulphuret. This venture, financed by a Philadelphia company, at first treated the ore of the Girard Mine owned by the company. It proved, however, too low grade to be commercial, and the mine was shut down in May, 1882, and the mill was run the rest of the year on 2nd class Contention and Tranquility ore on a custom basis. The mill continued to operate on low-grade ore from various sources up to November, 1883. The company expenditures exceeded receipts by $62,749, and the company assets were sold by the sheriff and purchased by a Philadelphia syndicate. The new operators reopened the mine and after developing 15 feet of 100 ounce

ore on the 200 foot level, the old owners redeemed the property early in 1884.

Early in October, 1882, a custom smelter for the treatment of silver-bearing lead ores was completed at Benson known as the Benson Smelting and Refining Works. This smelter, promoted by M. Salisbury of San Francisco, A. Byram of Chicago and Hugh White, greatly stimulated the development of the more leady portions of the Tombstone district as well as causing the reopening of other camps in the Territory. In an advertisement in the Arizona Weekly Star of Oct. 7, 1882, their rates for custom ore were published as follows:

Lead paid for over 25% at 50¢ a unit.
Silver 85% paid for at $1.13 an ounce.
Treatment charge $20 a ton.

This smelter operated until early in 1885 when it was forced to close due to lack of sufficient patronage. In October, 1882, a second mill was completed near Tombstone, known as the Watervale Mill. After a two months run on custom ore it was closed.

Shortly after the formation of the Tombstone Milling and Mining Company in March, 1880, the management was taken over by John A. Church, a member of the first graduating class of the Columbia School of Mines of New York, one of the pioneer mining schools of the country. In 1881, several modifications of the old Corbin and Gird mills were tried out. Concentrating machinery was installed, and a 40-ton water jacket furnace was erected in 1881 to treat the large accumulated tailing. The furnace was not completely successful until the middle of 1883, when a change in the concentrating equipment was made by the addition of special cone-shaped concentrators to the existing Frue vanners. Flux for the furnace was obtained from the manganese silver ores of the Lucky Cuss and Luck Sure Mines, and some lead ore was mined from the Hendricks claim in

Bisbee. As greater depth was obtained in the Tough Nut, higher grade lead ore was found, and the smelter discontinued buying lead ore. The year 1882 was the banner year for the camp. In that year the detailed production figures as reported by the Arizona Weekly Star of Jan. 4, 1882 were as follows:

Contention	$1,680,542.13
Grand Central	1,958,320.35
Stonewall(Boston Mill)	240,000.00
Boston Mill (Vizina and Miscellaneous custom)	165,000.00
Girard Mill, mine and custom	177,540.00
T. M. and M. Co.	1,440,894.06
Head Center	125,079.81
Watervale Mill	15,000.00
Total	$5,202,876.35

The total since discovery was given as $12,541,088.18

In 1883, the Contention and Grand Central companies were retarded to a great extent by the installation of pump machinery. The T. M. and M. Co. which was working on ores of a different geologic occurrence did not develop to water level for a number of years, and maintained normal ore extraction for the year. The Grand Central started developing the Emerald Mine.

Two new ventures were started. One of them, the Prompter, was financed by Arizona capital, and was run by John Haley. The second was the Rattlesnake Company owning the Rattlesnake, Bunker Hill, and Mammoth Mines. During the year this company shipped to custom plants $10,000 a month.

A third venture one and a half miles east of Tombstone was started during the year, known as the Woronoco or San Diego Company. This company developed ore running 75 ounces of silver and 20% lead, and built a 30-ton water jacket furnace, which treated besides its own ore, Luck Sure and other custom ore. It used as fuel both Trinidad coke and charcoal.

The Way Up and Ingersoll Mines, operated by small companies and chloriders, shipped considerable ore to custom plants, and a company did considerable development on the State of Maine to the west of the camp, and shipped a little high grade ore from above the 200-foot level.

The Head Center continued to produce during the year, and operated their mill at Contention City.

In the beginning of 1884, the prospects of the camp were very bright. The pumps were operating successfully, and ore was being found to extend below the water table at the Contention and Grand Central. The miners early in the year formed a union and in May struck for a raise from $3.00 to $4.00 a day. The strike was a general one, and all the mines were forced to close, as the operators were a unit in refusing any advance until the pumping problems were completely solved and the ore proved to continue below the water. The strike was without violence. Only one attempt was made in June by the strikers to invade the company premises. A mob of the more disorderly element had gathered but were induced to disband before any action was taken. The strike lasted four months, when the men voluntarily dissolved the union and agreed to return to work at the old scale. This episode is a great tribute to the orderliness of the Tombstone miners. The comparison with the disgraceful labor disturbances in Colorado and Idaho in later years is very striking, and goes a long way to exonerate the miners in the lawlessness of 1881 and 1882.

All the companies reopened one by one after the strike except the Contention. During the year the Rattlesnake Company continued mining from the Rattlesnake and Bunker Hill Mines, and the Silver Thread which had started developing in 1882 continued to develop and shipped high-grade ore to custom plants. In 1885, the Contention and Grand Central companies spent the first six months in an attempt at combined pumping.

This attempt was not completely successful. A large part of the Grand Central production came from the Emerald claim, which was equipped with large hoisting works. The T. M. and M. Co. in the latter part of the year bought the Girard Mill and treated all ore except stock piled reserves at Tombstone, leaving the Charleston works to finish up. The old Charleston Mill was abandoned at the end of the year. The Boston mill plant shut down at the end of 1884, leaving only one mill, the Grand Central, operating in the San Pedro at the end of 1886.

The year 1886 proved a disastrous one. In May the Grand Central hoisting house and pumping works were destroyed by fire, leaving the Contention pumps alone to handle the water. The Contention works were also destroyed later in the year. The Contention Mine was closed down during the early part of the year, and the mill operated only a short time on tailing. During the year the Head Center Company was reorganized as the Head Center and Tranquility. Only a small production through the treatment of tailing was made at the mill, but the mine was developed and new finds made. The T. M. and M. Co. had purchased the Girard Mill at Tombstone and used it instead of the Corbin Mill at Charleston, which was closed down for good. The furnace at the Girard Mill at Charleston continued operation longer and was never moved. Development work was done at the Bunker Hill Mine by a reorganized company known as the Bunker Hill Mining Company, and large reserves proved. The Old Guard, State of Maine and Silver Thread continued to develop, but did not produce.

In 1887, only the Grand Central and T. M. and M. Co. produced, the Grand Central mining mostly from the Emerald. The company reported treating 14,300 tons with a production in bullion and concentrates of $572,740, an average yield of $39.50 a ton. The cost per ton was given as $32.52, making a profit of $6.98. A new shaft was sunk 300 feet during the year

and the burned hoist was partially repaired but never put into service on the new Grand Central shaft. No attempt was ever made to repair the Grand Central Cornish pumping plant. The pumping plant was never re-conditioned.

The old Watervale mill was reopened and treated Old Guard and Ground Hog ore. The total production of the camp in 1887 was about $600,000 as compared with over $5,000,000 in 1882.

During the year 1888, the silver market continued to decline, the average price for the year being 94 cents as compared to 98 cent in 1887. The Grand Central operated their mill at Fairbank until July, when all the mills in the camp were closed. The company during the year bonded the Silver Plume, Mamie and Silver Thread Mines, and shipped most of their ore from the Emerald and Grand Central. The Emerald reached water level at 700 feet. No attempts were made to stope below the water. The T. M. and M. Co. operated the West Side and Lucky Cuss Mines the greater part of the year, but did not run their mill after July. The Contention and Tranquility companies negotiated during the year looking towards handling the water jointly, but did not resume mining.

Besides the larger companies, the Vizina and Ground Hog Mines were operated by lessees, who treated their ore up to July in the Watervale Mill. During the remainder of the year, high grade ore was shipped to Socorro and other custom plants.

The Bunker Hill Company under the superintendency of Coffman, sank a new vertical working shaft, and shipped high grade ore at the rate of about 150 tons a month.

In July there were about 500 men at work in the camp, but by the end of the year this had been reduced to 400 men.

In 1889, the large companies very much curtailed, and the main

production was from the Bunker Hill and lessees on the Vizina and Old Guard. During this year the camp produced only about $250,000, as compared to over $5,000,000 in 1882 and about $600,000 in 1887.

In 1890 the price of silver showed marked improvement, averaging $1.05 for the year. A general reopening by all the mines resulted. No attempts were made to operate the mills, the better ore being shipped to reduction works. The railroads made freight concessions during the year allowing for more profitable operation. The principal shipper was the T. M. and M. Co. under the management of Geo. W. Cheyney. The Grand Central, Bunker Hill and Vizina companies also operated during the year.

The silver market continued to hold up during most of the year 1891. During this two year period, the camp produced about $1,274,650, of which $674,650 was produced in 1891.

In 1892 the price of silver declined to 87 cents with a further drop to 78 cents in 1893, and reached bottom in 1894 when it was quoted at 63 cents. The T. M. and M. Co. operated on company account but at a steadily reduced rate until the end of 1896 when the mines were closed and operated intermittently by lessees. The other mines were turned over to lessees in 1892.

The production entirely from shipping ore was about $490,000 in 1892, $450,000 in 1893, and about $300,000 a year for 1894, 1895, and 1896.

Practically all production ceased in 1897 except for intermittent lessees operations. In that year, an attempt was made to work the tailing piles of the Grand Central Mill at Fairbank by cyaniding them. This was tried by Durckner, Longpaap, Scribner and Barron, but the values proved refractory to this method and after a few months trial the scheme was abandoned.

In the remaining years of the century lessees operated several mines,

more notably the Telephone, Tranquility, and Silver Thread, but the production was much reduced at the end of 1896. According to figures compiled by John A. Church in an article published in the Transactions of the American Institute of Mining Engineers, Vol. 33, 1903, the total production of the camp up to the end of 1901 was $25,000,000 almost entirely from above water level, and the greatest amount produced from 1879 to 1893 during the high silver market. The production by years was about as follows:

Year	Production	Price of Silver	Year	Production	Price of Silver
1879	$ 239,540	1.12	1890	600,000.00	1.05
1880	2,303,719.13	1.15	1891	674,650.00	0.99
1881	4,889,762.16	1.13	1892	490,000.00	0.87
1882	5,292,876.35	1.14	1893	450,000.00	0.78
1883	3,030,262.88	1.11	1894	300,000.00	0.63
1884	1,380,788.00	1.11	1895	300,000.00	0.65
1885	1,320,975.50	1.07	1896	300,000.000	0.68
1886	1,050,000.00	0.99	1897)		0.60
1887	996,366.00	0.98	1897)		0.59
1888	600,000.00	0.94	1899)	305,409.96	0.60
1889	250,000.00	0.94	1900)	(by difference)	0.62
			1901)		0.60
			Lead Production -		340,000.00
			Grand Total -		$25,000,000.00

Church estimated a production of 163,000 ounces of gold, 21,500,000 ounces of silver and 5000 tons of lead. Figuring this at the 1928 market the production would have been about $16,200,000. Mostly from the 14 1/2 year period from July 1879 to January 1894.

During the years of depression, E. B. Gage of the Grand Central Company had gradually absorbed the better independent holdings in the camp such as the Silver Thread, Mamie, Tranquility, and others, and in 1901 he persuaded the T. M. and M. Co. and Contention to join the Grand Central in a reorganization. The Tombstone Consolidated Mines Company was formed with Gage as President and the Development Company of America, owning the Congress Mine, and the Silverball copper deposits was induced

to finance an attempt to drain the camp and prospect below the water table.

It was decided to sink a central 4-compartment pump shaft to a depth of 1000 feet, to install large pumps sufficient to lower the water of all the mines, and to prospect each of the larger mines individually.

By August, 1902, the shaft had reached the water level. The first pumps were lowered in November. Large tripple expansion Prescott pumps were used, steam run. The sinking pumps, usually 4 in use at a time, were duplex Prescott pumps, 14 inch steam cyls., 8 inch plungers, 12 inch stroke, having capacity of 600 gallons per minute each.

The El Paso and Southwestern R. R. was induced to build in from Fairbank. Construction started in 1902, and was completed April 12, 1903. Shaft sinking continued during 1903, and the old working levels of the Grand Central, Contention, Emerald, Lucky Cuss, Silver Thread, and other mines reconditioned. During 1903, a considerable tonnage of silver lead ore was shipped to El Paso. By the end of the year, a second pump was installed on the 700 foot station, 140 feet below the water. When installed, 2,300,000 gallons a day were being handled. The shaft was sunk after this at the rate of five feet a month, and the water lowered six feet a month. During 1904, tests were made looking towards cyaniding a large tonnage of low grade silver ore piled up on the various mine dumps. By the end of 1905, the shaft had reached the depth of 886 feet, and third pump station cut on the 800 foot level and pumps installed. A 125-ton cyanide mill was started during the year and low grade ore was stock-piled. From two to three carloads of silver-lead ore were shipped a day throughout the year to El Paso. During the year, railroad lines were run to all the principal shafts.

In 1906 the shaft was completed to the 1000-foot level and the

and the final pumps were installed and drifting on the bottom level was started to get under the old Grand Central and Contention stopes. The mill composed of 65-stamps, Wilfley tables, slime cones and cyanide tanks was completed and ran the greater part of the year. The capacity finally attained was 225 tons.

The water handled, at first amounting to 5,000,000 gallons a day slowly decreased until at the end of the year 4,000,000 gallons were being pumped.

Working shafts were sunk at the Silver Thread, Tranquility, Emerald, Lucky Cuss, Tough Nut and West Side.

In 1903, three independent companies started operating, the Luck Sure, Old Guard, and Herschell Mines, and a second attempt was made to treat the Grand Central Mill tailing at Fairbank by the Slime Tailings Company.

In 1906, the Luck Sure and Black Eagle Mines shipped ore regularly, operated by the Old Glory Mining Company, and the Herschell Mining Company developed to a depth of 325 feet and shipped 2 cars a month to El Paso. The Slime Tailing Company was unable to recover the values at Fairbank and suspended activities.

In 1907 the Tombstone Cons. Mines Company produced a gross output of $507,009. The water continued at about the same rate during the year. The concentrator operated on mill tailing during most of the year. The Old Glory Mining Company closed down at the end of the year, but the Herschell continued to ship regularly.

In 1908 the Tombstone Cons. Mines Company operated the mill but produced both lead and zinc concentrates besides silver and gold bullion. The concentrates were made from the treatment of a new ore body encountered in 1907, 50 feet below the water level at the Emerald Mine, running

80 cents in gold, 10 1/2 ounces of silver, 13.3 % lead, and 22.6 % zinc. The total output of the camp for the year was 51,266 tons of ore and old tailing containing 84,866 ounces of gold, 357,414 ounces of silver, 7603 pounds of copper, 1,770,794 pounds of lead and 173,313 pounds of zinc, with a total value of $357,818. The Herschell Mine continued to produce during the year. The water started to increase in 1907, the average for the year, 1907, being 4,824,642 and in 1908 4,915,900 gallons per day.

The year 1909 proved a disastrous one. In June 1st at 2:30 a.m., due to the fact that the oil tanks supplying the boilers had not been drained of water settling from the oil, as was customary and necessary, some water with the oil entered the fuel oil supply pipes. The steam pressure fell to 50 lbs., stopping the 1000 level pumps. This condition lasted until 5:15 a.m. To add to the trouble, the telephone lines went out so that aid could not be summoned. During this 2-hour and 45-minute time, the water raised sufficiently to drown the 1000-foot level pumps. Frantic efforts were made to retrieve the pumps by the aid of sinking pumps, but unsuccessfully and the water raised to the 800-foot level pumps. Additional sinkers were installed and provision made to run part of them by air to minimize the heat from the exhaust steam*, and in 1910 a 4000 cu. ft. compressor was installed for this purpose. The water was slowly lowered with the sinkers and the top of the 1000 foot station had been reached when the six boilers went out of commission simultaneously due to overburden. New boilers were then added and by August 26, 1910, the pumps were recovered, and drifting on the 1000-foot level resumed. The amount of water increased to a maximum of 71,458,356 gallons a day. The amount of water pumped up to the

*Note: The exhaust could easily be taken care of by condensation. It was the heat from the live steam pipes and pumps that constituted the problem.

accident in 1909 was as follows:

Jan. 1st to Mar. 31st, 1903	1,207,465	gallons	per	day
April 1st, 1903 to Mar. 31st, 1904	2,180,341	"	"	"
April 1st, 1904 to Mar. 31st, 1905	3,345,477	"	"	"
April 1st, 1905 to Mar. 31st, 1906	3,164,079	"	"	"
April 1st, 1906 to Mar. 31st, 1907	4,223,550	"	"	"
April 1st, 1907 to Mar. 31st, 1908	4,624,642	"	"	"
April 1st, 1908 to Sept. 30, 1908	4,915,900	"	"	"
Oct. 1st, 1908 to Sept. 30, 1909	5,008,808	"	"	"

The amount the day before the accident was 6,706,080 gallons, and the average for the 10 days previous was 6,659,401 gallons, or 4,624 gallons per minute. The indications pointed to a gradual draining of the water. After the recovery of the pumps in 1910, they delivered 10,000,000 gallons per day.

The company reported at the end of 1909 a total production from 1903 to the end of the year 1909 of 9,353,068 lbs. of lead, 37,013 ounces of gold, 2,517,845 ounces of silver and a small quantity of copper. The concentrator was operated in 1909 and 1910, but in the latter year only lead-silver concentrates were made. The cyanide plant was not operated after 1908.

In 1909, the Bunker Hill Mine was acquired by the Phelps Dodge interests, who developed and shipped ore in 1909 and 1910.

On January 19, 1911, the extraordinary expenses proved too great a drain on the finances of the Development Company of America, and the pumps were abandoned, and the water allowed to raise to the 600 level. The pumps on the 1000, 800 and 700-foot levels were left on the stations, where they remain to this day.

Unsuccessful attempts were made to refinance the Development Company in 1911, and the mines were turned over to lessees. A small production was made in 1911, 1912, 1913 and half of 1914 by lessees, reworking old dumps, and upper level stopes until the acquisition of the Tombstone Consolidated holdings by Phelps Dodge Corporation in June, 1914.

The total production by the Tombstone Consolidated, Herschell, Old Guard, and Bunker Hill, the greater bulk from the Tombstone Consolidated, was $3,376,283 divided as follows:

1903-1906 incl.	$1,553,740
1907	507,009
1908	357,818
1909	260,145
1910	101,612
1911	216,042
1912	157,956
1913	130,189
1914 (half year)	101,772
Total	$3,376,283

An interesting summary of the activities and financing of the Development Company of America was published in the Engineering and Mining Journal of July 8th, 1911, as follows:

"The Development Company of America. To satisfy creditors, the following securities were sold at auction in New York June 2d: $1,015,000 Imperial Copper Company 6% bonds; $30,000 Development Company of America 15 year 6% gold trust bonds; $250,000 Tombstone Cons. Mines Company 6% special contract bonds; 100,000 shares Tombstone Cons. stock; $725,000 demand notes of Imperial Copper Co.; and $1,500,000 of Tombstone Cons. demand notes. They were bought by interests friendly to the Development Company of America.

"The Development Company of America was organized in Delaware Nov. 23, 1901 with $3,000,000 authorized capitalization and a bonded debt of $5,000,000. It owned the entire stock of the American-Mexican Lumber Company, and the Congress Consolidated Mines Company, Ltd. and controlled the Poland Mining Company, Lookout Copper Co., Imperial Copper Co., and Tombstone Cons. Mines Company.

"The American-Mexican Lumber Company owning 500,000 acres of pine lands in Chihuahua was capitalized at $5,000,000. The timber tract was

sold in 1909 for $3,000,000 cash. The Congress Cons. Mines Company Ltd. capitalized at $5,000,000, owns the Congress Mine. In 1906 and 1907, the Congress paid $150,000 dividends to the Dev. Company. The Poland Mining Company was capitalized at $3,000,000 of which $1,422,620 is owned by the Development Company, which also owned $1,000,000 7% income bonds. Concentrates from the 20-stamp mill were shipped to the Sasco Smelter and lead concentrates to Needles. The Lookout Copper Company was capitalized at $2,000,000 of which $1,700,000 was owned by the Development Company, owns property in Yavapai County. The Imperial Copper Company is capitalized at $5,000,000 and issued $2,000,000 of income bonds of which the Development Company owned $2,505,000 and $1,013,000 respectively. The Imperial Copper Company owns all the stock of the Arizona Southern R. R. and the Southern Arizona Smelting Company. Shipments began in Sept. 1903, and to July, 1908, the mine had produced 22,000,000 lbs. of copper and some silver and lead. Two $100,000 dividends were paid in 1906 and 1907. The smelter was blown in early in 1908. The Tombstone Cons. Mines Company was capitalized at $15,000,000, $6,500,000 owned by the Development Company. There was an income bond issue of $3,000,000, 6% bonds. About 7 years ago, E. B. Gage and associates, brought together the principal properties under one ownership. Funds were raised through the Development Company of America, thought ample to install necessary pumping equipment, and to prospect below the water level. A new 4 comp. shaft was sunk to water level (560') where a pump station was cut and a 1750 g.p.m. pump installed. A second station and pump were installed later at the 700' level and a third at the 800' level, and a final station at the 1000' level. Drifting started on the 1000' level. Oil was used as fuel for the boilers. An accident to the oil supply pipe occurred, and the water raised to the 800-foot level.

Attempts to lower the water with 4 sinking pumps failed. Pumps on the 800 were then enlarged and a compressor installed to operate the pumps by compressed air, to obviate the excessive heat of the steam. The 1000' level was nearly reached when an accident occurred to the boiler plant, and the water again raised to the 800' level. The boiler plant was repaired and the water finally lowered and the 1000' level pumps recovered. Drifting was resumed, but the credit of the company was exhausted, and pumping stopped Jan. 19, 1911. At the last, the pumps were handling 10,000,000 gallons per day. Steps are now being taken towards reorganization of the subsidiary companies. About 125 men are now working at Tombstone on lease account in and about the old stopes above the water level."

One of the principal creditors of the Tombstone Consolidated Mines Company was the Phelps Dodge Corporation. Negotiations were started in 1913, and after an examination of the mines above water level had been made the Tombstone Consolidated holding were acquired, by Phelps Dodge Corporation June 23, 1914. Phelps Dodge and Company decided to operate under the name of the Bunker Hill Mines Company. Emil Grebe was put in charge as superintendent. No attempt was made to regain the lost pumps, the decision having been made to prospect for new ore and extensions of old ore-bodies in the old upper levels above the water level. After a thorough sampling, shipments were started on company account at the end of the year.

In 1915 exhaustive tests were made on various kinds of ore in the mill, remodeled from the old Tombstone Consolidated concentrator. 30 stamps were used and cyaniding by percolation of the sands and agitation of the slimes employed. Some experiments were made in concentrating the high manganese ores of the Escondido, Lucky Cuss, Oregon and Prompter.

High grade concentrates were shipped as chemical ore and the tailing containing 10 oz. of silver was shipped to the smelter at Douglas.

During the year the Old Guard and Solstice Mines were reopened and shipped small quantities of ore.

In 1916 the Bunker Hill Mines Company shipped a large tonnage of ore direct and treated nearly 40,000 tons in the concentrator, producing bullion, lead concentrates, a little wulfenite concentrate, chemical manganese and silver manganese tailing. The total production of the camp was $411,592 excluding the manganese ore. The Silver Bar, Solstice, and Old Guard also produced small amounts.

In 1917 the camp produced 57,474 tons of ore with a value in gold, silver, copper, and lead of $608,315. The concentrator was run throughout the year and produced bullion and concentrates. A large tonnage of siliceous silver ore was shipped direct as flux to Douglas. The Randolph, Silver Bar, and Solstice also produced during the year.

In 1918 theBunker Hill Mines Company operated the mill and mine on company account up to April 1st. The mill was then closed and the mines turned over to lessees. The total production for the year was 19,307 tons yielding $354,892.

In 1919, the camp produced mostly from lessee's operations on the Bunker Hill Mines Company 27,445 tons of ore and old tailings yielding $613,943. During the year the Herschell, Hellgren, and Sunset groups were worked and produced. All manganese shipments ceased after the armistice. In the early part of the year, Emil Grebe was replaced by John H. Davis as superintendent of the Bunker Hill Mines operations.

In 1920, stimulated by the continuance of $1 silver under the Pittman Act, a large production was made by lessees on the Bunker Hill and numerous independent operators, more notably the Herschell, Free

Coinage, Mellgren Group, Old Guard, Ninety Six, Rocky Bar, Solstice and Sunset. The camp mined 28,946 tons yielding $580,939 during the year.

In 1921 production continued at about the same rate, the yield being $502,499. Silver bullion was produced from cyaniding the dumps of the State of Maine. The Old Guard Mill was rebuilt by the National Metals Recovery Company and lead silver concentrates shipped.

In 1922 the camp produced $729,214. The State of Maine dumps continued to be treated, and the Mellgren Group ore was treated in a 100-ton cyanide plant.

In August, 1923, silver bought under the Pittman Act was discontinued and most of the production for the year amounting to $531,947 was made prior to that date. A 50-ton custom mill was operated by the Bonanza during the year. The Grand Central tailing pile at Fairbank was acquired by a syndicate headed by Lewis Douglas and Harry Hendrickson. After making careful tests, a 150-ton flotation mill was started, completed in June, 1924.

In 1924, the production was much curtailed, the camp producing $263,508 as compared to over $700,000 in 1922 during the high silver market. The concentrator retreating the Grand Central tailing operated successfully on material running 80 cents in gold, .3 ounces in silver, 4.5 percent lead and yielded concentrates running $6 in gold, 18 ounces in silver, 45 per cent lead and a little copper. Sodium sulphide was used, and the best results found when the water was heated to 165° F. Extractions of 90 per cent of the lead and 65 per cent of the silver were made.

In 1925, the camp continued to produce at a reduced rate. The Grand Central Mining Company operated its concentrator throughout the year, treating over 10,000 tons of tailing from which 2169 tons of concentrates

were shipped running $4.62 in gold, 17.28 ounces of silver, 0.40 per cent copper and 26.49 per cent lead. The Bonanza Leasing Company operated its custom mill treating ore from the Argenta, Hamilton, Old Guard, Solstice and Mellgren groups. During the year one old dump on Bunker Hill ground was worked successfully by crude screening and tabling the fines, producing concentrates running 80 ounces of silver, $7 in gold, and 20 per cent lead. The total production for the year was $369,157.

In 1926 the camp produced during the first half of the year at about the same rate as in 1925 but the continued decline in the price of silver forced a general suspension at the end of the year aided by the decline of the lead market also. On September 28th one of the largest recorded floods occurred on the San Pedro River, which washed away bridges, railroad tracks and a large part of the Grand Central tailing pile. Up to the time of the flood, the Grand Central Mining Company had treated 25,925 tons yielding 2060 tons of concentrates yielding $5.45 in gold, 21.44 ounces of silver, 0.42 per cent copper and 26.80 per cent lead to the ton. The total production of the camp for the year was $373,002.

In 1927 and 1928 lessees continued to ship siliceous ore and lead silver ore to Douglas, at a reduced rate. The production for the two years amounted to about $150,000 a year.

In 1922 John H. Davis was superseded by A. M. Morris, and he was replaced in 1927 by F. H. Soderstrom as superintendent of the Bunker Hill Mines Company. The production of the camp from 1915 to Dec. 31st, 1926, was as follows:

1915	$ 97,780	1921	$ 502,498
1916	411,392	1922	729,214
1917	608,315	1923	531,947
1918	354,892	1924	263,508
1919	613,943	1925	230,259
1920	580,939	1926	243,473
		Grand Central Co.	388,528
		Total	$5,556,888

Production Summary

Period	@ Current silver prices	@ 1928 silver prices
1879 to 1901 incl.	$25,000,000	$16,200,000
1902 to 1914 incl.	3,376,283	3,376,283
1915 to 1926 incl.	5,556,888	5,556,888
Grand Total	$33,933,171	$25,133,171
Assumed 1927 and 1928	300,000	300,000
Grand Total to Dec. 31, 1928	$34,233,171	$25,433,171

This production was made practically all above water level.

The older part of the camp still has considerable low grade ore available above the water level, but the grade of that remaining is approaching the commercial limit. Unless another attempt is made at some future date to prospect below the water level, this part of the camp may be considered as practically exhausted.

DETAILED PRODUCTION FIGURES:

Up to the end of 1901 the total production by companies and the dividends paid were as follows:

Company		Production
T. N. and M. Co.	1879-1896	$10,549,571.37
Contention	1880-1885	5,908,797.98
Grand Central	1881-1888	5,658,917.28
Boston Mill. Co. Custom ore and Knoxville*	1880-1884	856,950.83
Vizina	1881	526,716.98
Head Center	1881-1884	395,600.31
Sunset	1880	22,500.00
Ingersoll	1881-1883	43,500.00
Way Up	1883	6,250.00
Luck Sure	1883	35,977.29
Girard	1882	177,540.00
Watervale Mill	1882	15,000.00
Bunker Hill and Rattlesnake	1883	98,000.00
Woronoco	1883	11,875.00

*Boston Mill. Co., Custom after 1881 includes Vizina lessees.

Miscel.*	1886-1901	1,032,802.96
	Grand Total	$25,000,000.00

From 1897 to 1901 there was intermittent work done by lessees at several properties, more notably the Silver Thread and Tranquility. This production amounted to about $300,000, about $60,000 a year. The ore was shipped to the El Paso Smelting Works and other reduction plants in the Southwest.

Tombstone Mill and Mining Co.

This company was organized in 1879 by Ed. and Albert Schieffelin, Richard K. Gird, Governor A. P. K. Safford and Frank Corbin. The first mill known as the Gird Mill was completed in June, 1879. In March, 1880, the company absorbed the Corbin Mill and Mining Co. organized in 1879 by Frank Corbin to operate the Lucky Cuss Mine. A mill was completed near the Gird Mill in October, 1879. The combined holdings of the company after March, 1880, included the Tough Nut, Lucky Cuss, West Side, East Side, Good Enough, Survey, Defense, Owl's Nest, Tributa, East Side No. 2 and Owl's Last Hoot, claims and the two mills aggregating 30 stamps, at Charleston. Concentrators and a smelter were added in 1881. In 1885, the Girard Mill at Tombstone was purchased and the reduction works moved to Tombstone in 1886.

Production started in June 1879 and continued without interruption except in 1889, to the end of 1896. For the first three years, 1879, 1880, and 1881, most of the production was from the Tough Nut and Lucky Cuss. The West Side, Owl's Nest, Good Enough were developed later, and the West Side and Good Enough produced prolifically. The detailed production figures for the life of the Company are about as follows:

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*Includes T. M. and M. in 1886 and Bunker Hill from 1888 to 1891.

Year	Mines	Tonnage	Production	Grade	Price of silver	
1879	Tough Nut		$ 239,540		1.12	213,875 (oz)
1880	Tough Nut	19,350	913,443.30	$59.635	1.15	794,298 (oz)
	Lucky Cuss (Jan.-Mar.)		107,194.28			93,212 (oz)
1881	Tough Nut	17,650 (10 months)	1,551,006.75	74.16 (10 months)	1.13	1,372,572 (oz)
1882	Tough Nut West Side Lucky Cuss		1,440,894.06		1.14	1,263,942 (oz)
1883	Tough Nut		611,084. in Ag			550,[illegible] (oz)
	Lucky Cuss	16,322	60,313 in Au	43.03	1.11	2918 (oz)
	West Side		30,936 in Pb.			747,200 (lbs)
1884	Good Enough		397,326 in Ag			353,[illegible] (oz)
	" "		38,752 in Au		1.11	1875 (oz)
1885	" "		429,744 in Ag			401,630 (oz)
			2,300 in Au		1.07	111 Au (oz)
			43,680 in Pb			1,108,600 (lbs)
1886	" "		400,000 (approx)		0.99	400,000 (oz)
1887	" "		227,216 Fine Ag			231853 (oz)
	" "		22,911 Fine Au			1108 Au (oz)
	" "		161,000 Ag in base bullion		0.98	164,296 oz TOT 396,139 oz Ag
			12,499 Au in base bullion			605 TOT 1713 oz Au
			20,000 Pb			451,500 lbs Pb
1888	" "		300,000 (approx)	311,152 oz	0.94	
1889			Closed			
1890	" "		600,000 (Approx)	571,434	1.05	
1891	" "		460,990 Ag	465,642	0.99	
			79,802 Au			3801 Au (oz)
1892	" "		490,000 (Approx)	563,218	0.87	
1893	" "		450,000 (Approx)	517,241	0.78	
1894	" "		300,000 (Approx)	476,190	0.63	
1895	" "		300,000 (Approx)	461,538	0.65	
1896	" "		300,000 (Approx)	441,176	0.68	

Total	$10,229,571.37
Pb produced	320,000.00
Grand Total	$10,549,571.37

Dividends Paid

1880	$ 500,000
1881	500,000
1882-1884	250,000
Total	$1,250,000

Total T. M. and M. Co. dividends probably amounted to $1,250,000. This figure is given in the report of the President dated April 29, 1882.

Contention or Western Mining Co.

The Western Mining Company was organized by J. S. White and associates in 1878 to operate the Contention claim, acquired from Ed. and Albert Schieffelin and Richard K. Gird. A mill was erected near Fairbank in October, 1879. Production started March 8th, 1880. The company was reorganized in 1881 as the Contention Mining Company and other ground acquired, more notably the Flora Morrison and Sulphuret claims. The ore mined was from ore shoots in the Contention, Grand Central, Head Center vein. Water was reached at a depth of 560 feet on the Sulphuret shaft in June 1881, and in 1883 the largest pumps in the Southwest were installed. The company continued mining to the end of 1885, when it ceased functioning, and the mines were turned over to lessees. Some stoping was done below the water, but the heavy flow proved too great for the pumps to handle and allow for drifting on the vein.

The production was about as follows:

Year	Tonnage	Production	Grade	Price Silver	Remarks
1880	15,000	1,213,975.57	80.93	1.15	1,055,630 oz
1881	20,016 (10 months)	1,489,168.82	61.10 (10 months)	1.13	1,317,845 oz
1882		1,680,542.13		1.14	1,474,160 oz
1883	26,107	987,955.59	37.84	1.11	890,050 oz
1884		330,000.000 (approx)	292,300 oz	1.11	Jan. 1st to May 1st. Miners strike
1885		207,173.87	205,733	1.07	
Total		5,908,797.98			

Dividends: The following dividends were paid:

1880 and 1881 - $1,375,000

Grand Central Mining Co.

This company was organized by E. B. Gage in 1878, who acquired from one of the original locators and his partners, the Grand Central claim. After developing the mine in 1878, 1879, and 1880, a large mill was constructed on the San Pedro, near the site of Fairbank, completed in March,

10, 1881. The expenditures prior to production were about $300,000. The Company acquired the Emerald claim in 1882, and started active development of this mine in 1885. The mill at Fairbank continued to function to the middle of 1887 after which time, ore was shipped to reduction works. Water was encountered in 1882, and a large pumping plant was installed in 1883. The combined pumps of the Contention and Grand Central were unable to control completely the flow. Winzes were sunk about 100 feet below the water table, but stoping was done for only about 50 feet. In 1886, the Grand Central main hoist and pumps were destroyed by fire. After that the greater bulk of the ore treated and shipped came from the Emerald ore body above water level. At the end of 1888 the mines were turned over to lessees. During the years 1889 to 1901, the company acquired considerable additional ground, but did not mine on company account.

The total production was as follows:

Year	Mine	Tonnage	Production	Grade	Price of Ag.	Remarks
1881	Grand Central	18,000 (2 months)	1,050,875.30	$47.125 (9 months)	1.13	929,978 02
1882	Grand Central		1,358,820.35		1.14	1,191,947 02
1883	Grand Central	29,250	854,523	29.21	1.11	769,840 02
1884	Grand Central Emerald		483,882	435,932	1.11	About 6 months strike
1885	Grand Central Emerald		638,077.63	596,334	1.07	
1886	Grand Central Emerald		500,000 (Approx)		0.99	Fire
1887	Grand Central Emerald	14,500	343,674 Fine Ag 42,340 Fine Au 164,319 Ag in Conc. 56,407 Au in Conc.	39.50	1.11	Mostly from Emerald
1888	Emerald		200,000			
	Total		5,658,917.28			

Dividends: The following dividends were paid:

1881 - 5 dividends aggregating $300,000.
No record of other dividends.

Head Center Mining Company.

This company was organized by T. E. Parish and associates in 1879. The Naumkeag and Head Center claims were bonded in November, 1879, from Jerry Ackerson, the bond for the Head Center being for $30,000 according to current press reports. A ten-stamp mill was erected on the San Pedro in 1880, completed in April, 1881. Production started in 1881 and continued to May 1st, 1884 when the miners strike of that year forced the property down.

In 1885 a reorganization was effected known as the Head Center and Tranquility Company, but litigation ensued and the mine was not reopened. The total production was as follows:

Year	Tonnage	Production	Grade	Price of Silver	Remarks
1881	8 months 5876	$191,520.50	8 months $20.80 1/4	1.13	169,482 oz
1882	3800*	125,079.81		1.14	109,718 oz
1883	1200	54,000	45.00	1.11	48,650 oz
1884	355*	25,000		1.11	4 months Miners strike 22,529 oz
Total		$395,600.31			

Some production was made after 1892 from lessees operations, but no records are available.

Vizina Consolidated Mining Co.

This company was organized in 1880 by Charles H. Filkins of Bradford, Pa. in March of that year. No mill was erected, the ore being treated at the Boston custom mill at Charleston. The Vizina claim adjoins the Tough Nut, and covered a large part of the early townsite of Tombstone. Protracted litigation resulted in 1882 between the mining company and the city of Tombstone, involving title to the ground. Production started in October, 1880 and ended in December 1881. The ore was of unusually high grade. The

total production was $526,716.98, and the grade from the first 4594 tons mined was 92.44. The mine was reopened in 1886 by lessees, who treated their ore in the Watervale mill and later shipped to various reduction works. Dividends of $80,000 were declared in 1881.

Boston and Arizona Smelting and Reduction Co.

This company was organized in 1879 to erect a mill at Charleston to treat Vizina and other custom ore. The plant was completed in July, 1880. The first installation was of 20-stamps and amalgamating pans. Concentrating machinery and a patent roasting furnace were added in 1882. The Knoxville-Stonewall Mine was purchased in October, 1881, for $100,000. This company operated up to the strike in May, 1884. During 1891, a small production was made from the Knoxville-Stonewall, and intermittent production from lessees operations from 1885 to 1891. The total production deducting the Vizina, was as follows:

Year	Mine	Tonnage	Production	Grade	Price of Ag.	Remarks
1880	Miscel.	16 months 1906	$ 46,624.00	$46.69	1.15	
1881	Miscel.	2225*	65,473.83		1.13	
1882	Knoxville Miscel.		405,000.00		1.14	
1883	Knoxville Miscel.	Knoxville 2250 Custom 1330	226,500.00	63.27	1.11	
1884	Knoxville Miscel.		106,868.00		1.11	4 months Miners strike
1891	Knoxville		6,465.00		0.99	
	Total		$856,950.83			

Part of the miscellaneous production in 1882, 1883, and 1884 was from ores outside the district, chiefly from Hershaw.

There is no record of dividends paid.

Sunset Mine.

This mine was purchased in 1879 by Asa Say of Oil City, Pa., and had a small production of very high grade silver ore from shallow depths. The principal production was in 1881 when approximately $22,500 was mined of

ore reputed in current news items to have run from $600 to $1600 a ton.

Ingersoll.

This mine was worked by a corporation composed of Arizona capital from 1881 to 1883. Development work was carried on in 1884 prior to the strike, but the mine was not reopened afterwards. The ore was treated at the Boston mill. An unrecorded production was made in the 90's from lessees operations. The total production was as follows:

Year	Tonnage	Production	Grade	Price of Ag.	Remarks
1881		15,000		1.13	1327
1882				1.14	Not recorded. Sent to Benson
1883	950	26,500	$30.00	1.11	23,874
1884				1.11	Developing
Total		43,500			

Luck Sure Mine.

This mine was also operated by a local company. It was opened in 1881 and shipped to various reduction works, to the T. M. and M. Co. smelter in 1881, and the Benson and Woronoco smelters in 1883, its value being as flux due to the high manganese content. In 1884, development work was carried on up to the strike in May, and the mine was then closed. An unrecorded small production was made later by lessees, shipping to various reduction works.

In 1906 the Black Eagle and Luck Sure Mines were reopened by the Old Glory Mining Company, but operations were suspended at the end of the year. In 1914 the property passed into the hands of the Bunker Hill Mines Company, a subsidiary of Phelps Dodge Corporation. The total recorded production was 680 tons of $52.91 grade, shipped to the T. M. and M. Co., Woronoco, and Benson smelters, the aggregate yield being $35,977.29.

Girard Mining Co.

This company was organized in 1881 to develop the ore of the Girard Mine. When water was encountered in the Sulphuret shaft in 1881 a mill was started at Tombstone, the first to be built in the camp, completed in February, 1882. The mill was operated about a month on Girard ore, but the values proved too low, and for the remainder of the year and part of 1883 it was run on third class Tranquility and Contention ore. The company went bankrupt in 1883, and the mine and mill were sold by the sheriff. In 1884, after higher grade ore had been found, the original company redeemed the property and carried on a development campaign during part of 1884. In 1885 the mill was purchased by the T. M. and M. Co. who moved their mill* to Tombstone in 1886. The production in 1882, partly from Girard ore and partly from third class Tranquility and Contention ore was $177,540.

Rattlesnake-Bunker Hill Mines.

These mines were purchased in 1881 by the Rattlesnake Company. Production started in 1883 when 1980 tons of $49.50 ore were shipped, aggregating about $98,000. From 1884 to 1887 the property was developed and reorganized as the Bunker Hill Mining Company. Active shipments started in 1888 and continued to the end of 1892 when the drop in silver prices caused suspension of work.

In 1909 the mine was purchased by Phelps Dodge and Company, but after reopening for examination, it was again closed.

In 1914 the Tombstone Consolidated holdings and other claims were acquired by Phelps Dodge Corporation, and the combined holdings were

*Not the smelter that remained at Charleston.

operated under the name of the Bunker Hill Mines Co. The Bunker Hill mine has been operated since intermittently by lessees. The total production is not available. During the years 1888 to 1891 the miscellaneous production from the camp was about $700,000. During this time, the Bunker Hill was one of the principal producers, and at least $500,000 probably came from there, making the total production including that of 1883 about $600,000.

Woronoco Company.

This company was organized in 1882 to exploit a deposit of lead-silver ore two miles east of Tombstone, on the San Diego and La Grande claims. A 30-ton water jacket furnace was erected costing $25,000, and production started in 1883. The ore treated was reported as 20% lead and 75 ounces of silver. Both charcoal and coke were used as fuel, and some custom ore was bought as flux, more notably the high manganese ore of the Luck Sure Mine. No production was made after 1883, and the total for that year was 415 tons with an aggregate value of $11,875 in silver, a grade in silver of $28.16.

Watervale Mill.

In 1882 a company was organized to erect a small custom mill, northwest of Tombstone. The venture did not prove profitable and closed after two months operation. In 1887 and a part of 1888 the mill was leased by lessees working the Vizina Mine.

The total production in 1882 was about $15,000.

Miscellaneous Mines.

Several small mines were worked during the productive period by "chloriders" and the ore sent to various custom plants, chiefly to the Boston Mill and Benson Smelter. The principal producers were the Mamie, Silver Thread, Way Up, and State of Maine, later absorbed by the Grand

Central Mining Company. The only production recorded independently was that of the Way Up, of 550 tons aggregating $6,250 in 1883.

Tombstone Consolidated Mines Co., Ltd.

This company was organized in 1901 by E. B. Gage and associates, as a reorganization and combination of all the more important companies operating previously, including the Tombstone Milling and Mining Company, the Grand Central Mining Company, the Contention Mining Company, the Vizina Consolidated Mining Co., and the Head Center and Tranquility Mining Company. The object of the reorganization was to prospect below the water table by handling the water through a central pump shaft. The history of the company has been given in previous pages. The production was as follows, in which however a small production from minor independent mines is included.

Year	Tonnage	Production	Grade	Remarks
1903-1906inc.		$1,553,740		Includes a large tonnage of old tailings and dump material
1907		507,009		Large tonnage of low grade material treated at concentrator.
		$120,255 Au.		
		506,455		
		10,780 #Cu.		
		2,509,215 #Pb.		
1908	51,266	$84,866 Au.		45,866 tons of low grade ore and old dump material treated in concentrator. 5,370 tons shipped direct to reduction works.
		357,414 Oz.Ag.		
		7,608 #Cu.	6.98	
		1,770,794 #Pb.		
		173,313 #Zn.		
		$357,818 (Total)		
1909		47,119 Au		18,928 tons of low grade ore and old dump material treated in concentrator. Total production 1903 to 1909 incl.: $765,059 Au. 2,517,845 oz.Ag. 60,000 #Cu. 9,359,068 #Pb. 887,029 Zn.
	27,123	201,700 Oz.Ag.		
		27,706 #Cu.	9.59	
		1,535,637 #Pb.		
		713,716 #Zn.		
		$260,145 (Total)		

Year	Tonnage	Production	Grade	Remarks
1910	5,249	$21,945 Au 116,520 oz.Ag. 31,163 #Cu. 305,876 #Pb. $101,612 (Total)	19.36	4619 tons of low grade ore treated at concentrator
1911	8,797	$44,354 Au. 224,098 oz.Ag. 68,209 #Cu. 982,010 #Pb. $216,042 (Total)	24.56	Lessees operations All shipped direct to El Paso Reduction works
1912	7,405	$28,177 Au 158,377 oz.Ag. 27,723 #Cu. 617,820 #Pb. $157,956 (Total)	21.33	"
1913	5,760	$25,415 Au 126,392 oz.Ag. 10,657 #Cu. 334,923 #Pb. 36,503 #Zn $120,189 (Total)	20.87	"
1914	6,093	$28,532 Au 108,868 oz.Ag. 14,217 #Cu. 234,345 #Pb. 39,324 #Zn $101,772 (Total)	16.79	Lessees operations All shipped direct to El Paso Red. works
TOTAL		$913,682 Au. 3,252,100 oz.Ag. 211,969 #Cu. 10,823,042 #Pb. 962,856 #Zn		
TOTAL		$3,376,283		

Bunker Hill Mines Co. (Phelps Dodge Corporation)

The assets of the Tombstone Consolidated Mines Company, Inc. together with the Bunker Hill Mine, and other property, were consolidated in June 1914, by Phelps Dodge and Co. under the name of the Bunker Hill Mines Company. Mining, concentration, and cyaniding, on company account were continued until April, 1918, when the various mines were turned over to lessees, who have continued to ship ore direct to the reduction plants at Douglas and El Paso to date (1929). The production has been as follows, included in which is a small tonnage of ore shipped by independent companies from 1916 to 1926 inclusive.

Year	Tonnage	Production	Grades	Remarks
1915	9,003	$25,135 Au 100,115 oz.Ag 36,075 #Cu 164,135 #Pb 63,386 #Zn $97,780 (Total)	10.86	Experimental work with concentrator
1916	57,200 From Bunker Hill 36,913 lbs. treated, 11,770 tons shipped	From Bunker Hill $81,646 Au 435,931 oz.Ag. 131,546 #Cu. 983,983 #Pb. 1,061,409 #Mn $411,592 (Total)	7.20	20,197 tons shipped direct. 20,426 tons milled Considerable manganese concentrates shipped
1917	57,474	$69,721 Au 444,139 oz.Ag. 229,488 #Cu. 1,278,754 #Pb $608,315 (Total)	10.58	26,762 tons direct shipped 16,075 tons milled 14,637 tons old tails as flux.
1918	19,507	$28,719 Au 293,412 oz.Ag. 41,503 #Cu. 457,183 #Pb $354,892 (Total)	18.19	13,885 tons shipped direct 5,622 tons milled Mines turned over to lessees in April and concentrator closed
1919	27,445	$40,220 Au 450,366 oz.Ag 209,182 #Cu 289,424 #Pb $613,943 (Total)	22.37	Lessees operations
1920	31,007	$36,953 Au 456,855 oz.Ag. 144,010 #Cu 243,946 #Pb $580,939 (Total)	18.74	28,946 tons ore 2,061 tons tails
1921	8,594 tons ore 10,000 tons tails	$31,141 Au 423,688 oz.Ag 132,688 #Cu 678,046 #Pb. $302,498 (Total)	17.57	State of Maine tailings dump in cyanide plant treated by lessees
1922	44,347	$48,005 Au 613,900 oz.Ag. 196,740 #Cu 744,529 #Pb $729,214 (Total)	16.44	27,617 tons milled 16,730 tons shipped direct

Year	Tonnage	Production	Grades	Remarks
1923	32,770	$63,924 Au	16.23	35,985 tons shipped direct
		495,943 oz.Ag		6,675 tons cyanided
		195,485 #Cu		110 tons tailings
		465,914 #Pb		Most ore production was prior to termination of Pittman Act Aug. 1.
		$531,947 (Total)		
1924	15,448	$50,820 Au	17.06	15,008 tons shipped direct
		247,642 oz.Ag		400 tons cyanided ore and sorted dump material.
		72,836 #Cu		
		465,323 #Pb		
		$263,507 (Total)		
1925	17,185	$44,878 Au	13.40	
		203,918 oz.Ag		
		57,996 #Cu		
		356,733 #Pb		
		32,592 #Zn		
		$230,259 (Total)		
1926	21,785	$50,569 Au		
		176,433 oz.Ag	11.18	
		96,172 #Cu		
		866,826 #Pb		
		$243,473 (Total)		
TOTAL:	351,765	$ 571,731 Au	14.69	
		4,332,162 oz.Ag		
		1,624,621 #Cu		
		6,998,697 #Pb		
		95,978 #Zn		
		1,061,409 #Mn		
GRAND TOTAL		$5,168,360		

Grand Central Mining Co.

This company was organized in 1924 by Harry Hendrickson, Lewis Douglas, and others to beneficiate the large tailings dump of the old Grand Central Mining Company near Fairbank. After careful testing, the material was found to be amenable to sulphidizing and flotation. A concentrator was erected and production started in June 1924. Operations continued until September, 1926, when a severe flood in the San Pedro River washed away railroad tracks, part of the equipment, and a part of the tailings pile. Operations were not resumed, as the better material had been treated. The production was about as follows:

Year	Tonnage	Production	Grade	Remarks
1924	15,000 (approx)	$10,000 Au	8.00	6 months operations
		30,000 oz.Ag		
		15,000 #Cu		
		1,000,000 #Pb		
		$120,100 (Total)		
1925	10,575	$10,450 Au	13.13	
		37,463 oz.Ag		
		17,346 #Cu		
		1,170,286 #Pb		
		$138,898 (Total)		
1926	25,923	$11,227 Au	5.00	
		44,146 oz.Ag		
		17,304 #Cu		
		1,104,160 #Pb		
		$129,530 (Total)		
TOTAL -	51,498	$31,677 Au	7.54	9 months operations
		111,609 oz.Ag		
		49,648 #Cu		
		3,274,446 #Pb		
GRAND TOTAL		$388,528		

CHAPTER 10

CATMAN DISTRICT

(This chapter never completed)

CHAPTER 11

YAVAPAI COUNTY (not completed)

History of Little Jessie (sketch)

This mine was discovered in 1867 and worked in a small way in arrastras. Like other vein deposits in the Bradshaws, the free milling ore extended down only about 50 feet, being then replaced by gold-bearing sulphides of a refractory nature. Until the railroads were built into the mining districts, the freight on concentrates was too high to allow for the erection of concentrators, and this mine like most of the others remained idle after the oxidized ores were exhausted in 1875.

About 1890 John S. Jones erected a mill in Chapparal Gulch to treat the ore of the Little Jessie out on lease to Wright, who worked it to the end of 1892, took out about $30,000, and exposed about $70,000 worth of ore.

In 1893 Jones took over the mine, equipped it, and in 1894 started regular production, saving $300 a day on the plates and shipping concentrates to the Commercial Mining Co. smelter at Curtiss. In 1896 the mine was clear of debt and a $5,000 dividend was paid. A rich strike of ore was found in 1897 and a cyanide plant was added, of 50 tons capacity. In 1898 the mill was equipped with 20 stamps, tables and cyanide plant. In the fall of that year the mine was sold to an English syndicate, who contemplated enlarging the mill to 200 tons capacity. This work was not done and the mine was shut down at the end of the year, and reverted to the original owner, J. S. Jones

In 1904 the mine was bonded to the Jessie Mines Co. organized by J. S. Jones who started to re-equip the mine and mill but did no effective work. The officers of the company were indicted for fraud, but the case was never tried. On January 1909 the Jessie Mining Co. was reorganized as the Ohio Mines Co. which leased the mine to the Chapparal Mining Co. This last company did considerable development work up to the end of 1916 and shipped a little ore.

The production of the Jones Mill up to its closing in 1898 is reported as about $750,000 gross from ore, chiefly from the Little Jessie Mine. This includes a small amount mined from the Chapparal or Union Mine, discovered at the same time.

Little Jessie Mine

Nov. 12, 1892	Jones Mill at Chapparal Gulch, running part time. Little Jessie worked by Wright on lease. High grade ore taken from 9"-15" streak. Total $30,000. Jones, owner contemplates equipping shaft. $70,000 milling ore in sight.
Aug. 19, 1893	John S. Jones Mill operating with 5 stamps.
Aug. 25, 1894	$300 per day being taken from plates by J. S. Jones. Concentrates sold to smelter at Curtiss.
Dec. 29, 1894	Regular shipment being made.
Feb. 2, 1895	Working in small way.
Aug. 29, 1896	Mining good ore. $5,000 dividend paid.
Feb. 27, 1897	John F. Blandy reports continuous work in 1896 and debts being paid off at rate of $5,000 per month.
June 5, 1897	Rich strike reported
April 9, 1898	Cyanide plant to be increased to 100 tons.

June 4, 1898	Jones Mill has 50 ton cyanide plant.
June 11, 1898	Los Angeles Review reports 20 stamps dropping.
Oct. 6, 1898	Transferred to English Company
Nov. 5, 1898	John F. Blandy reports wilfley table installed and 200 ton cyanide plant to be built.
	Mine idle.
Aug. 25, 1904	Jessie Co. equipping and sinking.
Nov. 20, 1904	Long idle. May resume. Has 657' shaft and new 300' shaft. Ore is auriferous pyrite. Lode claimed to be 100-150' wide in places. Occurs as lenses.

Mineral Resources

During 1905	Jessie Mines Co. actively developed from 170' shaft.
During 1906	Jessie Mines Co. resumed, sinking shaft now 659' deep. Will sink to 1,000'. Little ore shipped.
During 1907	Jessie Mine Co. retimbered shaft to 340'. A small lot of ore was shipped. Company expects to treat future ore in 50 ton mill not yet built.
During 1908	No production or activity.
May 21, 1910	Ohio Mines operating Jessie group near McCabe. A. L. McCarthy manager.

History of Burro Creek Deposits

This part of Yavapai County near the Mohave county line, northwest of Congress, is in one of the most inaccessible parts of the Arizona Mountain area. The nearest railroad point is Hillside on the Phoenix-Prescott branch of the Santa Fe system. From there the district is reached by a mountain road with adverse grades, 24-30 miles long.

Mineral was first discovered in the 70's by John Lawler, one of the

pioneers of Yavapai County, who located a large area of mineral ground, and whose estate still holds valuable mines.

The earliest work done was on a rich vein deposit carrying gold, silver and lead known as the Hillside Mine. In 1892 Lawler had raised capital enough to build a 10-stamp amalgamating and concentrating mill, and early in the year was reported to have shipped a $1200 gold bar and a few tons of concentrates.

In May 1922 the mine was bonded to a Rochester, New York druggist, H. A. Warner, for $500,000, who organized the Seven Stars Gold Mining Company for $3,000,000, enlisting capital in New York and London. The property was examined by T. A. and Edgar Richard and by Harrington Blauvelt who reported favorably on it. A 100-ton mill was erected, and a wagon road built from Hillside on the Prescott-Phoenix railroad, then being built by Diamond Joe Reynolds, 2 large storage dams constructed on Burro Creek, and machinery installed to sink a 1000-foot shaft.

In the stock selling campaign, Warner had given a guarantee that the mine would be on a paying basis within a stipulated time, supposedly backed by good security. In May 1893 an investigation disclosed that the guarantee was backed by his own promotion shares in the company, and therefore of little or no real value. In August he was sued for fraud, and the property closed. Then followed a protacted legal fight, into which were drawn the original owner, John Lawler, and his legal adviser, Judge Ed. W. Wells, of Prescott. As the payments had not been made by the Seven Stars Gold Mining Company, Lawler had taken possession of the mine and equipment. The Arizona courts decided the case against Lawler first in the Circuit Court at Prescott in 1898 and later in the Supreme Court in 1900. On appeal to the U. S. Supreme Court, the judgement was reversed in 1903 on the grounds that the vendor of the property cannot be

held responsible for the acts of the purchaser. The mine was reopened for a short interval in 1906 and again from 1909 to 1914 when a few cars of concentrates produced in a 5-stamp mill were shipped, and a little first-class ore in 1923.

The Copper King Mine, south of the Hillside Mine, was also located by Lawler. At the surface occurs a shoot of limonite and oxidized copper minerals in a lens of schist. The first work was done in the early 1900's by Colin Timmons, who obtained a bond and lease on the property and started an inclined shaft on the showing. This shaft almost immediately passed into oxidized zinc ore, which changed to zinc blende at 50 feet. Timmons continued the shaft to a depth of 200 feet. For all this distance, the ore continued as massive blende. Due to the long haul and low zinc market of that time, work was discontinued and the property reverted to the owners, Lawler and Wells.

In 1915 Bernard Cuniff had the property brought to his attention, obtained an option, and unwatered the shaft. Not being able to obtain a satisfactory market, he did not exercise his option.

In 1917 Buell and Gillispie obtained an option on the mine, organized the Arizona Hillside Development Company for 1,500,000 shares of $1 each, and again unwatered the shaft sunk by Timmons. At that time there was no good road to the property. They built a new road from Hillside to the mine, 29 miles long, and established a comfortable camp. In 1918 regular shipments started, the ore being hauled by truck to Hillside, and shipped to a retort plant in Arkansas. The mine was further developed and shipments of 45% to 51% zinc ore continued to the end of 1920, when the falling zinc market forced suspension. During this time 3,954,078 pounds of zinc were recovered.

The mine was not reopened until December 1925 when contracts were entered into with F. M. Manson of the Kingman Sampling Works to handle the ore. Shipments of 10 to 30 tons a day started the first of January 1926.

In June 1926 Chester R. Bunker of Fort Worth, Texas, optioned a controlling interest in the Arizona Hillside Development Company and organized the World Exploration Company to operate the mine, as well as other properties in other localities. Shipments of ore were continued up to the spring of 1927, when the drop in zinc prices forced suspension. Mine development continued up to the end of 1927, blocking out more ore and looking for extensions. The shaft was deepened to 600 feet, and improvements were made of the surface equipment. Considerable low grade ore was found, and a concentrator to handle it is under consideration. The long haul to the railroad is the principal drawback to further development.

The largest potential mine in the district is the Bagdad copper deposit. This is situated in a basin at the junction of Copper Creek and Burro Creek, and lies between the Hillside and Copper King mines. A group of 8 claims was located on the best part of the showing by John Lawler in the 70's. A little tunnel work was done by him in the years following the location but as the values were low, the ground was not developed for many years.

In 1904 the original 8 claims of Lawler were bonded to a syndicate headed by James L. Giroux, organized as the Copper Creek Development Company. This Company developed the copper stained areas by tunnels, and proved up a considerable tonnage of oxidized ore, and a little chalcocite ore was also found. 34 additional claims were located.

On April 9th, 1909, the Copper Creek Development Company was reorganized as the Arizona-Nevada Copper Company, a Delaware corporation

with capitalization of 5,000,000 shares of $5 par. 28 additional claims were acquired, bringing the total holdings to 70 claims. In 1910 the property was developed by means of churn drilling and diamond drilling. In 1911 a subsidiary company, the Bagdad Copper Company, was organized for 6,000,000 shares of $5 par.

In October 1912 a 2-year bond was given to the General Development Company, who started an active drilling campaign. By the end of April 1913 over 4,000,000 tons of 1.9% chalcocite ore had been developed. As this was not considered enough to warrant the building of an expensive railroad, the bond was relinquished. The option was renewed in October 1913, but after further drilling the bond was again relinquished in 1915. The Bagdad Copper Company then started drilling on its own account under the management of H. A. Geisendorfer. Intermittent work was done up to March 1918, by which time 8,000 feet of tunnels and laterals had been driven and 33,250 feet of churn drilling. Ore estimates by several independent engineers varied between 20,000,000 tons of 1.44% and 28,000,000 tons of 1.29% besides an enormous tonnage of primary ore of slightly less than 1% copper.

In March 1918 a reorganization was effected known as the Arizona Bagdad Copper Company for 1,750,000 shares of $1 par, 785,000 shares to the old shareholders, 65,000 shares to trustees to clear up indebtedness and 900,000 shares in the treasury for further financing. It was then contemplated to build a narrow gage railroad to the property from Hillside, to drive a long extraction tunnel under the ore to develop the ore bodies for caving by the Ohio system, and to construct a 3,000 ton concentrator and power plant. The plan was not carried out due to inadequate financing, and the mine was practically abandoned until the end of 1924, when Mr. Geisendorfer reopened it to try out a new scheme of treatment. A part of

the ore body was laid out for this treatment whereby the ore was to be leached in place by sulphuric acid and ferric sulphate, and the dissolved copper precipitated electrolytically. Experiments were conducted through 1923 and 1926, but the method did not prove a commercial success.

This property is the largest potential copper mine in the state. To bring it to production will require an extensive outlay in railroad building and plant, and, when world copper conditions warrant, it will enter the field as a large porphyry copper mine.

History of Blue Bell, Desoto, and Humboldt Smelter (sketch)

The earliest copper mining done in the Bradshaw mountains was at the Copper Mountain or Stoddard Mine, worked in the early 80's, the rich outcrop oxide ore being treated at an adobe furnace on the Agua Fria River.

In the 90's Phelps Dodge & Co., under the management of Dr. James Douglas, acquired a large group of claims in Copper Basin, and the Hackberry, Boggs, Iron Queen, and other mines in the Big Bug district. A leaching plant was installed at the Copper Basin mine, and a smelter at Arizona City, north of Mayer, was built to treat the Hackberry, Boggs, and Iron Queen ore. Some custom ore also was treated. These ventures did not prove profitable, and the smelter was shut down in 1897. In 1899 the Big Bug mines and smelter were bought by the Arizona Eastern and Montana Co., an H. B. Clifford promotion, which soon came to grief after running intermittently for about a year.

In 1899 J. Edwards Addicks and associates of Delaware and New York promoted the Val Verde Copper Co. to erect a customs copper smelter

to treat principally the ore from the Blue Bell Mine owned by a subsidiary company. The smelter was built at the site of the present Humboldt smelter and was completed in the fall of 1902. It was operated by the Val Verde Copper Co. until March 1904 when it was sold to the Bradshaw Mountain Copper Company.

The Bradshaw Mountain Copper Company was organized in 1903 by J. W. Middleton to operate the Copper Cobre Mine, later called the DeSoto. The mine was developed by a series of tunnels, and the entrance of the lower tunnel connected to the bins at the newly constructed Bradshaw railroad by a 4,000 foot Bleichert tramway. The smelter was operated on Copper Cobre ore up to September 20th, 1904, and plans were under way to double the capacity, when a molten matte explosion and attendant fire destroyed the plant with a loss of $175,000. In September 92 cars of 8% to 10% copper ore were treated.

Early in 1905 a reorganization was effected known as the Arizona Smelting Company and several subsidiaries to take over the holdings of the Val Verde Copper Company and Bradshaw Mountain Copper Company, including the Blue Bell and Copper Cobre or DeSoto Mines. A new and larger smelter was started at the site of the Val Verde Smelter. In 1906 the Blue Bell mine was operated by the Arizona Exploration Company and the DeSoto Mine by the DeSoto Mining Company. The Blue Bell mine was connected to the railroad by a long aerial tramway, and all the mine plant was electrified using power generated at the smelter, transmitted over a 10-mile power line.

In 1907 the net production from the DeSoto was 1,016,170 pounds of copper, 933.31 ounces of gold and 22,216 ounces of silver valued at $237,079. The Blue Bell produced 922,268 pounds of copper, 784.1 ounces of gold, and 19,657 ounces of silver valued at $213,531. The smelter was

closed at the end of the year due to the bad slump in copper prices. The mines and smelter were reopened in the late summer of 1909, after the various companies had been reorganized and consolidated into the Consolidated Arizona Smelting Company. The 1909 production from the two mines was 82,250 pounds of copper, 59 ounces of gold, and 30,550 ounces of silver valued at $13,470. Extensive new construction at the smelter was started and in April 16th, 1910, the enlarged smelter was blown in under the management of A. H. Wethey. A concentrator to treat low grade Blue Bell ore was constructed, and besides the Blue Bell ore, a large tonnage of United Verde iron ore and Goldfield Consolidated ore were treated as well as other customs ore. The smelter consisted of a blast furnace, reverberator, three roasters, and a converter.

By the beginning of 1911 the Blue Bell had been developed to a depth of 600 feet, and the ore for a thickness of 18 feet averaged 5% copper and $2 in gold and silver. 600,000 pounds of copper were produced monthly. The mine by the end of the year had been deepened to 850 feet.

In November 1911 the smelter was shut down but was reopened the first of the year and again closed in October 1912 due to lack of flux. It was reopened shortly and ran continuously in 1913. The smelter then consisted of 1,250 ton blast furnace, 3 reverberatories, 2 converters, and one 200-ton lead furnace.

In 1914 the concentrator was remodeled and the flotation process introduced. The DeSoto mine was reopened and most of the ore from both the Blue Bell and DeSoto was concentrated before smelting. In 1915 the Blue Bell was further deepened to 1,000 feet. By the beginning of 1915 the Blue Bell mine had been deepened to 1200 feet and was producing at the rate of 10,000 tons of ore a month.

In 1918 according to the company's annual report, there were milled

62,343 tons of Blue Bell and 42,036 tons of DeSoto ore, and considerable ore from both mines was smelted direct, the total yield being 8,514,177 pounds of copper, 8409 ounces of gold and 204,660 ounces of silver. During that year the smelter treated a large tonnage of customs ore, which yielded 10,285,696 pounds of copper, 5,969 ounces of gold and 238,149 ounces of silver, most of this tonnage coming from the United Verde Extension Mine at Jerome.

In the annual report, of the company for 1919, the production statistics were given for the years 1913 to 1919 inclusive as follows:

	Blue Bell			DeSoto		
	Tons	% copper	Value Gold & Silver	Tons	% copper	Value Au & Ag
1913	36,792	3.758	$1.60			
1914	56,058	3.637	1.40			
1915	82,171	2.970	1.40	8,360	3.50	$3.20
1916	75,070	3.278	1.70	34,382	3.37	2.35
1917	102,773	3.176	2.40	44,483	3.03	2.31
1918	131,090	2.771	2.80	42,870	2.57	2.50
19191	122,069	2.582	2.82	27,067	2.35	2.46

The same report reserves at the Blue Bell of 390,000 tons of 2.5% ore, and 21,000 tons of 2.351 ore at the DeSoto. Victor Heikes in Bulletin #782 of the U. S. G. S., "Jerome and Bradshaw Mountains Quadrangles Arizona," gives the Blue Bell production for the years 1903 to 1925 inclusive as follows:

Crude ore mined		957,712 tons
52,676,312 pounds of copper		$ 10,043,272
43,442.63 ounces of gold		897,959
1,137,441 ounces of silver		1,047,642
	Total	11,988,873

Previous to 1903 there had been a considerable tonnage mined of high grade oxidized ore shipped to various reduction works. About 800,000 tons

is estimated to have been mined from 1896 to 1919 by the Consolidated Arizona Smelting Company in its annual report for 1919. This would make the production from 1896 to 1902 inclusive about 100,000 tons. This ore probably netted at least 7% copper and $2 in gold and silver, making the total net production from 1896 to 1902 inclusive, approximately 14,000,000 pounds of copper and $200,000 in gold and silver, a total value of 14¢ a pound the average price for those years, of $2,160,000. The total net yield from 1896 to 1925 inclusive was therefore approximately $14,000,000.

The DeSoto Production from 1915 to 1920 inclusive was about 177,000 tons yielding about 8,879,300 pounds of copper and $334,200 in gold and silver. The yield in 1907 and 1909 was 1,026,170 pounds of copper, 963 ounces of gold and 23,700 ounces of silver with a value of $245,000. The total yield from 1907 to 1925 inclusive was therefore approximately 9,895,550 pounds of copper and $257,900 in gold and silver, a total net yield of $2,682,550. The yield under the Bradshaw Mountain Copper Company from 1903 to September 20th, 1904, was at the rate of 92 cars a month in 1904 and probably half this in 1903, a total of about 1300 cars of 40 tons each, a production of approximately 52,000 tons of 9% copper and gold and silver which yielded about 8,320,000 pounds of copper and $200,000 in gold and silver, a total value of $1,289,600. The total yield of the DeSoto from 1903 to 1925 inclusive was therefore approximately 10,215,550 pounds of copper and $465,900 in gold and silver, a total net yield of about $3,970,000.

The combined yield of the Blue Bell and DeSoto Mines from 1896 to 1925 inclusive was therefore about 84,900,000 pounds of copper and $2,600,500 in gold and silver, with a total net value of about $17,970,000.

In December 1920 a receivership was appointed for the Consolidated Arizona Smelting Company. This company had assumed the debts of the original companies and had been unable entirely to liquidate them and pay

for the new plant costing $1,000,000. A reorganization known as the Southwest Metals Company took over the assets, and reopened the Blue Bell Mine and the Humboldt Smelter in June 1922, treating besides its own ore, concentrates from Swansea, and miscellaneous customs ore. The smelter was run through 1923 and closed early in 1924 due to the low copper prices, under which no profit could be made on the developed reserves of low grade ore at the Blue Bell. The smelter reopened the first of 1926 but was closed at the end of the year and the Blue Bell and DeSoto mines turned over to lessees.

Val Verde

July 6, 1899	Gov. N. O. Murphy issues warning against Val Verde promotion.
Dec. 30, 1899	Blue Bell Mine owned by J. Edwards Addicks of Delaware down 125'.
Sept 27, 1902	S. F. Bretherton, manager, reports Val Verde Copper Co. plant to be ready shortly.
Mar. 10, 1902	Smelter sold.
April 14, 1904	Val Verde has been operating as customs plant for 2 years, sold to Bradshaw Mt. Mining and Smelting Company to treat Copper Cobre (DeSoto) ore.
June 23, 1904	Val Verde smelter sold to Bradshaw Mountain Copper Mine and Smelting Company, managed by S. W. Middleton.
Aug. 11, 1904	Bradshaw Mountain Copper Company operating Copper Cobre mine at Middleton, connected to the bins at railroad by 4000' Bleichert tramway. Has bought Val Verde Smelter, consisting of rectangular 250 ton furnace and a smaller round furnace of 75 tons capacity.

Aug. 10, 1904 — Bradshaw Mountain Copper Company to double smelter capacity.

Sept. 15, 1904 — 1000 tons of ore from mines in Pima County south of Bullwacker mine contracted for.

Sept. 27, 1904 — Smelter destroyed by molten matte explosion Sept. 20th with $175,000 loss.

Nov. 24, 1904 — Bradshaw Mountain Copper Mining and Smelting Company ground covers 6 1/2 miles from Peck north-easterly. 3 veins in schist developed. Most important mine at Middleton, developed by tunnels. Bornite and chalcopyrite. 3 cars shipped a day. 92 cars in Sept. Average 8-10% copper. Average of mine 5% copper.

Mineral Resources

During 1905 — Arizona Smelting Company building smelter at Humboldt or site of Val Verde.

During 1906 — Humboldt Smelter to be almost as large as the Vale Verde smelter

DeSoto Mining Company developed by 2705' tunnel, shipped ore to Humboldt where it is concentrated and concentrates smelted at Arizona Exploration Company, whose stockholders are same as Arizona Smelting Company. Mine connected with Cedar on Bradshaw railroad by aerial tramway. All machinery at mine run by electricity furnished by 10-mile power line from smelter to mine. Mine developed by 300-foot shaft.

During 1907 — DeSoto Mining Company shipped 1,016,17 pounds of copper, 933,31 ounces of gold, and 22,216 ounces of silver = $237,079.

	Arizona Exploration Company shipped partly crude ore and partly concentrated at Humboldt. 922,260 pounds of copper, 734.7 ounces of gold and 19,657 ounces of silver = $213,531. Smelter closed at end of year.
During 1908	No production. Smelter down and DeSoto and Blue Bell mines idle.
July 10, 1909	Consolidated Arizona Blue Bell mine being unwatered. Smelter to resume shortly.
Aug. 20, 1910	Consolidated Arizona Smelting Company 1909 production. 82,230 pounds of copper, 59 ounces of gold and 3055 ounces of silver = $13,470.
Aug. 7, 1909	Consolidated Arizona Smelting Company reorganization. Directors: Pres. Wm Schall Jr. Blue Bell and DeSoto mines to be unwatered and smelter to be started in a few months. Consulting Engineer: Martin J. Heller.
Nov. 27, 1909	Consolidated Arizona Smelting Company cash on hand $305,000. Expenditures $180,981 on new construction and development. Smelter to start soon after Jan. 1st, 1910.
April 2, 1910	Consolidated Arizona Smelting Company reorganization completed. Active operations scheduled for April 1st. Martin J. Heller, consulting engineer.
April 23, 1910	Consolidated Arizona Smelting Company 450-ton smelter blown in April 16th. Half of ore treated is customs ore from Goldfield Consolidated and Val Verde and half from Blue Bell where 6th level has been reached.
Nov. 19, 1910	Consolidated Arizona Smelting Company operations extending. Starting April 1910. One blast and one

reverberator in commission and 3 roasters and ore converter. Val Verde iron ore treated, concentrates from Goldfield Consolidated and ores from Clare Consolidated in exchange for high sulphur ore.

Dec. 10, 1910 — Blue Bell developments favorable.

Jan. 4, 1911 — Roaster capacity being enlarged. Blue Bell developing satisfactorily below 5th level. Ore 5% copper, $2 gold and silver. Width 13 feet.

June 3, 1911 — 600,000 pounds copper produced monthly. A. H. Wethey, manager.

Aug. 19, 1911 — Smelter ran two-thirds capacity in June due to lack of sufficient flux.

Aug. 26, 1911 — Suit growing out of reorganization settled out of court.

History of Crown King Mine (sketch)

The Crown King Mining Company was organized in 1890 by Place, Sheckels and Harrington to work the property, on the headwaters of Poland Creek, previously worked for rich gold ore from shallow surface workings. The claims are located on the War Eagle Vein, one of the prominent lodes of the region. At the time of organization, the nearest shipping point was Prescott, about 30 miles northwest.

The ore consisted of galena, zinc blende and pyrite, carrying high values in gold and silver. A 10-stamp mill was erected, and the crushed ore amalgamated and concentrated. The middling carrying 15 percent zinc and $12 gold were stockpiled, and the lead concentrates carrying $150

to $350 in gold and silver were sacked and shipped by burro to Prescott. About $10 to $12 per ton were caught on the plates.

During the winter months shipments were often delayed due to snow, and the road to Prescott was in bad condition a greater part of the time. Hauling cost about $21.50 a ton for supplies and ore.

The mine was shut down during 1893 on account of litigation, and was reopened in 1894, according to a report by Blandy. The original company continued operations until the middle of the year 1895, when it was bonded to H. B. Chamberlin & Company of Denver. John F. Blandy reported the mine and mill to have run steadily during 1896 and to have returned $20.00 a month during the year, and the workings extended to a depth of 400 feet. Work was done on a larger ore shoot 1 foot to 6 feet wide.

In January 1894 a suit for accounting was started by one of the original owners, Orrin F. Place of Chicago. The mine continued operating until the early part of 1901, when it was closed by court order, and remained closed until 1906. During the period from 1890 to 1901 the production is estimated to have been about $1,500,000, and $200,000 in dividends were paid. The ore shoot was followed to a depth of 650 feet in this time.

In the early part of 1899, the Prescott Eastern R. R. was completed into Mayer, and the haul was reduced to 24 miles, and the cost reduced from $21.50 to $12.50 per ton. In March 1904 the Bradshaw R. R. from Mayer to Crown King was completed, still further reducing the hauling costs.

In December 1903 the Crown King Mines Company was organized by George P. Shurtleff and Lester McLean to work the large stock pile of zinc middlings. The litigation started by Place prevented any work until 1905, and early in 1906 the suit was settled and work on the stock pile

started. After considerable experimenting, two products were made; a zinc concentrate carrying 28 percent zinc, 0.96 ounces gold, 9 ounces silver and 3.5 percent copper; and a copper-iron concentrate carrying 1.02 ounces gold, 10 ounces silver, and 2.9 percent copper. These two products were shipped during 1906 and 1907, and plans were made to reopen the mine, but all work ceased at the end of 1907 due to the closing down of the Humboldt smelter.

The mine remained idle until October 1909 when it was sold at receiver's sale to the Yavapai Consolidated Gold-Silver-Copper Company for $75,000. This Company did not work on the Crown King, confining its activities to other properties in the vicinity, chiefly the Old Tiger property.

In 1913 M. P. Randolph and David B. Gemmill obtained a lease on the Crown King dumps, renovated the old mill, and started experimenting with the treatment of the zinc middlings. After three years work, they organized the Bradshaw Reduction Company in August 1916 to finance the enlargement of the plant from 70 tons to 150 tons a day and to bond the properties of the Yavapai Consolidated Company. Two products were made, andiron concentrate carrying 0.8 oz. gold, 12 oz. silver, 3 percent copper, 15 percent zinc, 18 percent iron and 25 percent silica; and a zinc product carrying 45 percent zinc, 10 percent iron, 4 1/2 percent copper, 13 oz. silver, and 0.35 oz. gold. The mill used the flotation process, and retreated a preliminary bulk concentrate. Nine tons of zinc concentrate and 16 tons of iron concentrate were made from 100 tons of old middlings.

During 1916 the old shaft was cleaned out and retimbered, and 20,000 tons are reported to have been blocked out of $20 ore above the 400-foot level. But very little of this ore was mined, the company treating ore from the Wildflower and Tiger properties until 1919 when the high costs

of the War years caused suspension of work and the company was dissolved. The properties reverted to the Yavapai Consolidated Gold Silver Copper Company, controlled by the Murphy Estate.

No further work has been done. During the winter of 1926-1927, a bad flood wrecked the mill and other buildings at Crown King, and during 1925 and 1926 the tracks from Middleton to Crown King were torn up. The railroad grade was later utilized as a wagon road, replacing the old road by way of Venizia.

The production of the mine from 1890 to 1901 is reported to have been $1,500,000 in bullion and concentrates. During 1905 and 1907 V. C. Heickes* estimated a total production for the Pine Grove and Tiger Districts of $309,295. Probably a half of this came from Crown King Dump of over $150,000. For the period 1913-1916 inclusive, Heickes estimates a production of $197,118 mostly from Crown King Dump. An assumption of $190,000 would be about right for the period, making a total late production of $340,000 and a grand total from 1890 to 1928 of $1,840,000.

Crown King

Jan. 24, 1891	Shut down on account of poor roads.
July 18, 1891	Crown King Ming Company shipped $12,000 bullion and considerable amount of $397.26 per ton concentrates.
May 3, 1891	Shipping ore by burro to Prescott for milling.
Sept. 12, 1891	Crown King Mining Company shipping several hundred tons of concentrates to Prescott.
During 1891	Crown King worked.
Mar. 12, 1892	10¢ per share dividend paid on preferred shares.
Feb. 10, 1894	Litigation closed mines during 1893

*"Ore Deposits of the Jerome and Bradshaw Mountains Quadrangle, Ariz.," Bulletin #782, p. 172, 1926, U. S. G. S.

Mar. 7, 1894	Ore consists of pyrite, blende, and galena in quartz gangue. Concentrates run $150-$350 in gold. Blende carrying $14-$15 in gold separated and stored. $10-$12 caught on plates. Located on War Eagle Vein, 1'-4' wide.
Aug. 25, 1894	New ore strike reported.
Aug. 24, 1895	Bonded for $500,000 by Place, Sheckels and Harrington to H. B. Chamberlin Company of Denver.
June 20, 1896	Mine and mill running full time.
Feb. 27, 1897	John F. Blandy reports for 1896 mine returned $20,000 per month. Shaft sunk to 400 feet with layer on shoot.
Jan. 22, 1898	Directors sued for mismanagement and receiver asked.
June 11, 1898	Los Angeles Review reports 10 stamps working.
Nov. 19, 1898	President: N. C. Shokels, Local agent: R. H. Hetherington.
Feb. 18, 1899	Large free gold strike reported. Vein 6 feet wide.
April 1, 1899	Company sued by stockholder Place of Chicago. Receiver asked.
Dec. 30, 1899	24 miles southeast of Mayer. Shaft 650 feet deep. 13,000-14,000 feet of drifting. 10 stamp mill. Eight 6 feet Vanners. Railroad to Mayer reduced freight from $21.50 to $12.50.
1901-1902	Mine idle.
April 4, 1903	50,000 tons of zinc tailings to be treated (15% zinc. $12 gold.)
May 16, 1903	Company has been in litigation for several years due to bill for accounting filed by Orrin F. Place, stockholder. Lease on tailings set aside by courts.

Dec. 31, 1905	New directors elected Dec. 21. J. Lester McLean, Pres. George F. Shurtleff, General Manager. Bradshaw railroad from Mayer to Crown King to be completed Mar. 1st, 1904 when 100-ton mill will start up on tailings.
Jan. 7, 1904	Closed due to litigation.
Nov. 24, 1904	Bradshaw railroad completed in last 6 months. Crown King Mine operated from 1890 to 1901 and paid $200,000 dividends. Crown King Mining Company organized by George P. Shurtleff and associates to treat old tailings and will start to tunnel and develop continuous ground.
During 1905	Crown King Mines Company operated, treating Crown King Dump.
During 1906	Litigation terminated during the year. Previous to litigation the production was $1,500,000. Crown King Mines Company producing copper-iron concentrates assaying 1.02 ounces gold, 10 ounces silver, 2[illegible]% copper and a zinc concentrate assaying 28% zinc 0.96 ounces gold, 9 ounces silver and 3.51 copper.
During 1907	Several shipments made in cleaning up old tailings pile. Mine not developed.
During 1908	No mention. Idle.
Oct. 16, 1909	Sold at receiver's sale to Yavapai Consolidated Company for $75,000. Mineral Resources.
During 1913	Zinc pile again treated.

History of Big Bug or Henrietta Mine (sketch)

The Big Bug or Henrietta vein was one of the earliest locations made. J. Ross Browne in Mineral Resources for 1868 stated that after the exhaustion of the richer placer ground discovered by Joseph Walker and his party in 1863, lodes were located in 1867, the more prominent being the Galena, Big Bug, Eugenia, Ticonderoga, Chapparal, and Dividend in Big Bug Creek. Rossiter W. Raymond in Mineral Resources for 1871 reported that the Big Bug Mill was running on ore from the Big Bug and Eugenia veins. The mill and mine were then operated by Hitchcock and Gray. 10 men and a foreman were employed at the mines. The mill consisted of 10 stamps and copper amalgamating plates, and an arrastra for the treatment of the tailings, all run by steam. The mill saved about $14 out of the $25 heads, employed 4 men and a foreman, and treated 11 to 13 tons in 24 hours. The daily expense of mine and mill was between $90 and $100. The ore became refractory below a depth of 50 feet. Raymond's later reports did not mention the Big Bug so that it probably closed down in 1872 or 1873. H. A. Bigelow reporting for Raymond in 1874 did not include the Big Bug in his list of producers for the year.

History of Gladstone-McCabe (sketch

The McCabe and Gladstone mines were discovered about 1870 shortly after the earlier placer mines were worked out. Considerable rich oxidized ore was mined but sulphides were met at depths of 30 to 50 feet and the gold became too refractory to mill by amalgamation.

For many years the properties were idle.

In 1893 the McCabe mine was reopened and a 5-stamp mill put up, later

increased to 10 stamps, the crushed ore being treated by concentration on Wilfleys and the concentrates shipped to the Commercial Mining Company smelter at Boggs.

After the closing of the smelter the concentrates were shipped to the Silver City smelter until 1900, when the building of the Val Verde Smelter gave an outlet for the ores of the Bradshaw Mountains.

The mine was developed to 300 feet in 1894, and by the end of 1899 the shaft was 600 feet deep, and 3 cars a week of concentrates were being shipped and the shaft was being sunk to 1000 feet.

In March 1901, after a shut-down of several months, the mine was re-opened and started production at the rate of a car a day of $60-$80 concnetrates shipped to the Val Verde Smelter. Shortly after reopening it was sold to the Model Gold Mining Company, promoted by F. T. Jaeger.

The new company operated the mine intermittently due to legal difficulties until May 1903 when the surface plant was completely destroyed by fire entailing a loss of $250,000. The plant was rebuilt by November 1903, and a reorganization effected eliminating Jaeger, and in May 1904 the mine was again producing at the rate of 40 tons a day of concentrates shipped to the Val Verde Smelter. The shaft was then down 750 feet. In November 1904 the mine was reported as producing 2000 tons of crude ore per month, of which 88% was milled, producing 240 tons of concentrates, and 420 tons were shipped direct. The mill consisted of 10 stamps, and Ellspath, Standard and Wilfley tables, all steam run.

Assuring an average for 10 years of 8 tons a day of $70 ore and concentrates, the production from 1893 to the end of 1904 was approximately $1,680,000 in gold, copper and silver.

The Gladstone mine, adjoining the McCabe on the west and developed on the same vein was acquired about 1902 by J. W. Parsons, who developed

it to 1903 when it was leased to Cecil G. Fennell. By November 1904 the shaft was down 790 feet, and 1000 tons a month were reported mined, partly concentrated at Val Verde and partly treated direct. Assuming the production of 4 tons a day for 2 years of $70 concentrates and ore (grade assumed from McCabe), the production was approximately $168,000 in gold, copper and silver.

On December 22nd, 1904, the Gladstone mine was sold to the Ideal Mining and Development Company, organized by Cecil G. Fennell. In 1905 this company bought the McCabe and operated it 2 months and the Gladstone all year. The Gladstone incline shaft was sunk to a depth of 900 feet, and the ore shipped 2 1/2 miles by wagon to the Arizona Smelting Company at Humboldt. In 1906 both mines were operated, and the Gladstone inclined shaft sunk to 100 feet and the McCabe vertical shaft 900 feet deep. In 1907 the two mines were worked until the close of the smelter. Part of the ore was treated in an 80-ton concentrator. The total output for that year was 361,257 pounds of copper, 12,004.5 ounces of gold and 117,582 ounces of silver with a total value of $397,212.

In 1908 a little ore was mined by lessees, and in 1909 both mines were reopened and produced 189,107 pounds of copper, 6,256 ounces of gold and 47,001 ounces of silver with a gross value of $178,080. The mines were worked until August 20th, 1910, when they were bonded for $150,000 to F. M. Murphy, the promoter of the Congress, Poland, Tombstone Consolidated, Silverbell, and other venture of the Development Company of America. Final payments were not made and the mines reverted to the owners. They were owned in 1923 by Arthur Turnbull and Charles M. Chapin. Turnbull reported to Waldemar Lindgren in Bulletin #782 of the U. S. G. S., "On Deposits of the Jerome and Bradshaw Mountains Quadrangle, Arizona," that the production since the acquisition by the Ideal Mining and Development Company was $1,541,673,

principally before August 20th, 1910. A small production was made in 1912 and 1913 by lessees. The mines were developed to a depth of 1100 feet in the Gladstone and 900 feet in the McCabe. No work has been done since 1913 except small shipments of tailings.

The total production was about as follows, not taking into account the very early work:-

	McCabe	Gladstone	Total
1893-1904	$1,680,000		$1,680,000
1903-1904		168,000	168,000
1905			1,541,673
Total			$3,390,000

McCabe

March 7, 1894	Five stamp mill running. Shaft 300' deep. Much of ore hauled to Commercial Mining Company Smelter at Boggs.
Aug. 25, 1894	Developing
Feb. 27, 1897	John F. Blandy reports mine opened to 400 foot level.
June 11, 1898	Los Angeles Review reports 10 stamps dropping.
Oct. 1, 1898	New Hoist installed.
Dec. 30, 1899	Run regularly since 1893. 50 men employed now. Ships 3 cars a week of rich concentrates to Silver City. Shaft down 600 feet. 6 levels developed, 1100 feet on each level. Shaft being sunk to 1000 feet. Ore concentrated on Wilfleys. Ledge 6" to 5' wide carries gold, silver, copper.
March 16, 1901	Shipping carload of $60-$80 silver, copper concentrates a day from 500 to 600 levels. Shaft 700 feet deep. Mine has been closed for several months.

May 4, 1901	Purchased by Model Gold Mining Company.
Aug. 2, 1902	Model Gold Mining Company in hands of receiver.
May 23, 1903	Model Gold Mining Company working 10 stamp mill. Shaft 700 feet deep sinking to 1000 feet. (later) Total plant destroyed by fire. $25,000 loss.
Sept. 19, 1903	Mine and mill being rehauled
Nov. 28, 1903	McCabe mill and shaft houses rebuilt and early resumption to be made.
May 5, 1904	Model Gold Mining Company shipping 40 tons a day to Val Verde. Shaft 750 feet deep.
Nov. 20, 1904	Gladstone mine worked under lease by Fennell and 1000 tons produced per month. Low grade ore milled at Val Verde. High grade shipped. 790-foot shaft. Vein strike northeast. Ore carries gold, silver and lead. Model Mining Company operating several narrow veins. Oxidized to 40 feet. Ore is pyrite with little copper, lead, zinc, carrying gold and silver. 2000 tons hoisted per month. 12% shipped direct and 88% milled on ground giving 240 tons of concentrates. Mill has 10 stamps Ellspas, Standard and Wilfley tables. Run by steam.

Mineral Resources

During 1905	Ideal Mining and Development Company purchased on Dec. 22, 1904, the McCabe and Model Mines at receivers' sale. Company operated McCabe during Jan. and Feb. and the Gladstone all year. Shaft 900 feet deep. Ore shipped 2 1/2 miles by wagon to Arizona Smelting Company at Junboldt.
During 1906	Ideal Mining and Development Co. operated Gladstone and McCabe mines from 1000' incline on Gladstone and 900' vertical shaft on McCabe.

During 1907	Ideal Mining and Development Company sank main Gladstone. Incline to 1000 feet. Operated 80-ton concentrator until close of Humboldt Smelter and shipped some crude ore. Total output 361,257 pounds of copper, 12,004.5 ounces of gold, 117,582 ounces of silver = $397,212.
During 1908	Mine operated by lessees who shipped crude ore and concentrates from the Gladstone.
July 23, 1910	McCabe and Gladstone sold by Ideal Development Company to F. M. Murphy. A. W. Edwards to be in charge.
Aug. 20, 1910	Ideal Mining and Development Company 1909 production 189,107 pounds of copper, 6,256 ounces of gold, 47,001 ounces of silver = $178,080.
Sept. 3, 1910	McCabe and Gladstone sold August 20th, 1910 to F. M. Murphy for $150,000.

CHAPTER 12

COCHISE COUNTY

The detailed histories of the two major districts in this county, Bisbee and Tombstone, have already been given. In this chapter the histories of the smaller districts centered at Gleeson-Courtland, the Dragoon and Little Dragoon Mountains, the Chiricahua Mountains, the Dos Cabezas Mountains, Pearce, the Swishelm Mountains, and the Huachuca Mountains will be given.

Cochise County, originally a part of Pima County, was created as a separate entity in 1881 soon after the discovery of Tombstone and Bisbee. In the pre-Civil War days little was known of this corner of Arizona. A few Spanish and Mexican settlers had penetrated a short distance down the San Pedro river valley, but these settlements had been practically abandoned at the time of the Gadsden Purchase due to Apache raids. The first settlements by Americans were in the San Pedro, Sulphur Springs, and San Simon valleys during the pre-Civil War period, but they were so exposed to Apaches and outlaws that they were not permanent. Northern Cochise County was partly explored during this time near the route of the Butterfield stage, but as this part of Arizona was the center of the Apache mountain fortresses, almost no attempts were made at prospecting.

It was not until it had become assured that the Southern Pacific railroad was to be completed that real prospecting started, which resulted in the discoveries of the Tombstone silver deposits, the Bisbee copper deposits, the Teviston (Dos Cabezas) gold placers, and the Peabody (Little Dragoon) copper deposits, all within a few years of each other in the late

seventies. These discoveries were followed very shortly by the discovery of the silver and copper deposits of the Gleeson-Courtland region at the southeast end of the Dragoon Mountains, and the lead-silver deposits of the northern Chiricahua mountains.

Little work was done at any of the smaller districts until the revival of copper mining in the late nineties. This revival of mining was heralded in Cochise county by the discovery in 1895 of the bonanza Commonwealth silver-gold lode in a small hill near the center of the Sulphur Spring Valley.

Most of the smaller districts reached their zenith during the high metal prices during and immediately following the War, during which time they were exhausted of better grade ore. On the collapse of the metal markets in 1921, almost all activity ceased. A revival of mining took place in 1927, but it was short-lived. The smaller districts of Cochise county, like those of eastern Pima county, have been virtually exhausted. Short historical sketches of the most important centers are given in the following pages.

Gleeson-Courtland District

The silver-lead deposits of Turquoise, now known as Gleeson, were discovered in the late seventies after the first real truce in Apache warfare preceeding the completion of the Southern Pacific railroad. Little other than location and assessment work was done until the boom period of the early eighties. The principal claims were the Defiance, Hidden Treasure and Last Chance, now a part of the Costello holdings. From 1883 to 1893 when silver commanded a price of about 1.00 an ounce, considerable high-grade hand-sorted lead-silver ore was mined, hauled to the nearest railroad point at Cochise and shipped to various reduction works at Benson, El Paso, Silver City, Socorro and Pinos Altos. The most extensive work was

on the Silver Bell and Tom Scott claims. The Silver Bell shaft was sunk 270 feet on the incline, and the largest tonnage came from stopes off this shaft. Production records are lacking, but from the size of the stopes and the grade of ore left on the dumps it is probable that there was shipped about $100,000 of ore chiefly valuable for its silver content.

After the demonetization of silver in 1893 and its consequent drop in price, nearly all work ceased. The ownership of the claims passed into the hands of Martin Costello and McKittrick, and for many years bitter and protracted litigation still further hindered work in the district.

The first copper ore of any importance was found in 1896 by John Gleeson on the Charleston claim, located in the late eighties by Kit Charleston. The ore was discovered underlying a large outcrop of gossan. Gleeson purchased the Charleston claim from Charleston, and added to his holdings adjoining claims purchased from Alexander Casey and Silas Bryant. After several years of development work the Copper Belle Mining Company was organized by Gleeson in 1898, and in 1899 and 1900 shipments of high grade oxidized copper ore were made to Silver City and El Paso. Due to the high cost of the thirty-mile haul to Cochise, smelting of the ore was decided on in 1900, and by May 1901 a 60-ton water-jacket blast furnace had been blown in. By the end of the year, the oxidized ore had been nearly exhausted, but a large tonnage of massic sulphide ore was encountered on the 200-foot level. Part of this ore was smelted to matte and part was shipped to El Paso, Globe, and Clifton as sulphide flux. Operations continued until late in 1902. The company had been heavily mortgaged to finance the building of the smelter, and was finally forced into bankruptcy. Alt. Emmanuel was appointed receiver in January 1903, and in 1904 the company was reorganized as the Copper Belle Mining

Company under the management of William Kemp. The mine was reopened and shipments of massic sulphide ore were made to the Old Dominion Smelter at Globe. The smelter was again blown in in 1905 and both matte and ore were shipped to Globe. Intermittent production continued to the end of 1906 when the mine was leased to the Shannon Copper Company. In July 1908 the property was purchased at sheriff's sale by Nathan L. Amster of the Shannon Copper Company, and a large tonnage of low grade sulphide ore was shipped to the Shannon Smelter until its close late in 1918. Shipments to other reduction works continued until 1923 when an attempt was made to roast and leach the remaining ore in place. The mine was sealed, the shaft timbers were fired, and fuel oil and miscellaneous old timber was dumped down the shafts. It was hoped that the ore itself would be ignited and would be partially roasted in place, but after a few months it was found that after the timbers were burned the fire extinguished itself. The mine was then flooded, but the leaching of the ore was not effective, and the mine was again pumped out and the main shaft was retimbered, but no further production was made.

On the Courtland side of the district, northeast of Gleeson, little early work was done except on the relatively small outcrops of turquoise. The principal outcrops were of oxidized copper ore containing very little precious metal. The first locations other than for turquoise were made in the nineties, but no work was done until 1901, when the Humbot claim was developed, and a large tonnage of the high-grade oxidized ore outcropping was shipped, stimulated by the high copper market of that year. This claim was one of a group purchased in 1900 by the Young Brothers of Iowa who in that year entered the district, purchased the Mary, Mame, Humbot and other claims from McCormack, Hardy and Harnekross and organized the Great Western Copper Company.

After the drop in the price of copper in 1902, the Great Western developed the Humbot and Mary mines, but made no production until 1900. The property was equipped with a power plant in 1908, which was erected jointly by Phelps Dodge and Company and the Great Western Copper Company. Production started in 1909 at the Mary mine. On the exhaustion of the Mary mine, the Mame was developed and exploited followed by the Highland. Production on company account was continued without interruption until the drop of metal prices at the end of 1920, when the mine was closed. On the reopening of the smelters in Douglas in 1922, various sets of leases working on the property commenced production, which was continued until the drop of metal prices in 1930.

The Leadville group of claims, adjoining the Great Western group was purchased by William Holmes in 1903, who organized the Leadville Mining Company to exploit them. Most of the work on the various mines of the group was done by several companies who had the ground under option at various times, more notably the Calumet and Arizona Mining Company from 1907 to 1909, the Fuller and Near in 1912, and the United States Smelting and Refining Company in 1916. Some production was made by all these companies, and in 1923 the Maid of Sunshine mine was purchased by the Calumet and Arizona. During the high metal prices of the War years from 1917 to 1920, parts of the ground were leased and high grade ore was shipped, chiefly from the operations of the Maso Lease. Since 1921 a small intermittent production has been made by various leases.

The Calumet and Arizona Mining Company and the Phelps Dodge and Company entered the district in 1908, secured options on ground adjoining the Leadville and Great Western and started active development. The Calumet and Arizona secured the Germania and April Fool mines and

took an option on the Leadville group. Production was started on the Maid of Sunshine and Germania in 1908 and was continued until 1910. The district was greatly stimulated at this time by the construction of spur railroad lines by the El Paso and Southwestern and Arizona Eastern Railroads into the district. The Phelps Dodge Company discontinued development work and gave up its option in 1909, after the expenditure of considerable sums in equipment. The Calumet and Arizona company closed the Germania at the end of 1910, reopened the mine in 1912, and continued production partly on lease account until 1920. Production was again started by leases after the purchase in 1923 of the Maid of Sunshine mine, adjoining the Germania, from Leadville Mining Company, and continued intermittently until the depression in metal prices in 1930.

On the Gleeson side of the district no work other than at the Copper Belle was done after 1893 until 1912 when work was started on the Tejon claim by the Tejon Mining Company in the endeavor to find copper ore similar to that of the Copper Belle. A small production was made from development work until the end of 1919.

During the years of the World War the Tom Scott mine, one of the early producers in the district, was reopened by Marchello on lease account from owner Mrs. Mary McKittrick, and considerable lead-silver-copper ore was shipped during the high silver prices enjoyed under the Pitman act. The Tom Scott and Tejon mines were reopened in 1925 by the Tejon Leasing Company, and shipments were made for a year to the smelter at El Paso, after which the mines were again closed. They were again reopened by the Tejon Mining Company in 1927 under the superintendence of Frank W. Giroux. Most of the work was centered at the Tejon mine. Development work was pushed energetically and some stoping of copper ore was done until 1930, when work was again discontinued.

The old Silver Bell and Defiance mines remained idle after 1893 until 1922 when they were leased to various parties who both mined ore and sorted the old dumps until the end of 1929, when the low price of both lead and silver prevented further profits.

The reopening of the Silver Bell mine and the development of ore to the sideline of the property stimulated the development of the neighboring group of claims. This group owned by Mr. P. Warnekrose, was sold in 1923 to the Mystery Mining Company, promoted by John Gleeson. The property was developed by a long tunnel, and high-grade lead-silver ore was shipped to the end of 1929 when known ore was exhausted.

The production of the Courtland-Gleeson district, sometimes known as the Turquoise district, from 1883 to the end of 1929 has been approximately 57,500,000 pounds of copper, 4,200,000 pounds of lead, 360,000 pounds of zinc, 540,000 ounces of silver, and 24,000 ounces of gold with a gross worth of $10,400,000. Details are shown in the Appendix.

Commonwealth Mine*

The value of the Commonwealth vein, outcropping in a small hill near the center of the Sulphur Spring Valley, was discovered in 1895 by John Pearce, a cowboy of the valley. His own story is that while driving cattle over the hill he picked up a rock to throw at a recalcitrant cow, but noting its unusual weight, pocketed it instead, and had an assay made of it. On receiving the returns of 2100 ounces of silver a ton, he and his brother returned to the hill and located six claims. They gathered up a carload of rich float ore, hauled it to Cochise, the nearest railroad point and shipped it to El Paso. This first car returned 100 ounces of silver and $20 in gold a ton. They then sank what was later known as No. 1 shaft at the western end of the outcrop to a depth of fifty feet,

*Smith, Lewis A.: "The Geology of the Commonwealth Mine". Thesis (M.S.)-University of Arizona, 1927.

and shipped a second car of ore which gave about the same returns. The fame of the rich find spread quickly and in November of that year John Brockman of Silver City visited the prospect and secured an option on the mine for $275,000, payable in installments over a ten-year period. He then enlisted the aid of D. M. Barringer and R. A. F. Penrose, Jr., and the Commonwealth Mining and Milling Company, capitalized at $1,000,000, was organized to take over the option. A $250,000 bond issue was then floated, and the option was closed with the Pearce brothers for $250,000 in cash in lieu of $275,000 over ten years. A large block of stock was then sold to furnish working capital - sold in Germany and England as well as in the United States. John Brockman remained as manager. The original shaft sunk by Pearce was enlarged and a second shaft was started to the east. Both were sunk 267 feet to water level, and the ore cut was hoisted by whims, hauled to Cochise and shipped to the smelter at El Paso. The returns from the first three months of work enabled the retirement of the bonds and in addition $100,000 in dividends a month were paid for six months. The costs on this first work were almost as follows:

Mining	$2.50 a ton
Haul to Cochise	2.50 a ton
Freight to El Paso	3.50 a ton
Treatment charges	7.50 a ton
Total	$16.00

Operations were continued on this basis until 1898 when the first mill was erected, in which the ore was crushed in Blake crushers, ground in Chilean mill, and treated by pan amalgamation. The original capacity of the mill was 30 tons a day which was later increased to 200 tons a day by the addition of sixty 1000-pound stamps followed by rolls. This mill continued in operation until June 1900 when it was destroyed by fire.

A new mill was started immediately after the fire and, while building it, a new extraction shaft was sunk in the footwall of the vein. The mill was completed in January 1901. The higher grade ore had by that time been largely exhausted, and for the succeeding four years the mill was run on a 240-tons a day basis on lower grade ore. The policy followed in mining the ore body, leaving very small supporting pillars, finally ended in 1905 with the collapse of the hanging wall and the loss of the stopes. The mill was closed and the mine abandoned.

A lease was then obtained on the large mill tailing-pile by O. T. Swatling, the mill superintendent, and A. Y. Smith, the mine superintendent, who built a 230-ton cyanide plant for this purpose. The lease was extended in 1906 to include the mine. During the five years life of this operation 288,000 tons of tailing and 167,000 tons of caved ore were treated, averaging about $3 in silver and gold.

The mine was purchased in 1910 by the Montana Tonopah Mining and Milling Company, an organization promoted by Charles Knox and A. Y. Smith. Edward A. Collins acted as manager of the company. A new mill was erected at a cost of $203,000 and a new extraction shaft known as the D shaft was sunk to the 6th level. While the mill was building and the mine was being developed, the old tailing treatment was continued by leases. The mill was completed early in 1913 and was run on low grade ore stoped chiefly from the footwall side of the two veins until May 1917, when operations on company account were discontinued. 375,000 tons were treated at a profit of about a dollar a ton.

After the close of the mill, A. Y. Smith obtained a lease on the property, and organized the Commonwealth Development Company. The mine was subleased to various small lessees, and the ore was shipped to the Copper Queen smelter at Douglas as silicious flux. About 120,000 tons

of ore averaging 12.5 ounces of silver and $2.00 in gold was shipped to the end of 1929. Included in this was a small tonnage of old tailing.

The total production of the property through 1926 was approximately 940,000 tons with an average value of $11.71, a gross production of $10,407 which yielded about $5,000,000 in profits and dividends. By the end of 1929 the mine had been virtually exhausted of profitable ore, although under a normal silver market a small production of low grade ore may yet be made.

Dragoon and Little Dragoon Mountains

The main range of the Dragoon mountains in which is located Cochise's stronghold, one of the principal mountain forts of the Apaches, was little prospected until after the death of Cochise in 1879 and the subsequent removal of the Indians to the San Carlos reservation. Prospecting in the Little Dragoon, north of Dragoon Pass, had started at an earlier date, and the first locations were made in the early seventies on the copper outcrops at what is now Johnson, seven miles north of the pass. Little work was done until after the completion of the Southern Pacific Railroad in 1881 when what are now known as the Republic and Mammouth mines, on which rich oxidized copper ore outcropped, were acquired by a Philadelphia company known as the Russel Gold Silver and Copper Mining Company. This company erected a small furnace at what is now known as Russelville, about two miles west of the mine, where the nearest permanent water supply was obtainable. Production started in 1882, and according to the Tucson Star's estimate 266,636 pounds of block copper were produced during the year. The following year the Cochise Copper Company was organized to work the Peabody mine. A pipe line was laid from Russelville to the mine, the smelter of the Russelville Company was moved and rebuilt at the mine, and the town of Johnson sprang up in the mesa surrounding the mine. The smelter started in 1883 and 607,632 pounds of block copper were produced.

On the drop of the price of copper in 1884 the mine was closed and both properties were abandoned.

A second early venture near Dragoon Pass was the Old Terrible or Golden Rule mine located in the late seventies. The first published output from this mine was in 1883 when the Tucson Star and U. S. Mint Report credited it with a production of $125,000 in gold. A production of $20,000 was reported for 1884, after which no further output was recorded and the ore was shipped to the smelter at Pinos Altos, New Mexico.

The mine was acquired in 1897 by the Golden Queen Consolidated Gold Mining Company. This company built a small mill and produced partly in gold bullion and partly in concentrates shipped to the smelter at El Paso, and production was continued intermittently through 1902, during which time the company was reorganized or was purchased by a company known as the Old Terrible Mining Company.

No further work was done for three years when the Manzoro Gold Mining Company was organized to operate the mine. A new mill was built and the mine was operated and produced for three years from 1905 to 1908.

No further work was done until 1916 when the property was leased, and from that date through 1929 a small intermittent production has been made in shipments of ore. The most active year was 1927 when a production of about $14,000 in gold and lead was made. The mine has a recorded production of about $224,000 from 1883 through 1929.

The earliest work done in the main range of the Dragoon mountains was by the Middlemarch mine. This venture was financed originally in 1897 by Chinese merchants of Tombstone and San Francisco. A road was built through what is known as Middle Pass from Tombstone to the mine, and a few shipments of the richer surface ore were mined and hauled to the railroad at Cochise for shipment. This did not prove profitable and in

1898 the Chinese stockholders sold out and the property was reorganized with Richard Gird, one of the original discoverers of Tombstone, as president and M. M. O'Borman as manager. A small blast furnace was built and a small production was made, after which the property was closed.

During the high copper market of 1907 the company was reorganized by O'Gorman, but no production was made and the property was again closed at the end of the year.

After the high market of the World War had been established in 1916, the mine was again reopened after the company had been again reorganized as the Arizona Middlemarch Copper Company. At first the smelter was fired but it was found more economical to ship the remainder of the oxidized ore to outside smelters. While this was being done, the mine was developed below the oxidized zone and a substantial tonnage of low-grade sulphide ore was blocked out. A concentrator was started which was finally completed early in 1919, and was operated until the drop in the metal market at the end of 1920. The mine was then closed and has not been reopened. The total production of the property has been approximately 264,000 pounds of copper and a small amount of bi-product silver, which has yielded about $85,000 gross.

A second copper venture in the main range of the Dragoon mountains was started near South Pass. This passed into the ownership of Barrett and Fitts in 1896, and the mine was leased to the Tucson Smelting Company, which owned a small smelter at Tucson originally erected to treat Silverbell ore. Very little ore was shipped and in 1898 a 30-ton blast furnace was erected at the mine, and a small tonnage was mined and smelted, after which the mine was abandoned.

A third venture in the Dragoon mountains was started in 1897 by N. O. Bagge who in 1898 interested West Virginia capitalists to organize

the Black Diamond Copper Mining Company. After three years of intermittent development work, a considerable sum was spent in equipping the mine with a 100-ton blast furnace, a 38-inch cupola to resmelt the matte, a half mile aerial tramway from the mine to the smelter, and a 3 1/2-inch pipeline seven miles long from Pearce to the smelter. The organizer of the company, N. O. Bagge, acted as manager of the mine with the title of managing director. The smelter was finally blown in in April 1903, and was run intermittently for two years. No profit was made; the company was reorganized in 1905 and the mine was reopened in 1906 under new management, but no further production was made and all operations ceased at the end of 1907.

No further work was done at the property until 1929, when the mine dumps were leased and 2300 tons of sorted ore were shipped to a smelter at Douglas. The total production of the mine has been about 1,000,000 pounds of copper worth about $150,000.

A fourth venture in the main range of the dragoon mountains was the lead-gold mine of the Texas-Arizona Mining Company, south of Dragoon Pass. This mine was first located in the seventies, but little production was made until its acquisition in 1907 or 1908 by the Texas-Arizona Mining Company. The mine was developed, and small shipments of oxidized gold-bearing lead ore were made to the El Paso smelter until 1910 when large-scale operations were commenced which were continued through 1914. In addition to lead ore, smaller shipments of oxidized zinc ore were made in 1911, 1912, and 1913. The company ceased stoping at the end of 1914, but continued to develop the mine to the end of 1917, when the property was turned over to lessees who shipped lead ore intermittently to the smelter until the end of 1923. The total production of the property has about 650,000 pounds of lead, 56,000 pounds of zinc and 200 ounces of gold with a gross value of about $40,000.

In the Little Dragoon mountains north of Dragoon Pass, little work was done after the close of the Peabody mine in 1884 until the high copper market years at the dawn of the twentieth century. The Peabody mine was purchased by the Dragoon Dummit Copper Mines Company organized by Jacobs in 1899. No production was made until 1902 when the company was reorganized as the Dragoon Mining Company. Shipments were started of oxide ore to the smelter at El Paso at the rate of three cars a month. Intermittent work was done through 1903 when the property was closed. The company was reorganized four years later during the high market preceding the 1907 panic as the Bonanza Belt Copper Company and about $500,000 worth of ore was shipped during the year, after which the mine was again closed. It has been reopened at various times since by lessees who sorted the dumps and mined what was left of the high-grade ore of the mine. The production since 1907 has been negligible. The mine has produced since 1881 about 1,2000,000 pounds of copper with a gross value of about $191,000.

The largest producing mines of the Dragoon and Little Dragoon mountains have been those mines now owned by the Arizona United Development Company or Mason Copper Company.

This group consists of the Republic, Mammoth, and Copper Chief mines, near the Peabody mine at Johnson in the Little Dragoon mountains, about seven miles north of Dragoon Pass.

The first work was done in 1904 when the Republic and Mammoth mines and other contiguous groups of claims were purchased by the Arizona Consolidated Mining Company, financed in Pennsylvania. The principal work was centered at the Republic mine and, after equipping and developing the mine, production started in 1905, the ore being hauled to Dragoon station and shipped to the Copper Queen smelter at Douglas. Oxidized

ore was shipped from both the Mammoth and Republic until 1909 when the company was reorganized as the Arizona United Mining Company, under the laws of Delaware, and a 125-ton smelter was built near the Republic shaft. A railroad to serve the camp was built in the same year by the Arizona and Michigan Development Company, operating the Copper Chief Mine. Production continued at a larger rate in 1909, and a part of the ore was smelted. The smelter was run for a short time only, and was then abandoned. All shipments ceased in 1910 to await better copper market.

The company was again reorganized in 1910 as the Arizona United Mining Company, under the laws of Arizona, but production did not start until the better copper market of 1912. The company continued to ship ore to the smelters at Douglas at an increasing rate until January 1915. A large body of sulphide ore was developed in 1913 and production was greatly increased in 1914.

The property was leased for a period of ten years in the beginning of 1915 to the Cobrisa Mines Development Company of which Halstead Lindsley was ground manager, and David M. Goodrich was president. This company started production in July 1915, and continued shipments until July 1918 when the lease was surrendered to the company on the payment of $75,000 to the leasing company. During the period of the lease, ore of about $4,000,000 gross value was shipped, with a net return to the leasing company after royalties were paid of over a million dollars.

After the surrender of the lease, the Arizona United Company continued to mine until the end of 1920 when the drop in the price of copper forced suspension. No work was done after the close of the property until 1923 when the Copper Chief mine owned by the Dragoon Mountain Mining Company and the Republic-Mammoth mines of the Arizona

United Mining Company were consolidated as the Arizona United Development Company under the management of George F. Wilson. Small intermittent shipments were made in 1924 and 1925, and in 1926 the combined properties passed into the hands of the Mason Copper Company. A start was made at reconditioning the mine and a large flotation concentrator was contemplated, but all work ceased at the end of the year.

The Copper Chief Mine, one of the group now owned by the Mason Copper Company, lies between the Republic and Mammoth mines. This group was acquired by the Arizona and Michigan Development Company in 1904. The property was developed and equipped, and in 1909 a broad-gage railroad was built from Dragoon to the mine, a distance of about six and a half miles. Little production was made until 1914 when small shipments started which were continued into 1915. In 1916 the property was bought by the Dragoon Mountain Mining Company, and eleven cars of ore are reported as having been shipped in 1918, since which time no production has been made. The railroad was taken over in 1921 by the Southern Pacific Railroad Company and the line was abandoned and the tracks raised. The Dragoon Mountain Mining Company was absorbed together with the Arizona United Mining Company, by the Arizona United Development Company in 1923.

Other mines that have been considerably developed but have had only small productions have been the Keystone, financed in Kansas, for which a 200 ton flotation concentrator has been built, the Black Prince, the Centurion and the Johnson Copper Development Company.

The total production of the Dragoon and Little Dragoon mountains exclusive of the Courtland-Gleeson area at its southeast extremity has been approximately 28,500,000 pounds of copper, 1,000,000 pounds of lead, 67,000 pounds of zinc, 350,000 ounces of silver and 9900 ounces of gold with a gross value of about $6,500,000. Details are show in the appendix.

Dos Cabezas Mountains

The first locations were made in this range on a gold mine in Apache Pass. This pass, ten miles southeast of Dos Cabezas, was one of the stations of the Butterfield Stage which operated before the Civil War from St. Louis to San Francisco by way of El Paso, Tucson, Yuma and Los Angeles. The mine was probably located before the Civil War, but no attempt was made to work it after the withdrawal of troops at the commencement of the War until 1869 when it was reopened. It was abandoned after the murder of John F. Stone, the superintendent, by Apaches.

The mountains were not reentered by prospectors until the late 70's after the death of Cochise and the surrender of Geronimo. The first locations were made near the site of Fort Bowie on the northeastern slopes of the range in what is known as the Teviston district. Placers and gold ledges were found and the first production was reported by the Tucson Star in 1884 of $12,000 in gold. The principal mine was the Mineral Park located by Fowler and McGregor which was sold to Captain H. Tevis, George W. P. Anderson and M. G. Kinchala in 1882 for $50,000. Locations were made shortly after the completion of the Southern Pacific railroad in 1881 on the southwest slopes of the range near Dos Cabezas, both on gold and copper ledges, and in 1885, the Tucson Star estimated a production from the Dos Cabezas district of $34,000 in gold won both from placers and lodes. Two companies known as the St. Louis and Cincinnati companies had secured the best gold properties and built small stamp mills to treat the ore.

No further work was reported until 1890 when the Comet silver mine at Cochise City in the Teviston district was exploited and a production of over $300,000 was made in 1890 and 1891 in silver and lead. The Tevis mill in the Teviston district was also reopened in 1891 but no production was reported.

The two districts remained quiescent until 1902 when the copper deposits on the Dos Cabezas side of the range were acquired by the Dos Cabezas Consolidated Mines Company. The property was developed superficially and a small smelter was erected, but little production was made, and the property was closed in 1905.

No further work was done on the copper deposits until 1907 when the property of the Dos Cabezas Consolidated was purchased under bond and lease by the Mascot Copper Company, incorporated under the laws of Arizona, for $10,000,000 in both preferred and common shares, controlled and promoted by H. H. Evans and David S. Stevenson of Chicago. After two years of development work the company was reorganized by the Western Finance Company controlled by Thomas N. McCauley, which company took the entire stock issue of the Mascot Copper Company and returned 250,000 shares to the company for working capital. H. H. Evans was superseded by McCauley as president of the company, and Frank L. Sizer of San Francisco was appointed superintendent. An ambitious program was followed of development by tunnels, shafts and diamond drill, and by the end of 1913 a substantial tonnage of medium grade oxide and sulphide ore was reported as blocked out, and in 1914 the capital of the company was increased to $15,000,000. A fifteen-mile broad-gage railroad, known as the Mascot and Western Railroad, was started to connect the mine at Dos Cabezas with the main line of the Southern Pacific Railroad at Wilcox. The road was completed in June 1915, when shipments of ore to the smelter at El Paso commenced and were continued to the end of 1916. The mine was then leased to the American Smelting and Refining Company which shipped a considerable tonnage of low grade ore in 1917 and up to April 1918 when the lease was surrendered.

On the relinquishment of the lease the Central Copper Company, promoted and controlled by Thomas N. McCauley, was formed to absorb the

Mascot Copper Company holdings and the Elma mine on the northeast slope of the ridge. The Central Copper Company was incorporated as an Arizona corporation in 1919 with a capital of $10,000,000. The Mascot Copper Company was taken under a twenty-year lease and bond, and the two groups were worked together under the management of J. W. Prout, Jr. Development of the two groups, which were connected by means of a tunnel through the ridge, continued under 1924, when the construction of a modern townsite and of a 500-ton flotation concentrator was started, and completed in 1926. In the succeeding two years the concentrator was run intermittently on low grade sulphide ore, but was closed in 1928 to await further developments. Development work at the mine was again pushed, chiefly by diamond drilling until 1930 when all work ceased. The total gross production of the Mascot and Central Copper companies has been approximately $800,000, chiefly in copper, the major portion of which was produced during the high copper market in existence from 1915 to 1918.

After the close of the Comet mine in 1891, little work was done on the gold lodes of the district until 1896, when the Juniper mine at Dos Cabezas was developed by the Casey brothers. After two years of work the mine was bonded in 1898 to John Young and R. A. F. Penrose Jr., but after a few months of work, the bond was surrendered.

No further work was done until 1903 when the Gold Nugget mine was developed. A mill was built and a small production was made chiefly from ore extracted from development work. The mine was reopened in 1908 but was closed at the end of the year.

The Dives mine adjoining the Mascot Copper company holdings commenced developing in 1907. A mill was built in 1910 and production started in 1911 and was continued through 1915.

The Henry Clay and Casey mines, now known as the Gold Prince, were opened in 1915, and the rich surface gold ore was shipped to the end of 1918 when they were acquired by the Gold Prince Mining Company promoted by A. J. Welty. The mine was developed by a series of connecting tunnels, a mill was built, and over $20,000 in gold was produced to the end of 1921 when the property went into bankruptcy and was sold.

The Dives mine was reopened in 1920, and has had an intermittent production from the operation of lessees. The Gold Prince and Le Roy mines have also produced a small amount of gold ore chiefly shipped on lease account to various smelters as silicious flux. The Le Roy mine was purchased in 1925 by the Arilead Mines Company which produced lead-gold ore from 1926 to 1929, which was shipped to the El Paso smelter.

The total production of the Dos Cabezas mountains from 1884 to 1929 inclusive has been about 3,300,000 pounds of copper, 1,000,000 pounds of lead, 300,000 ounces of silver and 6,400 ounces of gold with a gross value of about $1,275,000.

Chiricahua Mountains

The high rugged mountain mass of the Chiricahuas in the southeast corner of the state was one of the principal retreats of both the Apaches and cattle-rustling outlaws in the early frontier days. It was not entered by prospectors until the dispersal of the Indians following the death of Cochise in 1879.

The first locations were made in the late seventies on the lead-silver outcrops near what is now the village of Paradise. These were purchased in 1880 by a company known as the Texas Company. After a year's development of the mines, the town of Galeyville was established and a small smelter was built. The first ten-day run late in 1881 was

reported in the Tucson Star as having produced 80,000 pounds of lead bars from the treatment of ore said to have assayed 60 ounces of silver and 45 per cent lead, from a mine in Granite Gap, ten to fifteen miles northwest of Paradise. Operations were continued by the company into 1882 but the mines and smelter was abandoned early in the year and Galeyville became a ghost town, and literally disappeared. Even the site of the town is now problematical. The output for the year 1881 was estimated by the Tucson Star as $15,500, presumably in silver, as lead was of little value.

Few prospectors reentered the mountains until 1903 when the oxidized copper outcrops were located near Paradise. The geological similarity of the district to Bisbee soon attracted the capitalists from the Great Lakes who were exploiting the deposits in Bisbee. Three major companies secured control of the best showings. The Chiricahua Development Company, financed by Calumet and Arizona interests, optioned the Burns group from Burns and Duncan in 1904, but after about a year's work, during which two 100-foot shafts were sunk and considerable lateral work was driven, the option was surrendered. The second large company was the Duluth and Chiricahua Development Company, financed by Shattuck Arizona interests, which optioned the Scanlon group and later the Sullivan group in 1904. Considerable work was done on both groups but insufficient ore was encountered and the options were surrendered in 1905.

A third company known as the Cochise Consolidated Copper Company was organized about the same year to acquire the Davis group. A little ore was shipped from near the surface for about a year but the high zinc content of the deeper ore made it unprofitable and the mine was closed.

The lead-silver lodes formerly worked by the Texas Company were relocated and in 1904 were leased to a local syndicate which shipped lead ore to the El Paso smelter for two years.

Intermittent production of both lead and copper from near Paradise continued until 1918 when the camp was again nearly abandoned.

The largest and most successful venture in the Chiricahua mountains was that of the Hilltop mine in Hands Pass, about six miles northwest of Paradise.

These lead-copper-silver deposits were acquired in 1916 by J. O. and R. O. Fife of Kansas City, who organized the Hilltop mines, later incorporated for $10,000,000 as the Hilltop Metals Mining Company. For eight years this company developed the mine by means of a series of tunnels, of which the deepest and longest cut ore at a depth of 1500 feet below the outcrop. Production commenced in 1924. The oxidized lead-silver ore was hauled about 25 miles to the nearest railroad point on the El Paso and Southwestern Railroad at Rodeo for shipment to the El Paso Smelter. Over 5,000,000 pounds of lead and 70,000 ounces of silver with a gross value of over $480,000 were produced from the Hilltop and neighboring Hilltop Extension mines from 1924 to 1928. The Hilltop mine was closed in 1926, followed by the closing of the Hilltop Extension in 1927.

The total production of the Chiricahua Mountains through 1929, as shown in the Appendix, has been about 96,000 pounds of copper, 5,700,000 pounds of lead, 106,600 pounds of zinc, and 105,500 ounces of silver, with a gross value of about $560,000.

Miscellaneous Production

There has been a small production of ore from a number of scattered centers, of which the principal ones have been the Huachuca Mountains, the Swisshelm Mountains and the Whetstones.

Prospecting in the Huachuca Mountains started soon after the establishment of Fort Huachuca in the late sixties. A little work was done in 1883

on the Nellie James prospect and others, and the ore was shipped to the Tombstone Mine and Milling Company lead smelter at Charleston and to the Salisbury and White smelter at Benson. After the close of these two plants in 1885, no further work was done except intermittent prospecting until 1908 when the Butte and Arizona, the Mitchel, Sitric and Exposed Reef mines were developed. The most ambitious of these was the Exposed Reef. Considerable work was done at this gold prospect, a road was built to the property and a mill was erected. Very little production was made and the property was closed in 1909.

Except for assessment work and prospecting, little work was done until 1911, when Wisconsin group, on which there are outcrops of oxidized copper ore, was optioned by the Hartford-Arizona Copper Mining Company controlled and promoted by Henry Hamburg. A townsite known as Hamburg was established at the mine, and considerable work was done, and a little ore was shipped in 1913 and 1914.

The existance of the tungsten mineral scheelite in several deposits in the mountains had been recognized at an early date. Prospecting for tungsten did not start until 1917 during the abnormal market of the World War years. The principal deposit exploited was the old Exposed Reef vein from which a small production was made by O. T. Smith in 1918.

The only other mine with a notable production is the Manilla, first exploited in 1923 or 1924. A small production in lead-silver ore was made from 1924 to 1928.

The total production of the Huachucas has not been much over $70,000 in copper, lead, silver, gold and tungsten.

From the Swisshelm Mountains west of the Chiricahuas the first recorded production was made in 1918 from the Swisshelm gold-silver company, which shipped ore first to El Paso as lead ore and later to other reduction works as silicious flux, until the close of the smelters in 1921.

The Four Horse lead-silver mine was opened in 1921 and shipped high grade ore and jigged concentrates to the El Paso Smelter to the end of 1929.

The Colford Copper Company secured the Scheerer group adjoining the Swisshelm gold-silver mine in May 1920. High grade lead-silver ore was found in 1924, and shipments of ore were made until sometime in 1926, when the mine was closed.

The Great American mine on which is exposed a large deposit of low grade silicious ore, was leased in 1925 and 1926 by George F. Wilson of Globe, and about 1,000 tons were shipped to a smelter in Douglas.

The Swisshelm Mountains have had a production of about $102,000 in lead, silver and gold to the end of 1929.

Considerable prospecting has been done in the Whetstone Mountains but a negligible production has been made.

The most important operation in the Whetstone district has been at Benson, where two smelting ventures were tried.

The first smelter was erected in 1882 by Salisbury and Company. The venture was promoted by M. Salisbury of San Francisco, A. Byran of Chicago and Hugh White of San Francisco. It went into operation in September 1882 as a lead smelter. The Tucson Star of Oct. 7th, 1882, advertised the rates charged for ores as follows: - Lead paid for over 25 percent at 50 cents a unit; silver in ore less than 100 ounces a ton, 85 percent paid for at $1.13 an ounce; the treatment charge was fixed at $20 a ton. At first the chief ore smelted came from Tombstone, but after the completion of the Charleston smelter of the Tombstone Mining and Milling Company, the company purchased the Schuylkill mine at Chloride, Mohave county, and still later purchased the old lead-bearing tailing pile of the Vulture mine at Wickenburg. The smelter did not prove profitable and was

closed in 1886 due to lack of patronage* and also due to the competition at El Paso, Silver City, Socorro and Pinos Altos. The production in 1884 was given in the Mine Report for 1884 as follows:

Gold	$48,000
Silver	680,000
Lead	72,000
Total	$800,000

Twenty years after the close of the smelter, what remained of the plant, together with the 75,000-ton slag dump, were purchased by a company known as the Southwestern Mine and Smelting Company, financed by interests owning the Copper Chief mine at Johnson. A patent oil smelter was at first erected, but it proved a failure, and was replaced in 1904 by a 200-ton copper blast furnace together with a 250 ton sampling plant. The plant was completed in November 1904, but was never blown in. In 1918 the company was reorganized as the Arizona Smelting and Power Company. This company did not open the smelter due to inability to compete with other plants. Nothing was done by the company until 1925 when shipments of slag were commenced to the Copper Queen lead smelter at Douglas. Over 1800 tons were shipped to the end of 1921, containing an average of 2.5 ounces of silver and 2.5 percent lead, with a gross value of about $104,000.

Summary

The total production of Cochise County through 1929, exclusive of Bisbee and Tombstone, has been approximately 89,400,000 pounds of copper, 14,000,000 pounds of lead, 534,000 pounds of zinc, 14,000,000 ounces of silver and 163,800 ounces of gold, with a gross value of about $29,500,000. Including Bisbee and Tombstone, the county has produced a grand total through 1929 of approximately $763,500,000.

*Trippel, Alex, "Production of the Precious Metals in the United States", U. S. Mint report, 1887.

CHAPTER 13

EASTERN PIMA COUNTY

EARLY MINING

The first mining in what is now Arizona was done in Eastern Pima and Santa Cruz Counties. The two settlements of Tucson and Tubac in the Santa Cruz River Valley were the northern frontier towns of that part of Mexico west of the Sierra Madres for at least two centuries before the Mexican War. However, mining was never a major industry in Arizona in Spanish and Mexican time, due to the control of the mountains by the warlike Apache tribes against whom no headway was ever made. A little placering was done, and a little silver mining of a very crude kind in the Santa Rita, Patagonia, Catalina, and Sierrita Mountains. "Antigua" workings were found at the Cerro Colorado, Patagonia, San Xavier, and in the Cañada del Oro of the Catalina Mountains. At the time of the American occupation no mining was being done by the Mexicans, and only legends remained of what had been done in the past. One of the legends dealt with the finding in the eighteenth century of a rich silver placer known as the "Planchas de la Plata" somewhere near the present international line west of Nogales. Shortly after its discovery the Spanish government forbad its exploitation on the grounds that it was a "Creadero" or source of the mineral wealth of the country.

Mining on a comparatively large scale did not commence until after the occupation of Tucson by the Americans in 1854 following the estab-

lishment of the international boundary by the Boundary Commission. Forts were established in the Patagonia Mountains, San Pedro Valley, and at Tucson as a protection against Apaches, and several large exploring companies were organized in New York, Providence, Cincinnati, San Francisco, and Texas to exploit the territory embraced in the Gadsden Purchase. These early ventures were promoted largely by Army officers and members of the Boundary Commission. The most influential of these early promoters were C. D. Poston, Lieutenant Sylvester Mowry, Major Heintzelman, Colonel Samuel Colt (the inventor of the Colt pistol), and Captain R. S. Ewell (later a brigadier general in the Confederate Army.) They were ably assisted by two German mining engineers, Herman Ehrenberg and Frederick Bruckmow.

The country was then extremely inaccessible, and over-run by Apaches and Mexican outlaws. Tucson and the various forts were the only permanent settlements prior to the establishment of the ranches and mining camps. The most accessible entrance into the country was by boat to Guaymas and by road and trail from Guaymas to Tucson through northern Mexico. After the establishment of the mining camps and ranch haciendas, roads were built from El Paso to Tucson and from Tucson to Fort Yuma, and in 1857* the first stage line was established, known as the San Diego and San Antonio line. This first venture was promoted by James E. Birch and Isiah C. Woods of California. No roads existed and the company occupied itself chiefly in road building. Regular stage service was never achieved. The following year the San Diego and San Antonio line was taken over by the Butterfield line, organized to run from Marshall, Texas, to San Diego, California. Its eastern terminus were St. Louis and Memphis and its

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*Parrish, Thomas Edwin, History of Arizona, 1915, Vol. 2.

western termines was San Francisco. Its president was John Butterfield of Utica, New York. The company was subsidized by the U. S. Government for $600,000 a year to carry the mails. The route through Arizona led west-bound through Apache Pass in the Dos Cabezas Mountains, Dragoon Pass at the northern end of the Dragoon Mountains, Benson on the San Pedro River, and down the river to the mouth of Aravaipa Creek. From there there were two routes followed, one to Tucson by way of the present town of Oracle and thence in part following the course of the Cañada del Oro, and the second, down the San Pedro to the Gila at the present town of Winkelman and thence west following the Gila River to Fort Yuma by way of the Pima villages near the site of Maricopa. A route also was established from Tucson down the Santa Cruz River to the Pima villages, and thence west to Fort Yuma. The first stage left St. Louis September 15th, 1858, and reached San Francisco October 10th. From then on regular tri-weekly service was maintained for eighteen months. The through passage cost $150 exclusive of meals, which cost, such as they were, from 40 cents to a dollar. In March 1860 the route was discontinued and moved north through Denver and Salt Lake City. The inauguration of the stage line was a great stimulus to mining in Southern Arizona. Some high grade ore was shipped to mid-western reduction works and most of the machinery for local reduction works was shipped into Arizona by the stage company. A vivid account of a trip into Arizona from St. Louis to Tucson at this time has been given by Pumpelly* who was employed as metallurgist for one of the early ventures in the Snata Rita Mountains. For sheer traveling

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*Pumpelly, Raphael, My Reminiscences, H. Holt and Company, 1918, vol. 1.

discomfort and danger, it has had few peers in the history of transportation. The regular maintenance of the line through two thousand miles, half of which was through Apache and bandit-infested country for even the short eighteen months of its existence demonstrated the metal of the men who were attempting to open up the territory. They were a hardy and fearless lot. Short sketches of the lives of the two chief promoters of the period, Poston and Howry* serve as examples of the type.

Charles D. Poston was born in Hardin County, Kentucky, April 20th, 1825. His mother died when he was twelve years old, and soon after he served three years in the office of the Supreme Court of Tennessee at Nashville. During this time he studied law and was admitted to the bar. Shortly after the '49 gold rush he went to San Francisco and served there in the customhouse. After the Gadsden Purchase in 1854 he accompanied an exploring party into Arizona, and was so much impressed with the country that he spent the following year in a trip to San Francisco, New York, Kentucky, and Washington, D. C., to interest capitalists in Arizona and New Mexico. In 1856 he returned to Arizona with funds for prospecting and acquiring mining properties. He was an active promoter of three of the early ventures which were financed from New York and San Francisco. On the outbreak of the Civil War, he was transferred to the New York office of one of the companies. On the organization of the Territory of Arizona in 1863 he was appointed by President Lincoln as Superintendent of Indian Affairs. After serving one year he was elected first Delegate to Congress from Arizona, and upon the conclusion of his term he made a

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*The two biographies are taken from Farrish's History of Arizona, Vol. 2, 1915.

tour of Europe, practiced law at Washington, D. C., and later accompanied J. Ross Browne, newly-appointed Minister to China, as Commissioner of Immigration and Irrigation. On his return to the United States, he was appointed as Register of the United States Land Office of Arizona by President Grant, and served afterwards as Consul at Nogales and military agent at El Paso. For five years after the conclusion of this work he was very active in Washington, promoting the interest of the government in irrigation, after which he retired to Phoenix, where he died in 1902.

Sylvester Mowry entered West Point in 1848 and graduated with the class of 1852. Among his classmates were General Crook, General Kautz, Colonel Mendel, Jerome Bonaparte, Jr., Major-General Evans, Captain Mullin, and Lieutenant Ives. In the summer of 1853 he was engaged with George B. McClellan on the Columbia surveying for a railroad route. In 1855 he was commissioned to conduct some recruits and animals from Salt Lake to California, and was then transferred to Fort Yuma. While there he made an expedition into southeastern Arizona, and was so inspired with the mineral possibilities that, in 1857, he resigned his commission to engage in mining. In 1860 he purchased the Patagonia Mine in the Sierra Santa Cruz (the Patagonia Mountains) 55 miles south of Tucson, and together with his brother, Charles Mowry, spent the succeeding two years in developing and equipping the property. On the outbreak of the Civil War in 1861 he fortified the mine against Apache attacks and continued working after all troops were withdrawn and the territory was in a terrible state of confusion. He remained in possession of the mine until 1862 when General Carleton of the California Column arrived and took possession of Arizona. Mowry was suspected of

southern sympathies, was arrested and sent to Fort Yuma, and the mine was confiscated. He was liberated after six months, without trial, and the mine was afterwards restored to him. After the Civil War he spent the rest of his life in writing about conditions in the Southwest and in unsuccessful attempts to refinance the mine. He died in London, England, in 1871. By his writings and enthusiasm he probably did more to interest the country in Arizonaand its possibilities than any one man of the period.

The principal mining and cattle ventures of southeastern Arizona before the Civil War were the following, as described by F. Biertut, Metallurgist for the Mowry Mine in 1860: "My first visit to the Patagonia Mine, nowcalled the Mowry Silver Mines, has lasted four days - the time necessary to give it a full examination in all its parts, and to make a careful assay of its ores. But why is it called the Patagonia Mine? Is it because it is situated in a desert inhabited only by Indians? Such were the questions I put to myself while traveling, and which I thought might be answered affirmatively. Great was my surprise, however, when instead of finding as I expected, barren mountains as at Washoe and Mono, I gazed onbeautiful landscapes, and a country covered with trees of different kinds, with fertile lands perfectly watered. True it is that the nearest neighbors, the Apaches, are far from being equal to the Patagonians, but this, it seemed to me, could not be the reason for giving to such a beautiful spot, which in spring must be covered with flowers, so savage a name. Mr. Mowry was perfectly right to alter it. ...

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*Mowry, Sylvester, Arizona and Sonora, Harper and Brothers, N. Y., Third Edition, 1864.

"The discovery of the Patagonia Mine dates only from the fall of 1858, but it would appear that its existence was suspected long ago, for the first parcels of ore gathered by the Mexicans were taken, at the time of the late discovery, from shafts which had been sunk many years ago, and which had been abandoned.

"The Owners: - The first owners were Colonel J. W. Douglass, Captain R. S. Ewell, Lieutenant J. N. Moore, Mr. Randal, Mr. Lord, and Mr. Doss, all belonging to the United States Army, excepting the last named individual and Colorel Douglass. Those parties started some preliminary works - sunk shafts, extracted a certain quantity of ore and built up several furnaces for smelting. But being short of capital ... two of the principal shareholders, Messrs. Lord and Doss ... sold their interest during the year 1858-9 to Mr. Brevoort. ....

"The administration of Mr. Brevoort was not a happy one. The mine ... fared much worse. A certain quantity of ore was extracted, but ... the proceeds ... were not sufficient to cover the costs incurred. These failures gave rise to disagreements between the owners, which could not be stilled except by the sale of their whole interest, which Captain Ewell and his partners made to Mr. Brevoort, this last named gentleman turning the interest immediately over to Mr. H. T. Titus. ... Consequently, the sale of the whole was resolved upon, and the conveyance took place in the Spring of 1860 in favor of Lieutenant Mowry, all the interested parties joining in the deed. The price of the mine, including the lands surrounding it, all the works and establishment standing at the time, fixed at $25,000, was paid in cash by the new owner. ...

"The Management of the Mine: The old furnaces having been badly

constructed, and being out of use, they will be replaced by others containing all the later improvements, either for smelting or refining. ... The expenses to be incurred this year to put in operation the different projects in view will exceed the sum of $60,000.

"The Eagle Mine: This mine is situated to the east of the Mowry Mine, and its vein composed of argentiferous galera, exactly similar to the Mowry Mine, is, it is stated, its continuation.

"The San Pedro Mine*: This mine is situated on the east side of the San Pedro River, about twenty five miles from the Overland Mail Road, and half a mile from the river.

"Empire or Montezuma Mine[1]: I have mentioned above this mine as forming a part of the Santa Cruz Sierra. It is half-way between the Mowry Mine and the town of Santa Cruz. The ores are composed of lead and silver. The first owners were Th. Gardner and Hopkins, who it seems, sold their interest out to New York companies.

"Santa Rita Mining Company: The Sierra de la Santa Rita, as that of the Santa Cruz, incloses rich deposits of precious ores. The Cazada, Florida and Salero Mines are united in one company, under the above title. The last one was known a long while ago, and was worked by the Jesuits. In that one also the argentiferous galera dominates. Shortly, furnaces will be put up for smelting and reducing; they will be erected on the very mountains of Santa Rita, which are to the east of Tubac, at the distance of about ten miles. The superintendent of the mine is Mr. H. C. Grosvenor, and Mr. Pumpelly is the engineer.

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*Known also as the Brucknow Mine, about six miles from the site of Tombstone. (J. B. Tenney)

[1]One of the Washington Camp properties. (JBT)

The capital is $1,000,000. These mines were opened in 1856.

"Mariposa Mining Company*: This company is working a copper mine, situated forty miles from Fort Breckenridge at the junction of the San Pedro and Arivaca** Rivers and from three to four miles south of the Gila. ... It is under the direction of Mr. A. B. Gray, ex-surveyor of the United States attached to the commission of the Mexican Frontiers, and engineer-in-chief of the Pacific Railroad. Mr. Hopkins is the engineer of the mines; the house of Soulter, of New York, is the principal owner.

"Sonora Exploring and Mining Company: This mine, situated at about thirty miles from Tubac, in the Cerro Colorado, is one of the principal mines, if not the richest in the Territory. The company is working the vein known as the Heintzelman Mine, rich in argentiferous coppers, and also other veins on the Rancho Arivaca. ... One of the principal shareholders, Mr. Charles D. Poston, is the director, and at the same time lessee of the mine for the term of ten years. This company was incorporated in Cincinnati, Ohio, with a capital of $2,000,000 divided into 20,000 shares. The sum already expended for the working of this mine is estimated at $230,000, either in ready cash or from the proceeds of the mine.

"Cahuabi Mining Company***: The mine going by that name is near meridian 112 and 32 north latitude, in a region inhabited by the Papago Indians. The argentiferous copper ores are treated according to the

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*This mine was probably the Collins Mine adjoining the Mammoth. Ancient work was reported as existing at the time of relocation in 1884. JBT

**The Arivaca River is the present Aravaipa Creek. JBT

***The Cahuabi Mine is probably what J. Ross Browne refers to in 1864 as the Picacho Mine. JBT

Mexican amalgamation process known as the patio. I have seen specimens from this mine in the hands of Herman Ehrenberg, president of the company, of extreme richness. The mine was opened since 1859. ...

"Arizona Land and Mining Company: This mine is situated north of the Rancho of Sopori.* This company owns a large tract of land of thirty-two leagues square, on which is situated the old silver mine of San Xavier, which was worked during the time of the Jesuits, and which appears exceedingly rich; other veins, equally rich, are to be found in the center of the property, on the Sierra Tinaja.** The company was incorporated in Procidence, R. I., with a capital of $2,000,000. The Honorable S. G. Arnold is the president. The treasurer is Mr. Alfred Anthony, President of the Jackson Bank of Providence. Colonel Colt, Lieutenant Mowry, and other rich capitalists of the East are the actual owners. Mr. Mowry is the holder of more than one-half of the stock of the company. N. Richmond Jones, Jr., is the engineer-in-chief of the mine, as also of the Sopori Mine.*** ...

"The particulars I have just given you, although already quite lengthy, are far from containing all that might be stated in regard to mineral wealth of the Territory; but I must stop here, as I only intend to give you statements entirely correct."

The Sonora Exploring and Mining Company and the Arizona Land and Mining Company were closely affiliated in stock ownership. The old town of Tubac, abandoned by the Mexicans at the time of the American occupation, was rebuilt and fortified by these two companies, and

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*The original location of the Sopori Ranch was north of Tubac in the Santa Cruz Valley somewhere near the present Canoa Ranch. JBT

**The Sierra Tinaja is the present Sierrita Mountains. JBT

***The location of the Sopori Mine is in doubt. It is probable that it is synonymous with the Cerro Colorado or Heintzelman Mine. JBT

served as headquarters. A large fortified hacienda was established at the Cerro Colorado, and a second large ranch and hacienda was built at Arivaca where the reduction works for the Cerro Colorado were erected in 1859 under the direction of Guido Küstel, a noted metallurgist of the times. A large part of the machinery for the works was designed and purchased in New York by Colonel Samuel Colt, one of the principal stockholders.

The headquarters of the Santa Rita Mining Company was the old Tumacacori Mission Ranch, which also had been abandoned by the Mexicans and was partly rebuilt and fortified by the company. All these companies found it necessary to enter the cattle and farming business as necessary accompaniments of mining.

Large sums of money were spent in all these early ventures, but the returns were extremely small. As an example, Colonel Tolcott reported in July 1860 to the owners of the Sonora Exploring and Mining Company that the total yield in bullion from the start of operations to that date (from 614 tons hoisted, of which 327 tons had been treated or shipped and 287 tons were on hand) was $45,010.28, and he estimated the yield from the ore on hand should be $25,794.00. The yield of the Mowry Mine was probably a little larger, but as no real production was made until the fall of 1861, and as the mine was badly managed after its seizure in 1862, the gross yield was not very large. Some of the ore was shipped east, but most of it was treated at the mine, and the lead-silver pigs were shipped to Europe. Some of the lead was refined at the mine and the silver was cast into bars of $2 to $300 value and used as currency. It is to be noted in this connection that the capacity of the Arivaca works of the Cerro Colorado Mine

was about 1 and a half tons a day. The capacity of the Arivaca works of the Cerro Colorado at Mowry was larger but the silver yield per tone of ore treated was comparatively small. Only one smelter run was made by Pumpelly at the Salero Mine, and this was disappointing.*

The Cahuabi or Picacho Mine was worked from 1862 to 1864 by Mexican lessees who realized a net profit, according to Browne, of about $50,000. The total yield of all mines from 1858 to 1864, including the Mowry which is outside of the area under consideration, was not over $300,000, including ore stolen by Mexican "gambucinos" from 1861 to 1863. Excluding the Mowry, the yield from the present Eastern Pima County from 1858 to 1864 was not over $200,000.

Early in 1861, when it became certain that the Civil War could not be averted, all the American troops were withdrawn. Absolute chaos and panic resulted. The Apaches immediately descended in force on the haciendas, and most of the Americans either precipitately fled to Yuma, accompanied the troops to El Paso and Santa Fe, N. M. or took up their residence behind the walls of Tucson. Lieutenant Mowry was the only one to stick to his guns. Mowry** describes the desolation as follows:

"Many lives were lost; property of all description was abandoned; crops to an enormous amount were left standing in the fields; never to be gathered. In my late journey from Tucson to Guaymas, I passed over one hundred and fifty miles of beautiful country, studded with ranches and farms, where at every step were found comfortable houses, outbuildings, fences and tilled fields, utterly abandoned and

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*Pumpelly, Raphael. op. cit.
**Mowry, Sylvester. op. cit.

tenantless. The mining interest suffered at the same time. Partly through the cowardice of agents and superintendents, partly through the fault of Eastern directors, the various silver mines in Central Arizona were temporarily abandoned, and I was left with a handful of men who were willing to share my fortunes, and, if fate so willed it, be the last Americans in the Territory to fall by the lance or arrow of the Apache."

After the arrival of the California Column in 1862 attempts again were made to bring the Apaches under control and to reopen the mines, but the destruction of the works and buildings was so complete that no real mining was done in Southern Arizona for about ten years. Chaos again resulted on the withdrawal of the California troops at the close of the Civil War.

It is interesting to analyze the conditions which influenced the type of the preCivil War mining venture in Southern Arizona. The most important factor was the excessive cost of transportation caused by the extreme isolation of the country. Only those ores could be worked which could be easily reduced or were so rich that they could bear transportation charges to outside reduction works. A second important factor was the peonage system in vogue in Mexico at that time. Labor was extremely cheap. By the establishment of company stores at the various haciendas, the peon laborers were kept continuously in debt, so that the actual cost to the companies was their food and clothing. Under these conditions, it paid to sort all ore to the extreme limit, and to treat only the richest at the imported expensive reduction works. Mines that could be worked at a profit under these conditions could not be worked under modern

conditions of high labor. Of all the properties worked at this period, only five were later reopened and worked to any extent, and of these five, only one, the Ajo Mine, was profitable in later years. The other four, the Mowry, Empire, San Xavier, and Collins had checquered careers, but were on the whole, financial failures.

After the withdrawal of the California Column in 1864 Southeast Arizona again lapsed into the condition of utter isolation and lawlessness prevalent in 1854, with the additional handicap of extremely bitter Apache warfare. The Butterfield line was never reestablished. Transportation of passengers, goods and the mail was by private conveyance. The most accessible entrance from the outside was by boat to Yuma (then known as Arizona City) and by road from Yuma to Tucson. Freight from San Francisco cost about thirty cents a pound, which absolutely prevented mining of anything but the richest gold and silver ores. The relations of the Apaches and Americans were strained to the limit. A state of war without quarter on either side existed, largely brought about by the unwise policy of the small force of American troops. All sense of honorable dealing between the troops and settlers and the Indians was abandoned. The worst kind of attrocities were perpetrated by American and Mexican renegades, which were retaliated with interest by the Apaches. At first the advantage lay with the Indians, as the trails to their strongholds in the mountains were not known by the Americans. To add to the confusion, the suspected Confederate sympathies of a large proportion of the settlers, encouraged carpet-bag rule by the early Territorial Government established at Prescott. In the first two Territorial legislatures Pima County was poorly represented, and it was not until the third assembly

in 1866 that it was adequately represented. In 1867 the fourth legislature through the political ambitions of Governor Richard C. McCormick, voted to move the capitol from Prescott to Tucson, in exchange for the Pima County vote for McCormick as delegate to Congress. The first census of the Territory in 1866 showed a total population, exclusive of Indians, of 5,526, distributed as follows: Pima County 2,115, Yavapai County 1612, Yuma County 810, Mohave County 448, and Pah-Ute County, (most of which was later transferred to Nevada) 541.

In the years 1866 and 1867 the first surveys were made through the Territory for possible transcontinental railroad routes, and the two routes, one following the 35th and the second following the 32nd parallels of latitude, were found to be the most feasible. Legislation was introduced in Congress in 1867 authorizing the construction of the Atlantic and Pacific Railroad, following the northern route land grants were made, and public subscription of stock in the company was offered. The road was not completed, however, until 1882. After the removal of the capitol to Tucson, McCormick used all his influence in Congress to speed the construction of the second or southern route.

At this time the only commercial activity in Southeastern Arizona was in supplying contracts to the Military. The excessive costs of transportation encouraged agriculture and cattle raising to supply these contracts. This part of the Territory literally lived off the pay roll of the Army and federal employees. The moving of the capitol was therefore a big stimulus to Tucson and the surrounding country. No mining activity started at this time due to the Apaches against whom the feeling of bitterness constantly increased. By the year 1871

the trails to their mountain fortresses had nearly all been discovered. The advantage in the warfare from then on lay with the settlers and troops. In that year, 1871, Congress authorized a Peace Commission to negotiate terms with the Apaches in New Mexico and Arizona, headed by Vincent Colyer as Commissioner. Ample powers were given him to establish reservations, and to enlist the full support of the army in the enforcement of whatever terms were made. The local feeling in the two territories was extremely bitter. The majority of the population approved of nothing short of the utter extermination of the Indians and had little faith in the feasibility of keeping them within the bounds of reservations. Colyer in 1871 and 1872 made a thorough and impartial survey of the situation, established reservations and induced over half of the Apaches to enter them and to agree to remain there. Unfortunately two of the most able of the Apache chiefs, Cochise and Geronimo, refused to make peace, and they were able to keep their followers almost half of the tribes, on the war-path. The federal government also wisely chose a splendid type of man to head the Arizona division of the Army in General Crook, who replaced General Stoneman in 1871. A policy of diplomatic treaties with the different Indian chiefs was inaugurated by him, coupled with stern and rapid punishment of those breaking the pacts which were kept by the Americans for the first time since the trouble. A beginning of law and order was made in 1872, resulting in the first renewal of prospecting in Southeastern Arizona since 1860. The old silver properties in the Santa Rita, Patagonia, and Cerro Colorado Mountains were relocated, but little work was done. The first new discovery of note in South Central Arizona was that of the Silver King

Mine, near the present town of Superior, in 1872. This was followed in 1873 by the discovery of the rich gold placers of Greaterville south of Tucson in the Santa Rita Mountains.

Late History

The result of the discovery of these two new deposits and the reports of high grade copper ore ar various points greatly speeded the interest of the Southern Pacific Company of California in its projected construction of a railroad to connect Los Angeles with El Paso. By 1873 the line was completed into Arizona City (Yuma) and by 1876 it had been extended to Casa Grande. Right-of-way difficulties prevented further building and for four years Casa Grande was the eastern terminus of the road. Prospecting was still further increased, and in the next three years rich copper deposits were located at Bisbee, Silver Bell, Helvetia, Twin Buttes and Globe, the bonanza silver deposits of Tombstone, Hermosa and Total Wreck were discovered and the old Olive Camp deposits were relocated. In 1877 the surrender of Geronimo and the death of Cochise marked the end of serious Indian warfare, although complete peace was not established until about 1884.

The Southern Pacific completed construction into Tucson in 1880, and by the end of 1881 the line was completed into El Paso. For the next four years a mining boom took place in Southern Arizona chiefly in the start of exploitation of the copper deposits of Silver Bell, Helvetia, Rosemont and Twin Buttes in what is now Pima County, in the development of the deposits at Bisbee in what is now Cochise County, and at Globe in what is now Gila County. During the boom the silver deposits of Quijotoa were discovered and the Total Wreck and San Savier Mines were equipped and actively worked. Copper was then

commanding a price of from 16 1/2 to 21 1/2 cents a pound, and silver was worth $1.13 an ounce. A good start was made in all the camps, smelters and mills were erected, and a bright future was apparently in store. The end came in 1884 in the financial depression of that year. Copper started to drop, and by the end of the year had reached a low of 10 cents. The average price in 1885 was 10.8 cents, and all the copper mines in Pima County closed down. The old silver deposits did not prove economical under modern high labor conditions, and the new bonanzas at Quijotoa and Total Wreck were rapidly bottomed. By 1886 mining in Pima County was again nearly at a standstill. The lead-silver deposits of the Sierrita Mountains at Olive Camp were worked in a small way by lessees, and the Greaterville placers were active on a much reduced scale. The demonetization of silver in 1893 still further depressed the situation, and almost all mining ceased in Pima County.

It was not until 1894 that the rapidly expanding use of electric lighting, telephone, telegraph and electric power lines began to be felt in an increased demand for copper. Due to the depression of 1893 prices did not immediately respond, but a feeling of confidence in the future of copper resulted in a general speeding up of the older mines and in an active search for new ores. The first camps to respond in Pima County were Helvetia and Rosemont in the Santa Rita Mountains south of Tucson, and the Silverbell deposits northwest. These were followed soon after by the exploitation of the Sierrita deposits at Azurita (Mineral Hill) and Twin Buttes, and the Camp Apache deposits in the Catalinas.

All of these deposits had reached the production stage by the

beginning of the twentieth century except the Catalina Mountain deposits, which were never able to overcome their handicap of high transportation costs. They all furnished their quotas of copper during the World War but were practically exhausted by the end of the War.

Eastern Pima County, by the end of 1929, found itself without ore deposits of any size except, those in the Catalina Mountains possibly, and these will have to remain in reserve until such a time as the price of copper will justify their exploitation. The eastern end of the county - that is, all of the county with the exception of Ajo and Gunsight - has produced up to the end of 1929 approximately 157,000,000 pounds of copper, 26,400,000 pounds of lead, 3,000,000 pounds of zinc, 3,500,000 ounces of silver and 48,000 ounces of gold with a gross value of approximately $30,900,000.

In the following paragraphs historical sketches of the individual camps are given:

Helvetia-Rosemont

It is probable that the copper outcrops of these two districts, on either side of the main ridge of the Santa Rita Mountains at their northern end, were discovered at a very early date. No mention, however, is made of them by the early explorers before the Civil War. It is highly probable that, if found, they would not have been deemed of sufficient importance to note, as only those copper ores high in precious metal value were possible to exploit under the conditions then extant.

The first locations in the district were made in the late seventies after it had become certain that the Southern Pacific Railroad was to be completed. Locations were made on the principal outcrops at both Helvetia and Rosemont.

The first work was done on the Helvetia side on a group of claims owned by Tully, Ochoa and Company, F. C. Hughes, and T. S. Jefferds of Tucson. These gentlemen organized the Omega Copper Company in 1881, and enlisted working capital in Philadelphia. F. C. Hughes was retained as superintendent, and work commenced in 1882 after the completion of the railroad. After developing a considerable tonnage of high grade oxidized ore, a small blast furnace was erected at the mine in 1883 which was blown in in April of that year. The smelter was operated six months, when all work was stopped by litigation instituted by the Philadelphia stockholders.

A second venture known as the Columbia Copper Company was started about the same time on the Helvetia side. This company also built a small blast furnace in 1882, but closed down early in 1883 due to the drop in the price of copper.

Practically no further work was done other than intermittent assessment work for ten years when, in 1894, L. J. Rose, the owner of the Chicago claims on the Rosemont side, organized The Rosemont Copper Company, and erected a 50-ton blast furnace and started production. The furnace was operated intermittently about two years, when in 1896 the Lewisohn Brothers of New York entered the district and purchased the Chicago and other claims of the Rosemont Copper Company on the Rosemont side and the Mohawk group on the Helvetia side. The smelter built by Rose was operated intermittently in the next four years and was then abandoned.

The first work on an ambitious scale was started in 1899 by the Helvetia Copper Company, organized by Paine Webber and Company to acquire and operate a group of 27 claims in Helvetia, owned by J. B.

Seeger, F. Fellows and James R. Copper. A 200-ton blast furnace was built and completed in September of that year. The mine superintendent for this venture was J. R. Cooper, former owner of the principal mine of the group, the Old Dick. When running at maximum capacity, 250 men were employed. This company laid plans to build a railroad to the property by way of the Sierritas and Rosemont, but financial difficulties prevented consummation of the plans and all work ceased in December 1901 after a production of over two million pounds of copper.

For two years the two camps were inactive. Finally in December 1903 a block of stock of the Helvetia Copper Company was sold to a company known as the Michigan and Arizona Development Company. This company transferred the principal work from the Old Dick to the Isle Royal and Copper World Mines and, about a year after development work, built a new 150-ton blast furnace to treat the large sulphide ore-body developed at the Copper World Mine. Matte from the furnace was shipped to various reduction works by way of Vail. After the construction of the smelter, a further block of stock in the Helvetia Copper Company was purchased and the Helvetia Copper Company was reorganized. The furnace was not a financial success, and in 1907 was closed down, and the low grade massive sulphide ore remaining was shipped to the Old Dominion smelter at Globe, then badly in need of sulphide ore flux. Operations continued on this basis until April 1911 when, on the exhaustion of the ore body, all operations ceased and the equipment was sold.

During the operating life of the Helvetia Copper Company, a second smaller venture known as the Tip Top Copper Company, or Little Helvetia

Company, was launched in Helvetia, the stock for which was largely held in Tucson. This company started operations in September 1904, and shipped intermittently to El Paso until the 1907 panic, when the property was closed. Work was recommenced in 1912 and continued for a short time only.

The largest single producer, the Narragansett Mine, between Rosemont and Helvetia, was discovered and located by J. K. Brown in the first period of activity in 1879. He continued slowly to develop the high-grade oxidized ore at the property for over thirty years, and made only small shipments during this period. On the advance in the price of copper in the early years of the World War, he started active production, which was kept up until 1917 when the property was sold to the Narragansett Copper Company, financed chiefly in Tucson by W. R. Ransdell. The company operated the mine for three years and shipped a considerable tonnage by way of Vail to various reduction works. In 1919 the mine was acquired by Albert Steinfeld and Company of Tucson on a judgement for $300,000 loaned on notes. Small shipments were continued until the financial depression of 1921, since which time the property has been idle. The mine is reported* to have produced in the period 1915 to 1918 over 34,000 tons of 7 percent ore yielding a net smelter return of $835,860.

A second group operated during the high copper market of the World War was the Rosemont group owned by the Lewisohn Brothers. Operations commenced in 1915, and in 1919 the property was leased to a Tucson company known as the Daylight Mining Company. This

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*The Mines Handbook, 1922, p. 346.

company made small regular shipments of sulphide ore until the 1921 depression when all work ceased.

Since 1922 the two camps have been virtually idle except for small intermittent shipments made by lessees.

The district has produced about 15,460,000 pounds of copper, a small amount of lead and zinc, and a little molybdenum ore with a total gross value of approximately $3,350,000. Details are found in the appendix.

Silverbell District

The existence of the Silverbell Copper deposits, like that of the Helvetia-Rosemont deposits, probably was known to the earliest explorers, but as the outcrops contained little gold or silver, nothing was heard of them until the certainty of rail transportation made the exploitation of copper ores possible. The first locations were made in the middle seventies on the Old Boot, Blue Coat, Mammoth, and other claims. The first reported work in the camp was done in 1873 by C. O. Brown of Tucson on the Mammoth lode. He was financed by Tully, Ochoa and Company, and E. N. Pearce. The ore developed contained native copper with good silver values.

The first serious attempt at exploitation was in 1881, after the completion of the Southern Pacific Railroad. In that year the Huachuca Mining and Smelting Company was organized to mine and treat the rich oxidized ore of the Old Boot, Mammoth, and Blue Coat claims. A thirty-ton water-jacket furnace was erected, which produced 250,000 pounds of black copper. The following year a new company was organized, known as the Pima County Mining and Smelting Company. A new furnace of the Swansea type, without water jackets, was erected by

H. M. Howe, and in 1882 this furnace produced at a maximum rate of four tons of black copper a day, and a total for the year of 961,500 pounds.

The success of the first venture encouraged others, and in 1882 three other companies were organized to develop the Evening Star, Scott, and Silver Bear groups. The only one to build a smelter was the company operating the Scott group. This smelter was built under the supervision of S. W. Rea, but it was never blown in, as the drop in the price of copper at the end of 1883 forced a general suspension of work in the camp. No further work was done for two years when, in 1885, a small production was made, at a loss, from the Old Boot.

The camp remained idle during the low copper prices of the succeeding five years. In 1891 Philips and Evanston of Sacramento, California, organized the Silverbell Mining Company, acquired control of the Old Boot group, and built a smelter at Tucson to treat the better grade ore. The smelter was operated for a few months, but was unable to make money due to the excessive transportation charges from Silverbell to Tucson. It was later used to treat copper ore from the Dragoon Mountains and still later was used to smelt lead ore from the Cañada del Oro in the Catalinas.

The camp again lapsed into idleness after 1891 for seven years until the revival of the copper market in the late nineties. In 1898 the old thirty-ton water-jacket smelter at Silverbell was repaired by a Tucson company controlled by Albert Steinfeld. The Old Boot and Mammoth Mines were reopened, and intermittent production of black copper was started at the rate of from two to three tons daily. After the enriched sulphide zone was reached, the smelter produced about

the same amount of 50 percent matte, which was shipped to reduction works in the east. The property was operated under the supervision of Carl Nielson for four years.

The camp did not reach its stride at any time in the early years due to its inaccessibility. The nearest railroad point was Red Rock on the Southern Pacific Railroad, twenty-two miles to the northeast, and the haul from Tucson, the nearest supply center, was about forty miles. High transportation costs did not permit the mining and smelting of any but the highest grade selected ore, which was nearly exhausted by the end of 1901.

The increased demand for copper in the boom period starting in 1902 turned the eyes of capitalists to all the older Arizona camps, and in that year, the Old Boot and adjoining claims were sold for $700,000 to a syndicate composed of B. B. Gage, N. O. Murphy, and the Development Company of America, represented by George A. Beaton. The Imperial Copper Company was organized, and W. F. Staunton was brought down from the company's Congress Mine to manage operations. A broad-gage railroad was built from Red Rock to the mine, two deep operating shafts were sunk on the Old Boot and Mammoth claims, and a large tonnage of rich sulphide ore was blocked out. The railroad was completed in June 1904, and production started at a rate of 100 tons a day, which was shipped to the Copper Queen smelter at Douglas, pending the completion of a smelter by the Imperial Copper Company. To finance the building of reduction works, the parent company organized the Southern Arizona Smelting Company in 1904 to build a custom smelter, near the mine. A site on the railroad twelve miles from Silverbell was chosen, christened Sasco, and a 300-ton concentrator was built by the

mining company at Silverbell while the smelter was being built, to treat a large tonnage of low-grade silicious sulphide ore on Imperial and adjoining El Tiro ground.

The success of the Imperial Copper Company stimulated other ventures in the district, chief of which were the Oxide Copper Company, organized to develop the Young American Group, first exploited in the early eighties; the Cleveland-Arizona Copper Company, later reorganized as the El Tiro Copper Company, to develop a group of claims adjoining the Imperial Copper Company ground on which there were indications of the "porphyry copper" type of dissiminated ore; and the Indiana Arizona Company, which acquired the old Abbie Waterman group, exploited in the early eighties as a silver mine.

The Sasco smelter was operated continuously for three years until August 1910, when it was closed to await developments at the mine. High grade ore reserves had been badly depleted, and development of El Tiro ground, then under option to the Imperial Copper Company by churn drilling was under way, but ore development had not kept up with production. The following year the financial collapse of the Development Company of America, caused by the heavy expenses at their Tombstone venture, forced suspension of all work, and the Imperial Copper Company, the Southern Arizona Smelting Company and the subsidiary railroad company were all forced into bankruptcy and passed into the hands of receivers.

For the succeeding five years the only activity in the camp was the intermittent development of the El Tiro Copper Company ground. The Imperial Copper Company receivers operated the Old Boot mine for a short time in 1914 but suspended operations after the outbreak of the

World War in August.

After the high copper prices of the War years had been established in 1916, the Imperial Copper Company and the Sasco Smelter were leased from the receivers by the American Smelting and Refining Company, for a period of five years. The smelter was reopened and repaired and was run on Silverbell and custom ore until February 1919, when it was closed and Silverbell ore was shipped to the company's smelter at Hayden until the expiration of the lease at the end of 1920.

The El Tiro Copper Company developed its ground energetically for the first two years from 1906 to 1908, and built an experimental 50-ton concentrator, later enlarged to 100 tons a day. In 1907 the ground was optioned to the Imperial Copper Company, and was developed by churn drilling, which proved a considerable tonnage of low grade disseminated mixed oxide and enriched sulphide ore. Some production was made by the Imperial Copper Company, but on the close of the camp in 1911, very little was done. The company was heavily bonded, and in 1919, was forced into the hands of receivers and was sold to a bondholders' protective committee. The mine was immediately leased to Percy Williams, formerly mine superintendent for the Imperial Copper Company, who enlisted support from the Calumet and Arizona Mining Company of Bisbee. The El Tiro Leasing Company was organized, and production of ore was started which was shipped as flux to the C. and A. Company's smelter at Douglas. Shipments were continued, except during the 1921 shut-down, until early in 1925 when the lease was surrendered. The property was then bonded to a reorganization of the leasing company known as the Western American Mines Company. Stoping continued and the ore was shipped to the Hayden Smelter at a

Maximum rate for about eighteen months, when the bond was relinquished.

Percy Williams then obtained a lease on the property, and shipped silicious flux ore to the Hayden Smelter for a year, when the property passed into the hands of the American Smelting and Refining Company.

During the operation of the Western America Mines Company the Imperial Copper Company ground was leased to the American Smelting and Refining Company. A small production was made for two years, then the property was purchased by that company. The following year the El Tiro ground was also optioned and in the succeeding years the combined properties were operated by the American Smelting and Refining Company under the management of Albert Kohler, and regular shipments were made to the company's smelters at Hayden and El Paso as siliceous flux until the depression of the copper market in 1931.

The district has been the largest producer in Eastern Pima County. It has produced to the end of 1929 a total of approximately 86,000,000 pounds of copper, 1,400,000 pounds of lead, and 800,000 ounces of silver with a gross value of about $16,000,000. Detailed figures are shown in the Appendix.

Sierrita Mountains Deposits

The first account extant of the deposits of the Sierrita Mountains is contained in the report by F. Biertu, metallurgist for the Mowry Silver Mines, in 1860, a year before the outbreak of the Civil War, and seven years after the Gadsden Purchase ceeded the southern part of Arizona to the United States. He reported: " ... Arizona Land and Mining Company ... this mine is situated north of the Rancho of Sopori. This company owns a large tract of land of thirty-two leagues square, on which is situated the Old Silver Mine of San Xavier, which

was worked during the time of the Jesuits, and which appears exceedingly rich; other veins equally rich are to be found in the center of the property, on the Sierra Tinaja* ..."

The reports by J. Ross Browne to the United States Government on the condition of the mines west of the Rocky Mountains in 1868, states that there was no mining in Pima County at that date due to the Apaches. In his list of important mines he includes the Olive, San Antonio and Sierrita Mines in the Sierritas. Another old mine mentioned in early reports was the Esperanza Mine, said to have been worked by the Spaniards before the Mexican Revolution. None of these properties were brought to the production stage by the American Land and Mining Company prior to the Civil War.

The districts, now known as the Pima and Papago districts were not touched after the general abandonment of all mining property in 1864, until the first truce with the Apaches was effected in 1872. Rossiter W. Raymond's report of 1874 on mining west of the Rocky Mountains stated that in 1873 a large group of Tucson people including Tully, Ochoa and Company, Sam Hughes, H. S. Stevens, A. Lazard, and Miguel Alvarez, relocated the Margarita, Montezuma, Esperanza and Plumosa Silver Mines of the Montezuma District thirty-five miles southwest of Tucson, and actively developed them during the year.

The discovery of the Greaterville or "Smith" placers in that year and the reopening of the Oro Blanco Gold district south of Arivaca drew away most of the men working in the Sierritas. The only property left working in 1875 was the large San Xavier silver-lead lode which was relocated and developed during the year.

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*The old name for the Sierrita Mountains. JBT.

No production was made in the district until after the completion of the railroad into Tucson in 1880. In that year the San Xavier Mine was purchased by Col. C. P. Sykes who organized the San Xavier Mining and Smelting Company. A twenty-ton blast furnace was built on the Santa Cruz River, nine miles south of Tucson to treat the ore. Locally burnt charcoal costing thirteen cents a bushel was used as fuel, and limestone quarried at the mine was used as flux. The smelter was designed and erected by John Williams of the engineering firm of Bisbee Williams and Company, the firm which helped promote the Copper Queen Mining Company of Bisbee. The smelter was not a financial success, and was abandoned after a short run. No further work was done for two years when, in 1882, Col. Sykes effected a reorganization known as the Santa Rita Lands and Mines Company. The mine was reopened and the rich lead-silver ore was shipped to outside reduction works.

After the abandonment of copper mining in 1884, for a period of nine years up to the demonetization of silver in 1893, the silver-lead mines of the Sierritas were worked intermittently by chloriders, who shipped the ore to reduction works in El Paso, Socorro, and Silver City. The records during this time are very sparse, but it is probable that about 16,000 tons of high grade sorted ore were shipped, with a gross value in silver and lead of close to $1,000,000. The principal mines worked during this period were the San Xavier, Olive, Matchless, Silver Blende, Fortune, Arizona Queen, Veta, Democrat, Banner, Santa Cruz, Patterson, Annie, Minor, Chloride and Celia. The lead smelters of those days paid very little for lead, and high smelting charges and freight rates were the rule, so that the net returns of the ore made few fortunes for the operators.

The copper deposits of Mineral Hill probably were known at a very early date, but no work was done until 1882 after the completion of the railroad, when the Emperor Copper Mining Company was reorganized to exploit them. This company started to develop the deposits and planned to erect a smelter, but abandoned all work in 1884 when the price of copper slumped.

No work was done in the Sierritas after the demonetization of silver in 1893 for four years, when, in 1897, the San Xavier Mine was reopened by L. H. Manning. A steam hoist was installed and for several months 20 tons a day was mined and shipped to the smelter at El Paso. No further work was done in the district until 1898, when the Azurita Copper and Gold Company was reorganized to develop the Mineral Hill group, last worked fourteen years previously by the Emperor Copper Mining Company. One of the active promoters of this venture was W. Morgan who remained as superintendent. A thirty-ton water-jacket furnace was built at the mine and production of black copper started in September 1898. This first venture lasted for only one year after production started. The mine remained idle for six years when, in 1905, it was acquired by the Mineral Hill Consolidated Copper Company. This company developed the mine for two years, but closed during the period of 1907. The mine remained idle until the high prices of 1916 when the old smelter was repaired and enlarged and production on an ambitious scale started. This was kept up on a diminishing scale for three years, when the mine was closed and has never been reopened.

The copper deposits of Twin Buttes were located in the seventies, but little work was done in the first period of copper mining in the early eighties. By the beginning of the twentieth century, the principal

owners were Baxter, Ellis, and Irish. In 1903 during the copper boom of this time, the Twin Buttes Mining and Smelting Company was organized by Milwaukee capitalists to take over the Twin Buttes Copper holdings. This company laid out an elaborate townsite, and actively developed the Senator Morgan, Minnie, and other mines of the group. After developing promising showings of ore in 1903, the company organized a subsidiary railroad company known as the Twin Buttes Railroad Company to build a 27-mile broadgage road from Tucson to Twin Buttes, up the Santa Cruz Valley to Sahuarita, and thence into the mountains to the mines. The railroad took three years to build. After its completion in July 1906, high grade ore was shipped to various reduction works but chiefly to the Sasco Smelter near Silverbell. After this smelter was closed in August 1910, the Pioneer Smelting Company was organized by New York capitalists to build a custom smelter to treat the ores of the surrounding districts. A smelter site was chosen at Sahuarita, and a 150-ton blast furnace was started in 1911, and completed early in 1912. The chief tonnage came from Twin Buttes. It was short-lived, and was closed after only one year's operation, after which ore from the mine was shipped to other reduction works for another year, when in 1914, the venture collapsed. That part of the railroad from Tucson to Sahuarita was purchased by the Southern Pacific Company, and formed the first link of their present line from Tucson to Nogales.

After the close of the Pioneer Smelter in 1913, the Senator Morgan Mine and, a year later, the Minnie Mine, were leased by the receivers of the company to G. G. Bush and Baxter, two of the original owners of the property. These two, in the next five years, during the greater part of which War prices for copper were realized, shipped a large tonnage

to the Copper Queen Smelter at Douglas. At the end of the lease, the Midland Copper Company was organized by the leasing company to acquire the assets of the Twin Buttes Mining and Smelting Company, including the railroad from Twin Buttes to Sahuarita. The Copper Queen Mine was operated by this company steadily, with the exception of the one year's close of the smelters in 1921, until the exhaustion of the better grade known ore at the end of 1926. During this eight-year production period dividend disbursement of $126,150 was made.

No further work was done at Twin Buttes for two years, when the Midland Copper Company was reorganized as the Buttes Mining Company. The Minnie Mine was reopened, and a small shipment of low grade sulphide ore was made during the high copper market of 1929, after which the mine was closed and abandoned.

The construction of the railroad from Tucson to Twin Buttes greatly stimulated mining throughout the Sierritas. The history of one of these ventures, the Mineral Hill Consolidated Copper Company, has already been given. A second copper venture was started in 1906 to develop a large group of claims southwest of Twin Buttes, on which there were indications of possible disseminated ore bodies of the "porphyry copper" type. This group, known as the Red Carbonate was optioned by the Calumet and Arizona Mining Company of Bisbee. For over a year this company did considerable underground development work, and tested a part of the ground by churn drilling. The results proving disappointing, the option was surrendered. At the commencement of the World War, a part of the group was leased to Alfred Paul of Douglas and for two years he mined a deposit of low grade silicious oxidized copper ore, which he shipped as flux to the smelters at Douglas. After

the exhaustion of this one ore body, work ceased.

The first mine to be reopened in the old Olive Camp silver-lead area was the Paymaster. A company known as the Paymaster Mining Company was organized in 1905 to work this and other old silver mines of the district. After two years of development, the company ceased operations.

In the year following the closing of the Paymaster, the Chesterfield Mining Company was organized to reopen the Esperanza and Annie silver-lead mines, but more especially the Esperanza, until the end of 1913, when the company went out of existence.

In 1907 shortly before the launching of the Chesterfield Company, the Swastika Copper and Silver Mining Company was organized to reopen the Pioneer and Alice Mines in Olive Camp. This venture lasted only one year. It was revived five years later by a company known as the Tucson Mining Company, which constructed a 100-ton mill to treat the ore of the Pioneer, Alice, Wedge and other old mines of Olive Camp. The life of this company was also very short.

The most ambitious venture launched was at the old San Xavier. This property was purchased in 1912 by the Empire Zinc Company, the Western subsidiary of the New Jersey Zinc Company. The mine was reopened, and shipments of lead-silver and oxidized zinc ore were started in 1913, which were continued throughout the War years and to the end of 1920 when the mine was closed.

On the west slope of the range there is a mineralized area independent of the others known as the Papago district. The Banner Mine, one of the early lead-silver deposits was worked by chloriders during the eighties. The ore was packed over the range to Olive camp.

The district remained dormant until 1918 when the Banner was re-

opened. A townsite was established, and considerable work was done. A small portable concentrating plant was installed in 1919, and a small production was made.

The Ramsdell Lead-Silver Mine, south of the Banner, was acquired in 1926 by Tucson interests. The mine was developed by open cut and shaft during the next three years, and a small gravity concentration plant was installed in 1929, and a few shipments of lead concentrates were made. The district labors under transportation difficulties, as ore has to be hauled around the range to Tucson, a distance of about forty miles.

The silver-lead area of the camp, centered at Olive Camp, remained dormant in the years following the World War until 1926, when the Helmet Peak Mining Company was organized to develop a deposit of low grade complex ore at Olive Camp. This company did considerable development work for three years, but never reached the production stage.

The Sierrita Mountains deposits have made a noteworthy contribution to the wealth of Eastern Pima County. The total has been approximately 36,000,000 pounds of copper, at least 18,000,000 pounds of lead, 2,300,000 pounds of zinc, and at least 1,400,000 ounces of silver with a gross value of at least $9,000,000.

Empire Mountains.

The lead-silver deposits of this range of hills northeast of the Santa Rita Mountains were not discovered until after the Civil War. The first location was made in 1879 by John Dillon on the Richmond lode. The following year, during the construction of the railroad from Tucson into Benson, the claim was relocated by Vail and Harvey as the Total Wreck.

The surface ore was very rich and extensive activity was reported throughout 1880. Operations were delayed in the following year by a lawsuit to determine the title to the claim. After the settlement of the suit in favor of N. H. Vail, the Empire Mining and Smelting Company was organized to develop and equip the mine. By February 1883 the plant was completed. The mine had been opened up by a 360-foot inclined shaft with levels at 50-foot intervals. A large hoist was installed, and a 20-stamp mill was built, six hundred feet from the mine, and connected to it by an aerial tramway. An ample water supply was issued by pumping from Cienega Creek through a six-inch pipe line 14,000 feet long against a head of 580 feet. The ore averaged $65 a ton in silver. Operations were extensive for the times as evidenced by the townsite which was described in the Tucson Weekly Star as being composed of five saloons, three general stores, a butcher shop, and a shoemaker's shop, and from eight to ten Chinese laundries. The mine was operated to the end of 1884 under the supervision of John O. Dougherty with a production of about a half a million dollars in silver bullion. After its close, it was bought by the original owners, Vail and Harvey, at a delinquent tax sale.

For twenty years after the close of the Total Wreck, the camp remained virtually dormant other than for intermittent small shipments from the Total Wreck and other mines from assessment work. In the early years of the World War, the Arizona Rare Metals Company was organized in Tucson to mine wulfenite lead molybdate for delivery to Eastern steel manufacturers. The Total Wreck Mine was leased by this company in 1917 and a mill was built to make wulfenite concentrates. Production continued to the end of 1918, when the lease was surrendered.

The last large operation at the mine was in 1926 when the old mill tailing pile was leased and over 1000 tons of low grade material was shipped as flux.

In the first years of the district's development in the late seventies, lead-silver deposits were discovered in the mountains fifteen miles southwest of the Total Wreck. As these deposits were comparatively low in silver content, little work was done on them at that time. Production did not start until the high metal prices of the War years. Small shipments were made in 1915 and 1916 from the Andrade, Copper Point, Verde Queen, Jerome no. 2, and State of Maine, and in 1917 the Forty Nine Mine was quite extensively developed, and ore was shipped by the owner steadily to El Paso until June 1924. It was then bonded to the St. Louis Smelting and Refining Company. This company continued shipments to the end of the year, and surrendered the option.

The Lone Mountain Mine adjoining the Forty Nine Mine was opened up by Hilton, the owner, 1924 and he shipped high grade lead carbonate ore for three years when in 1927 it was optioned to the Calumet and Arizona Mining Company of Bisbee. This company established a camp at the mine and in the next two years did a considerable amount of development work on the Lone Mountain and adjoining claims, but surrendered the option at the end of the campaign.

The camp continued to ship ore to various reduction works until the depression of 1931 when all work ceased.

The production from the Empire Mountains from the start of operations in 1880 to the end of 1929 has been approximately $1,000,000, chiefly in silver and lead. Details are shown in the Appendix.

Cerro Colorado and Arivaca Districts

The old Cerro Colorado Mine, later called the Heintzelman Mine, was worked in a small way by the Spaniards before the Mexican Revolution. It had been long abandoned at the time of the United States occupation of the Territory in 1853.

Soon after the establishment of the international line by the joint Boundary Commission in 1854, troops were sent as a protection against Apaches, and a fort was established near what is now Patagonia, and a garrison was kept at Tucson. The old stories of the Planches de la Plata and other tales of rich mineral soon attracted American adventurers, and in 1856, C. D. Poston who had accompanied an expedition in 1855, was able to organize several large exploration companies to acquire and operate mines. The largest of these was the Sonora Exploring and Mining Company financed by New York, Cincinnati and Providence capital. Several army officers were heavily interested financially, more notably Major Heintzelman of Fort Yuma, Col. Colt, and Lieutenant Sylvester Mowry, a retired officer, who later purchased the Patagonia Mine. The first and principal mine acquired was the old Cerro Colorado, which was re-christened the Heintzelman Mine, fifteen miles northwest of the old settlement of Tubac. The company repaired the old buildings in Tubac, which at that time had been for some time abandoned by the Mexicans, fortified it against Apache raids, and used it as company headquarters. During the first year of operation, a small adobe furnace was built at the mine, where a fortified hacienda was built, and part of the rich carefully sorted ore was smelted and a part was hauled to Guaymas and from there shipped to Europe for treatment. This did not prove profitable, and in 1858, Arivaca was chosen

as the site for more ambitious reduction works. Guido Kustel was employed to design and install the plant. A large fortified hacienda was established at Arivaca and a plant using the European Barrel-Amalgamation process was erected. The machinery was hauled by the Butterfield stage line from St. Louis to Tucson, and was from there hauled to Arivaca by ox teams. A detailed description of the plant was given by Pumpelly as follows: "The reduction works are on the Arivaca Ranch, eight miles from the mine. The process used is the European barrel amalgamation for argentiferous copper ores, and was introduced by Kustel in 1858 or 1859. The extent of the works is small. The capacity is 1 1/2 tons a day. The plant consists of six dry stamps, a steam arrastred. The slime is sifted and pounded after drying. 500 pounds of ore was mixed with 8 to 10 percent of salt and the charge is subjected to a chloridizing roast of four hours. A half hour before a drawing, two percent of unburnt limestone is added to reduce the bichloride of copper to protochloride. Six roastings are made each twenty-four hours. The barrels are charged with 1000 pounds of roasted ore, 100 pounds of metallic copper, and 144 pounds of water, and are revolved two hours, when 500 pounds of mercury is added. The charge is then revolved twenty-four hours more. The amalgam is then recovered, retorted, and the silver melted with boras and cast into bars of 990 to 998 fineness, and used as local currency."*

Sam F. Butterworth, who examined the mine for the owners in the winter of 1863-4, reported: "The principal ore in the depth is silver-copper glance-containing and average of 6 percent of silver; this is

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*Pumpelly, Raphael. "Mineralogical Sketch of Arizona," Address before the California Academy of Natural Sciences, Aug. 5, 1861.

accompanied by argentiferous grey copper which averages 2 percent of silver. These minerals are very unequally distributed through the quartz; their presence in greater or less quantity determines the value of the ore; at the present level (the 132 foot level) they constitute about 7 percent of the ore fit for reduction, making its value about $120 per ton; at a higher level the ore contained fully 30 percent of these minerals."

As is seen from these current descriptions of the mine and plant, the mine was not a large one as judged by modern standards. The production was quite small in spite of the high grade of the ore treated. The mine was run until early in 1861 when the withdrawal of the U. S. troops on the outbreak of the Civil War forced a complete abandonment of the mine and works. An attempt was made to reopen the property in 1863 and 1864 but during the time of abandonment, Mexican gambucinos and Apaches had wrecked the mine and reduction works beyond repair. The total production up to six or seven months of the property's close was reported by Colonel Talcott, the secretary of the company to the owners the 1st of July 1860, as follows:

	Pounds
Sold and taken by purchasers to Sonora	3,880
Sent by the company to San Francisco	44,037
Sent by the company to Cincinnati	1,400
Smelted by the company	18,991
Reduced by amalgamation at the Arivaca works of the company	586,700
Total sold and reduced	(327.5 tons)
Remaining at Cerro Colorado	129,500
On hand at Arivaca	443,700
Total ore on hand	573,200
Total product of mine	1,228,208 (614.1 tons)

The 655,008 pounds sold and reduced yielded the company $45,010.28.

Allowing for the ore on hand $90 per ton the value should be $25,794.00.

Assuming that all the ore on hand was treated in the next six or seven months, the total gross yield of the mine was only a little over $70,000.

Considerable ore was stolen by Mexican gambucinos during the eleven years of chaos after 1861, but it is doubtful if much ore was taken, as the Apache was a more bitter enemy of the Mexican than of the American. Making the most liberal allowances for ore stolen, the total gross production was probably not over $150,000.

Little work other than by Mexican gambucinos was done in the district until the late seventies when the upper levels of the old mine were reopened and new reduction works were built at Arivaca. Extensions of the vein were located, more notably the Tucson Mine. Most of the locations were acquired in 1880 by a company known as the Consolidated Arizona Mine and Milling Company, which built an amalgamation mill composed of twenty-five 900-pound stamps at Arivaca to treat the ores of the district. This plant continued in operation to the end of 1884, with a production in the neighborhood of $150,000.

The district remained quiescent for four years when, in 1888, a San Francisco Company under the management of George W. Saunders pumped the water from the old Cerro Colorado, repaired the old workings, sampled them, did some development work and closed the mine. The vein proved too small to work under modern conditions.

The mines of the district were dormant for twelve years when Col. Wemple in 1900 acquired title to the old Liberty Mine, said to have

produced $500,000 during the operation of the Consolidated Arizona Arivaca Mill in the early eighties.

The mine was reopened and a few shipments were made of ore returning $32 a ton in lead, silver, and copper.

From 1900 to 1929 the district has produced a little ore each year, most of which was shipped to various smelters. The aggragate production has been small. Two of the most successful of the later mines were the Mary E. and Oreona which shipped a small tonnage of high grade oxidized lead-silver-copper ore. In 1923 the Old Cerro Colorado Mine was operated by lessees, and over 200 tons were reported* as shipped of ore returning from 8 to 217 ounces of silver and from 1 to 5.5 percent copper.

The total production of the Cerro Colorado and Arivaca districts has not been over $330,000 from 1856 to 1929. Details are shown in the Appendix.

Papago Country (Sells, Covered Wells, Combabis, etc.)

The desert ranges of the Papago country west and northwest of the Baboquivari Mountains were prospected very early by the Indian converts of the Jesuit and Franciscan Padres. Considerable gold placering was done, and one silver mine known as the Cahuabi or Picacho was worked in a small way.

After the United States occupation in 1854, the Cahuabi Silver Mine was purchased by Herman Ehrenberg, mining engineer for the Sonora Exploring and Mining Company. Little work was done until 1863 when the mine was leased to Mexicans, who in the succeeding two years are reported**

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*U. S. Bureau of Mines. Mineral Resources of the United States, 1923, pt. 1 (Metals) p. 537.

**U. S. Treasury Dept. Report of J. Ross Browne on the Mineral Resources of the States and Territories West of the Rocky Mountains, 1868.

to have mined and treated by the patio method, the rich outcropping ore with a net return of about $40,000. On the withdrawal of the California troops in 1864, the mine was abandoned.

No further work was done in this large area until 1883 when rich outcrops of silver ore were discovered in the Quijotoa Mountains by Albert Weldon, J. A. Roark and Alex McKay. The finds were extensively advertised, and in the same year were sold to a syndicate of San Francisco capitalists who had made their fortunes in the Comstock. The principals were Mackey, Flood, and Flower. Four mining companies, the Peer, Peerless, Crocker, and Weldon, were organized to develop the veins. In the succeeding two years the camp was very active. To develop an ample water supply, a 1000-foot well was sunk in the valley east of the mines, a pumping plant and pipe-line were installed, and a hundred-stamp mill was constructed out of the Consolidated Virginia Mill (80 stamps) and the Hershaw Mill (20 stamps). A three-quarter-mile tramway was erected to connect the mines and mill. The stamps commenced to drop in June 1885, and the mill was run six months with a production in silver of $108,984. Development continued at the mines after the closing of the mill, but results were very disappointing. The high surface values proved to be universally superficial. The only further production was in 1887 of $85,000 from the Locomotive Mine, and in the winter of 1891-2 when 20 stamps of the mill were started up to treat an accumulation of medium grade ore from five years of development work. About $15,000 was cleaned up. The mines were worked on a reduced scale until the demonetization of silver in 1893 when they were closed and abandoned.

During the first years of excitement in the Quijotoas, placer

gold was discovered at the north end of the mountains. The richest deposit was found in Horseshoe basin. The production from this field is un-recorded but was probably not very great as all the gold was recovered by dry methods from gravels, most of which were consolidated and required breaking to free the gold. Blake reported to the Governor of the Territory in 1899 that the field was then being worked by Papagoes who realized between $6,000 and $7,000 a year. There was reported as produced from the Quijotoa placers a total of about $29,000 from 1903 to 1912, but no production has been reported since. The best ground in Horseshoe Basin is now held by a company who keep a caretaker on the property. The total production from 1883 to 1912 probably has been not over $150,000.

Except for intermittent placer production by the Indians in various dry arroyos, little work was done in the Papago country until 1922, when a vein carrying copper and silver values in the Cababi Hills northwest of Sells was located as the Little Mary. The Como Pina Mining Company was organized by Carl Erichson to exploit the deposit. A few small shipments were made from 1923 to 1939, but the values proved superficial and the work was discontinued.

The production from the Papago country from 1860 to 1929 inclusive has been approximately $468,000 mostly in gold and silver. Details are shown in the Appendix.

Greaterville

The history of this district in the north central part of the Santa Rita Mountains is almost wholly that of the gold placers. Some lode mining has been done but comparatively little production has resulted.

The placers were discovered in 1873 by David Burroughs and Arden. They were known at first as the "Smith diggings." Some large nuggets were found, and the field held the center of attraction for several years after its discovery. For three years the field was worked by several hundred men, but by 1876 the best ground had been exhausted. P. J. Coyne reported to Burchard, Director of the Mint in 1883, that about $250,000 was the approximate yield from 1873 to 1875, but that in 1883 the yearly yield had dropped from 18,000 to $12,000. Coyne's estimate of the total produced through 1884 was $500,000. Small scale work by individuals continued until 1900 when a company was organized by Stetson of San Jose, California, to work the ground of Kentucky Gulch on a large scale by hydraulic methods. Wells were sunk but insufficient water was developed. Stetson continued his investigations of the field, and in 1904 he and McAvery of San Jose reorganized the company as the Santa Rita Water and Mining Company to work the same ground. Impounding dams were built in Gardner and South Canyons, and several miles of pipe line were laid looking towards hydraulic operations. The work was never consummated due to the death of both Stetson and McAvery in 1905.

Since 1905 several companies have attempted to work different parts of the field by various methods. One company tried a steam shovel, two companies used drag-lines, and one company installed a dredge. All were failures due to the development of insufficient water and to poor sampling, of the ground.

A small production of from several hundred dollars up to over a thousand dollars a year continues to be made by Mexican and American miners who sink shallow pits, gopher the pay gravels, and save the gold in rockers.

After the discovery of the placers, a search was made for lodes. Several were located in the early years, more notably the Anderson or Conglomerate, Enzenberg or Mountain King, and the St. Louis. Very little production was made from them. Some rich pockets were mined, but principal work was done at the Conglomerate Mine two miles southwest of Greaterville. This mine is to the south of the placer area, and the ore occurs as pockets of lead, silver-gold ore in limestone and adjacent granite. The property was acquired in 1923 by Reese of Bisbee, who developed the mine for a year and in 1925 shipped over $8,000 of rich lead-silver ore. The mine was bonded to the Midland Copper Company of Twin Buttes in 1926, who deepened the shaft, drove several hundred feet of drifts, and relinquished the bond at the end of the work. A small tonnage was shipped by Reese in 1927, and at the end of the year the mine was bonded to the Phelps Dodge Corporation. This company shipped a small tonnage of ore in 1928, and relinquished the bond. The mine was then turned over to lessees who continued to ship ore in the succeeding two years.

During the high metal prices of 1929, the St. Louis Mine, which had been slowly developed for years, was reopened and a small tonnage of copper-lead ore was shipped to the Phelps Dodge Lead Smelter at Douglas. The Greaterville district has produced approximately $710,000 from the discovery of the placers in 1873 through 1929. Of this total, approximately $680,000 has been derived from the placers. Details are shown in the Appendix.

Tucson Mountains

This range to the west of Tucson contains numerous small deposits of various metals, which were worked in a crude way by the Spaniards

and Mexicans prior to the occupation by the United States, and a small output has been made by Americans since then. None of the deposits have developed into large mines. The first mine location recorded in the Territory of Arizona was that of the Naquilla Lode in this district in the pre-Civil War period.

No work was done during the Apache disturbances after the Civil War until after the completion of the railroad, when the Buena Vista Silver Mine was operated up to 1883.

The district remained quiescent until the early nineties when the Saginaw Mining Company was organized. A mill consisting of three Huntingtons and six concentrating tables was erected together with a small smelter in 1898, but very little production was made, and the company went out of existence.

Nothing further was done until 1907, when the Pioneer Smelting Company at Sasco optioned the Gould Copper Mine. The mine was developed and low grade sulphide ore was hauled to Sahuarita in tractors. After the close of the smelter in 1908, the mine was abandoned.

There is very little further activity in the district until 1914, when the Amole Copper Company ground was optioned by the Calumet and Arizona Mining Company of Bisbee. Five diamond drill holes were drilled to test the ground but the values proved too low grade to be commercial and the option was surrendered.

One of the best known mines of the district is the Old Yuma Lead-silver Mine. This was worked at an early date, but no records are at hand. In 1916 it was reopened by the Arizona Rare Metals Company of Tucson. A concentrator was built to produce lead and wulfenite (lead molydate) concentrates. Several cars were shipped during the year,

but the venture was not profitable and the mine and plant were closed. It was reopened eight years later in 1924 by the International Ore Separation Company. The mill was reconditioned and over 500 tons of ore and concentrates were shipped to a lead smelter. In the following year, the mine was operated by the Reilly Mines Company and about three cars of copper ore were shipped during the year. The property was then closed and has not been reopened.

During the high copper market of the World War, the Mile Wide Mine was developed by a 400-foot inclined shaft, and in 1917 and 1918 low grade copper ore was hauled to Tucson and shipped to the Sasco Smelter. The property was then abandoned. It was again opened in 1927 and several hundred feet of development work was done, after which it was again closed.

During the post-War boom in 1919, the Arizona Tucson Copper Company was organized to develop the Ivy May group of claims. Considerable work was done in the next five years and a small tonnage of oxidized copper ore was produced from development work and stoping, after which the property was abandoned.

Very little has been done since 1927. A few small lots of lead-silver ore have been mined from several prospects in the districts, most of which was handled through the Tucson Chamber of Mines.

The district has a recorded production of about $150,000. Details are shown in the Appendix.

Baboquivari Mountains

The first record of work in this prominent range of mountains southwest of Tucson was in 1898, when William Blake reported that the Allison Mine had that year been developed by a 100-foot shaft with

rich gold ore showing at the bottom. He reported that a small production of rich gold ore was made from sorted ore, and that the cullings were said to assay $30 a ton. The rich outcropping ore proved to be superficial and no further work was done until 1923 when a crosscut tunnel was driven under the old shaft, and a rich ore body was cut. The Allison Mining Company was organized in the following year, and a four-stamp mill was erected. A small intermittent production of gold bullion was made in the next two years, and in 1926 the mine was optioned by the Tom Reed Gold Mining Company of Oatman. The mine was further developed and a 6000 ton ore body of $30 gold ore was blocked out. The richer parts of this body were stoped and milled, but the ore proved to be very refractory due to its high manganese content, and the property was closed in 1927. It was reopened in 1930 and considerable development work was done, but all work ceased in 1931.

The only other development in the district was from 1911 to 1917, when a small production of gold-copper ore was made from the Papago Chief, Gold Bullion and Little George prospects.

The district has produced about $140,000, chiefly from the Allison Mine.

CHAPTER 14

SANTA CRUZ COUNTY

Chapter 13 which dealt with the history of mining in Eastern Pima County, covered the subject in that county prior to the Civil War, and included, in the account, the activities in that part of the original county separated from Pima County in 1899 as Santa Cruz County. The later history of Pima County, in the same chapter, covered only that part of the county included within the present boundary of Pima County. In this chapter, a general review of the late history of Santa Cruz County is given, followed by detailed accounts of the more important centers.

After the withdrawal of the garrisons from Arizona at the start of the Civil War, only one camp, that of Mowry, was able successfully to withstand the pressure from the Apaches and Mexican renegades. The situation of the camp was ideal for defence, and it had been well fortified and equipped prior to the outbreak of the War. The owner of the property, Sylvester Mowry, remained at the mine. Enough silver bullion was produced to pay for the labor and local supplies necessary. The scale of operations was large for the day, but small as compared with modern standards. Mowry continued to work the mine until the arrival of the California Column under the command of General Carleton in 1862. For a short period before Carleton's arrival, Southern Arizona had been partly occupied by Texas Confederates, and Mowry was suspected as a Southern sympathizer, and was accused of having furnished lead from the mine for Confederate bullets. He was arrested in 1862 and the mine was

confiscated. Mowry was sent to Fort Yuma, where he remained six months but was then liberated without trial. The mine was operated by agents of Carleton until the withdrawal of the California Column in 1864. It was then returned to Mowry, but it had been so badly managed that it had become unprofitable without considerable further expenditures for reequipment. It was not reopened, and after a fruitless campaign by Mowry to interest capital in the venture, he died in London in 1871.

During the lawless years following the withdrawal of the California Column and up to the dawn of peace with the Apaches inaugurated by Vincent Colyer in 1872, the mines in what is now Santa Cruz County were completely abandoned.

The year following the work of the Peace Commission, early in 1873, Raymond* reported that the Mowry Mine was relocated by jumpers and that some work was done. Capital was supplied by merchants and army officers of Tucson. In the same year he reported that the Oro Blanco gold mine west of Nogales was located by Leatherwood, Hopkins, Hewitt and Marsh of Tucson, and that the mine was worked by lessees. By 1875, the Trench and Salero Mines had been relocated in the Santa Rita and Patagonia Mountains, and the Ostrich and Yellow Jacket Gold Mines north of the Oro Blanco Mine.

Little real work was done however at any of the mines until the completion of the Southern Pacific Railroad into Casa Grande in 1876. The following year the bonanza Hermosa Silver Mine was discovered in the Patagonia Mountains. This mine was purchased the

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*U. S. Treasury Dept. Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains. v. 7, 1874.

year after location by a New York company known as the Hermosa Mining Company. A large stamp mill was built and in less than two years about a million dollars in silver bullion was produced. The railroad had by then been completed to Tucson and in 1881 connections were made into El Paso.

The erection in 1882 of the Benson smelter very much stimulated the development of lead-silver mines in the Patagonia Mountains. During its short life from 1882 to 1886, the Flux, Hardshell, Mowry, Pride of the West or Washington, New York, Kansas, Blue Nose, and other smaller properties shipped considerable ore. On its close in 1886 nearly all production ceased.

In the Oro Blanco Mountains west of Nogales, several new discoveries were made in 1880, more notably the Montana Ledge. Several mills were built and were run when water was available. By 1887 the better ore from the oxidized zone had been largely exhausted, and nearly all activity ceased. The gold output from the discovery in 1873 to the end of 1886 is incompletely recorded. It was probably not over $700,000.

A spectacular venture in the Patagonia Mountains created considerable stir in 1880. The Holland Mine and adjacent claims were purchased by the Hon. H. J. Luttrell for sixty thousand dollars, and the Holland Smelting and Mining Company was organized. A smelter was built, but little production was made. The finances of the company were grossly mismanaged, and by July 1881 all work ceased.

The Patagonia and Santa Rita Mountain districts were much stimulated on the completion of the Mexico and Arizona Railroad from Guaymas, Mexico to Fairbank in 1884, which allowed the lead-silver

mines to ship their ore, at first to the Benson smelter and after its close, to various reduction works in Texas and New Mexico.

Several small smelters were built at or near Patagonia at various periods. The first was built by the Nogales and Sonora Mining and Smelting Company near Nogales in 1886 to treat ore from Mexico. This venture lasted about two years. The second was built at Crittenden four miles north of Patagonia in 1888. Its life was less than a year. A third attempt was made in 1897 at Patagonia, but it also was not a financial success, and was short-lived.

The demonetization of silver in 1893 had a profound effect on the silver mines of Santa Cruz County as it did throughout the world. Its depressing effect was partly offset in the Patagonia and Santa Rita Mountains by the improved base-metal metallurgy and the consequent lowering of smelter rates, and concentration costs. The lead-silver mines have been worked intermittently since 1893 with varying success, more notably the Flux, Hardshell, Mowry, Holland, Belmont and World's Fair.

The largest operations in the area did not start however until the revival of copper prices in the late nineties allowed for the marketing of copper as an important bi-product or principal constituent of some of the mines. The first of these ventures was the Washington or Pride of the West Mine. This mine in the Patagonia Mountains was purchased early in 1899 by A. R. Wilfley, the inventor of the Wilfley concentrating table, and his associates in Denver. The ore, a complex mixture of the sulphides of copper, zinc, lead and iron in a heavy gangue of garnet, quartz and calcite, had been worked in the early years for the silver associated with

the lead. Wilfley erected a concentration plant to separate the three valuable base-metal sulphides and shipped the three concentrates separately to suitable reduction plants. The attempt was a success metallurgically and the mine and plant were operated a little over three years until a change in the character of the ore in depth forced suspension. The plant was purchased two years later by the Duquesne Mining and Reduction Company. This company, financed by the Westinghouse Electrical Company, had been gradually acquiring ground in the district since the eighties. Considerable development work had been done on several of the mines acquired, and some testing of the complex ores had been done, but little real production had been made. After the purchase of the reduction plant of the Pride of the West, the plant was used at first as a test plant and later as the main reduction plant for the ores from the Bonanza and Pride of the West Mines. Large-scale work commenced in 1913 and continued to the end of 1918 when the mines and plant were closed and the plant was dismantled and sold.

Santa Cruz County has produced only one major copper mine. This mine, the Three R Mine in the Patagonia Mountains was discovered in 1897 by R. R. Richardson, a pioneer operator of the district. Little work was done on the property until the organization of the Three R syndicate in 1909 by Richardson and his associates. In the succeeding three years the mine was extensively developed by tunnels and connecting raises and a large body of high grade chalcocite ore was blocked out. The mine was then bonded to N. L. Amster of Boston. In the succeeding two years over 30,000 tons of ore were shipped after which the bond was relinquished. The property was idle during the first year of the World War in 1915.

It was bonded the following year to the Harrison Brothers of Texas. A concentrator was erected at the mine, the water supply for which was furnished by a pumping plant on the Sonoita River. After two years of operation during which both concentrates and first-class ore were shipped, the bond was relinquished. The mine was sold at the end of 1919 to the Magma Copper Company. This company further developed the mine for a year, then closed it down and offered it for sale. The mine remained idle until the end of 1928 when it sold to the Three R Mines Company. This company, in 1929, reopened the property and shipped a small tonnage of ore from old pillars. Considerable development work was also done and a small flotation concentrator was built. After its completion in 1930 a small output of concentrates was made after which operations ceased due to the rapid fall in the price of copper.

A third copper venture, the Santo Nino, was not developed to any extent until 1926. It has produced a fair tonnage of copper sulphides and a small tonnage of high grade associated molybdenite.

In the Oro Blanco Mountains the gold mines, after the early period of activity, remained dormant until 1893 when the close of the silver mines of the state turned the attention of miners again to gold. Several of the old mines were reopened and new mills using the cyanide process were built. The most successful of these ventures were the Montana, Austerlitz, Yellow Jacket and Old Glory Mines. The boom in copper mining in 1902 finally attracted capital from these low grade gold properties, and the camp again lapsed into idleness.

At several of the larger veins in the Oro Blanco Mountains, the gold ore changes at shallow depth to zinc-lead-silver sulphides.

The largest of the deposits of this type is the Montana. The first attempt to treat the base ore was made in 1917 during the high zinc market of that year. Little work was done however until the mine was purchased in 1927 by the Eagle Picher Lead Company of Missouri. After assuring an ample supply of ore by development work, a large concentrator was constructed, and production of lead and zinc concentrates commenced and continued until the slump in metal prices in 1930.

The total production of the mines in what is now Santa Cruz County has been about 33,600,000 pounds of copper, 51,400,000 pounds of lead, 13,900,000 pounds of zinc, 5,000,000 ounces of silver, 60,000 ounces of gold, and 500,000 pounds of molybdenum sulphide with a gross value of about $16,000,000.

In the following paragraphs short sketches are given of the separate mining centers.

Patagonia Mountains. This range, the northern extension of the Sierra Santo Cruz of Mexico, is separated from the Santa Rita Mountains to the north by the valley of the Sonoita River.

Prior to the occupation of southern Arizona after the Gadsden Purchase by the United States in 1853, the principal silver deposits of this range of mountains had been found by Spanish and Mexican prospectors, chiefly the former. A start had been made during the Spanish regime at exploitation, but on the withdrawal of effective garrisons after the Mexican War of Independence in 1828, the Apaches soon dominated the mountains to such an extent that all mining ceased. The American prospector in 1853 found evidence of this early work in numerous shallow partly-caved shafts, tunnels and stopes, whose production and histories had been nearly forgotten since their

abandonment for over a generation.

Mowry Mine. The first important deposit to be rediscovered and located by Americans was the Patagonia Mine, on the eastern slopes of the range, five miles north of the international boundary. The mine was first located, or purchased from Mexican owners in the fall of 1858 by Colonel J. W. Douglass, Captain R. S. Ewell, Lieutenant J. N. Moore, Mr. Randal, Mr. Lord and Mr. Doss, most of whom were connected with the United States Army.

The old workings were reopened and conditioned and several crude furnaces were built for smelting the ore. Due to lack of capital, little real work was done, and in 1858 and 1859 two of the owners, Messrs. Lord and Doss, sold their interest to Mr. Brevoort, who assumed the management. He was also handicapped by lack of funds, and the venture under his management was a financial failure. After a year of disheartening work, the other owners sold their interest to Colonel H. T. Titus. In the spring of 1860 these two sold the mine to Lieutenant Sylvester Mowry, a wealthy retired officer of the United States Army who had entered the new territory three years before with the intent of investing his capital in mining. The price paid for the property was $25,000 including all equipment standing. Lieutenant Mowry changed the name of the mine to the Mowry and immediately sent for P. Biertu, a noted mining engineer and metallurgist of the period to design suitable smelting works for the property. He advised the expenditure of about $60,000 in new plant. The outbreak of the Civil War in the year following and the consequent withdrawal of all the troops may have prevented the complete consummation of the plans, as it became necessary to fortify the camp against Apaches and Mexican outlaws. Work, however, did not

not cease as at all other mines in the Territory, and Mowry himself remained at the property. Production on what was then considered a large scale was started. The ore consisted of silver-bearing galena in a basic gangue. The lead bars produced were at first shipped abroad for refining, only a certain number being refined at the plant, for the purpose of supplying silver to be used as currency to meet the payroll and local expenses. After the start of the Civil War more refining was done locally. Texas Confederate troops penetrated in their drive for California as far as Tucson in 1861, but withdrew early in 1862 on the advance of the California Column under General Carleton. On Carleton's arrival, he suspected Mowry of Southern sympathy, accused him of having supplied lead from the mine to the Confederates, arrested him, and in June confiscated the mine. Mowry was sent to Fort Yuma, but was never brought to trial and, after six months incarceration, was released. The mine, however, was not restored and was operated by Carleton's agent during the remainder of the War, and was not returned until after the withdrawal of the California troops in 1864. The administration of the mine during this time was bad. All blocked ore was mined, supplies were stolen and the reduction works were worn out. On return of the mine to Mowry, successful operation necessitated the expenditure of large sums in further development equipment and remodeled works. Mowry's resources were gone, and in the succeeding seven years he attempted unsuccessfully to raise the necessary capital, and died in London, a disappointed man in 1871. The mine in the meanwhile was completely abandoned. The production of the property in silver in the first period of operation from 1860 to 1864 is unrecorded. Mowry*

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*Mowry, Sylvester, Arizona and Sonora, Harper Brothers, N. Y., Third Edition, 1864.

claimed that with the twelve crude blast furnaces installed in 1860, followed by cupelling, he was able to make about $4,500 in silver a week or 3,3360 ounces at the prevailing price of $1.34. If it is assumed that the property was worked at half capacity from 1860 to 1862 and quarter capacity from 1862 to 1864, the total production was about 250,000 ounces of silver. As the ore treated was carefully sorted galena, even with the crude methods used, about twelve pounds of lead were obtained in the form of litharge for each ounce of silver, making a total production of about 3,000,000 pounds of lead. With silver at $1.34 an ounce and lead at five cents a pound, the gross production was probably about $335,000 in silver and $150,000 in lead, a total of about $485,000. Prior to the confiscation of the mine, the port of entry for supplies was Guaymas, Mexico, to which connections were made through Magdalena by a 230-mile wagonroad. Freight to San Francisco for incoming goods was five cents a pound in 1860 and had been reduced in 1862 to less than four cents. Outgoing ore or bullion shipments from the mine took a rate of two cents a pound. Peon labor at the mine cost about fifty cents a day, and was paid chiefly in goods supplied by the large company store. About seventy men were employed, and the camp was the trading center for most of the surrounding territory on both sides of the border. After the withdrawal of Carleton's troops in 1864, and up to the first partial truce with the Apaches in 1872, practically no mining was done in the Patagonia Mountains. On the dawn of peace with the Apaches in 1872, prospectors again entered from Tucson, grub-staked by local merchants and army officers. The Mowry was relocated by claim jumpers, and was worked in a small way by Dr. Bennett. Its inaccessibility proved too great, however, and

aside from a little ore shipped to the Silver King to help smelt the high silver ore of that bonanza, little production was made.

After the completion of the railroad through Patagonia, in 1883, the accessibility of most of the mines was greatly increased. The Mowry Mine, however, was still fourteen miles from rail connections. Little was done until it passed into the hands of Silverberg and Steinfeld of Tucson who reopened it in 1890 with the object of developing the property for mine. Several hundred tons of ore were shipped in the course of development work over a period of three years, after which the mine was again closed, and remained idle until 1900 when Steinfeld reopened the mine and erected a 100-ton concentrator. Daily shipments of ore and concentrates were made for a short period. The mine was again closed in 1901 and remained closed until 1904, when it was sold to a company known as the Mowry Mines Company.

The mine was reopened and extensively developed, and in 1905 a 100-ton steel blast furnace was erected. The company acquired the Alto Mine in the Salero district in the Santa Rita Mountains, and in 1906 a reorganization was effected as the Santa Cruz Mines and Smelter Company to operate both properties. A railroad was planned to the Mowry. The venture did not long survive the business depression at the end of 1907. Both mines were closed at that time, and the Mowry Mine eventually passed into the hands of A. J. Hazeltine of Warren, Pennsylvania. The last work done before closing was to sink the shaft to the 500-foot level. After closing the pumps were pulled and the deeper workings were allowed to flood.

No further work was done for eleven years until, in 1918, the owner reopened the workings above the water level and did several

thousand feet of development work. The old stopes were reentered and small shipments were made partly from new ore and partly from sorting old stope fills. The working shaft caved in 1928, since which time no further work has been done. The total production of the mine has been about $600,000, largely estimated.

Washington Camp. Four miles south of Mowry a second large center of mineralization, known now as Washington Camp, was partly exploited by the Spaniards prior to the Mexican War of Independence in 1828. As at the Mowry only superficial work was done, and this camp had been abandoned for twenty-five years when the United States took over the territory in 1853. The principal mine worked by the Spaniards for its silver content was known as the Montezuma. It was relocated or purchased prior to the Civil War by Thomas Gardner and Hopkins about the same time that the Mowry Mine was revived. A second adjoining mine was relocated as the Empire. Little was done at the time and the properties were abandoned at the outbreak of the Civil War in 1861, when Hopkins and Gardner fled to Tucson.

The district was completely abandoned after the Civil War until a partial peace with the Apaches was effected in 1872 by the Peace Commission under Vincent Colyer. Gardner and Hopkins returned to their holdings, and a third rich silver-lead mine was located by W. C. Davis near the present camp of Washington. The rich lead-silver outcrop of the deposit was developed by Davis, and by the fall of 1880 over 1,600 feet of work had been done, and 500 tons of ore had been extracted. The property was then under the management of James Finley. A small furnace was built in the San Rafael Valley to the east of the mine in the following year, which was operated intermittently for about a year. The total ore treated is unrecorded

The ore body proved to be superficial and was soon exhausted. The grade reported in the local press was 40 percent lead, 10 percent iron and 40 ounces of silver. It is doubtful if more than the 500 tons reported on the dumps in 1880 was smelted.

A second rich silver-lead deposit was discovered adjoining the old Montezuma and Empire Mine located prior to the Civil War by Gardner and Hopkins. It was located as the Holland. A third mine, the Belmont, was also located and partly developed by Thomas Yerkes and H. D. Bacon.

In 1879 a promoter styling himself the Hon. H. J. Luttrell entered the district. He bonded the Holland for $60,000 and organized the Holland Smelting and Mining Company. The mine was purchased, and a smelter known as the Holland smelter was erected south of the mine. Capital was to have been raised by sale of stock set aside for the purpose. After about two years of work, the venture collapsed financially.

A second venture was launched by Luttrell in the fall of 1880 involving the Belmont and San Antonio Mines and a large adjoining group of ten claims known as the Washington Pool, owned by Allen Longbotton, Davis, Lowell, Baker, Hensley, Wait and Ayers, all pioneers of the district. This venture never got beyond the promotion stage.

On the collapse of the Holland Company in 1881, the district was almost abandoned for two years until, in January 1884, A. B. Elder purchased the Holland Mine and Smelter. The smelter was reconditioned and enlarged and was blown in April of that year as the La Noria Smelter. After a run of about eight months the plant and mine were again closed. The first month's run was 797 bars of

101 pounds each of 95 percent lead, 210 ounces of silver and 1 1/16 ounces of gold, according to a report of the Tucson Star of May 22nd, 1384. The Mint Report of 1884 described the smelter as a single furnace of fourteen tons capacity which treated ten tons a day, making three tons of bullion yielding 320 ounces of silver and 1 1/16 ounces of gold from Holland ore of 25 percent lead, 36 ounces of silver. At this rate about 150,000 ounces of silver, 750 ounces of gold and 1,300,000 pounds of lead were produced during the year.

On the completion of the New Mexico and Arizona Railroad through Patagonia in 1883, considerable ore was shipped from various properties to the Benson Smelter, and, after its close, to other reduction works. The district however did not realize in full the benefits of the railroad as the haul was still about seventeen miles to the nearest rail point at Crittenden. The Tucson Star reported that in 1885, 1353 1/2 tons of ore were shipped from Crittenden, part of which came from the Washington district and a part from Harshaw.

With the exception of the Holland and Davis Mines, the other deposits, at shallow depths, changed into massive copper-lead-zinc sulphides associated with garnet and silico. The most valuable of the base sulphides in the ore is chalcopyrite. The possibilities of the mines as copper deposits were first realized in the late eighties by George Westinghouse of the Westinghouse Electrical Company. The first properties purchased by him in 1889 were the W. C. Davis Mine known as the Pocahontas, the Bonanza, the Pluto, and the Illinois. The oxidized ore to a depth of about seventy feet was developed by Westinghouse for two years, and a little ore was shipped. Base sulphides were encountered below the oxidized ore.

Very little work was done in the camp until the revival of the copper market in the late nineties. The Westinghouse Company in 1896 leased a small furnace at El Paso and shipped about 2,000 tons of lead-zinc ore for treatment. In the same year the Washington Mine, the oxidized ore from which had been worked by the Benson Smelter during its life from 1882 to 1886, was optioned to Senator W. A. Clark of Montana. The Giroux shaft was sunk to a depth of about 150 feet and a considerable tonnage of complex ore was developed, after which the option was surrendered.

In the same year the Holland Mine was purchased for $15,000 by F. L. Bartlett of Denver. A concentrator was built to treat the lower-level complex ore. Huntington Mills followed by Wilfley tables recovered lead and zinc concentrates, both of which were shipped, the latter to Canon City, Colorado for manufacture of zinc oxide. Work ceased after a run of about a year.

In the following year the Pride of the West, formerly known as the Washington Mine, was leased by N. H. Chapin, one of the owners, and about 8000 tons of sorted copper sulphide and oxide ore was shipped and the work of Senator Clark was continued from the Giroux shaft. This work blocked out 200,000 tons of complex sulphide ore. The mine was then sold in April 1899 to C. R. Wilfley of Denver, the inventor of the Wilfley Concentrating Table. Wilfley and his associates organized the Pride of the West Mining and Smelting Company and continued to ship high grade copper ore for a period of about three months, until the exhaustion of the shoot. The company then started the construction of a 100-ton concentrator which was completed towards the end of the year. Many experiments were made and by June 1900 the mill consisted of crusher, stamps

and Wilfley tables making a 50 percent lead concentrate. A roaster was installed to roast the tailing from the Wilfleys and a Weatherill Magnetic Concentrator was installed to separate the copper-iron from the zinc roasted product. Zinc concentrates of 56 percent zinc and copper concentrates of 24 percent copper were produced. The zinc was shipped to Europe and the copper to the Copper Queen Smelter in Bisbee. By April 1901 the prices had been changed. All the crushed ore was roasted and passed over the magnetic concentrators which produced a copper-iron product and a zinc-lead-copper product. The latter was then treated on Wilfleys and a lead-silver concentrate was made, the blends - a garnet-quartz-calcite product, - being rejected as tailing. A reverberatory furnace was installed to smelt the copper concentrate to a 50 percent matte. Eight tons of matte and five tons of lead concentrates were produced daily. The crude ore treated contained 17.33 percent chalcopyrite, 8.80 percent pyrite, 19.53 percent zinc blende, 4.83 percent galena, 34.68 percent garnet, 18.30 percent quartz and 3.53 percent calcite. The plant was built fourteen hundred feet from the mine and was connected to it by a switch-back, three-rail gravity tram laid on a 15 percent grade. The reverberatory furnace was operated only for a short time, after which the copper concentrates were shipped to Silver City and other reduction works. In 1902 the plant was remodeled and enlarged, after which the mine was closed at the end of the year, due to the change of the higher grade copper ore in depth to an ore with high zinc content.

The camp remained nearly deserted for three years when, in 1906, the Pride of the West plant was purchased by the Westinghouse Company. Further mining property was purchased, the principal mines being the

Holland, Belmont and Washington Pool group of ten claims. The mill was run intermittently to experiment with the treatment of the company's Bonanza Mine base ore.

Operations in the district were much facilitated in 1913 by the construction by the Southern Pacific Railroad of the connecting line from Nogales to Naco. The haul to the nearest rail point on this line at Zorilla, Mexico, from Washington is about eight miles, as against a seventeen-mile adverse grade haul to Patagonia.

After four years of intermittent experimentation, the Westinghouse interests, organized as the Duquesne Mining and Reduction Company, started to equip the property for large-scale production. The principal mine, the Bonanza, was developed to a depth of 650 feet and connected with the mill at Washington by a 3000-foot aerial rope tramway. A large Diesel power plant was erected and comfortable camp buildings were constructed at Washington and at the Bonanza Mine, known as Duquesne Camp. Production started in August 1912. Three products were made: copper, lead, and zinc concentrates, hauled at first to Patagonia and later to Zorilla and from there shipped in bond through Mexico to the port of Naco. The greater part of the ore mineral was handtreated at the plant. Most of the ore came from the Bonansa. The Pride of the West was optioned from the owners and reopened, and some ore was also mined from the Belmont, Holland, Kansas, New York and other mines owned by the company. The plant was run until early in 1919, when it was closed, and the mines were turned over to lessees. In the succeeding three years there was shipped a considerable tonnage of sorted lead and copper ore on lease account until the depression in metal prices at the end of 1920. Since then small intermittent work has been done at various mines.

The plant was dismantled and sold, and the property was offered for sale, and in 1926 was purchased by Bracy Curtis and Associates of Nogales.

The total gross production of the Duquesne Mining and Reduction Company from August 1912 to the end of 1920 was approximately $6,500,000 in copper, lead, zinc, silver and gold.

The only other large producing mine in the vicinity is the Santo Niño, 2 1/4 miles south of Duquesne. This deposit is geologically quite different from the mines of the Washington Camp. It is entirely within the large monzonite mass forming the back-bone of the range. The ore is a mixture of massive copper and iron sulphide associated with smaller amounts of molybdenite. It did not outcrop as carbonate or oxide ore, and for that reason was not discovered until recent years.

The mine was located in 1908 as the Benton by Dennis Coughlin of Duquesne. In the following year a tunnel was driven to crosscut the ledge at depth, and a zone fifty feet wide was cut of low grade disseminated purite-chalcopyrite ore together with some molybdenite. Little further work was done until the high copper market of 1917 when it was relocated as the Santo Niño Mine and was sold in 1919 to the Southern Copper Company, a subsidiary of the General Development Company. The company further developed the zone to the end of 1920, and again in 1922 and 1923. A small tonnage of ore was shipped, and in 1926 the mine was leased to Smith and Fulton of Nogales. The zone was further developed at greater depth and high grade lens of chalcopyrite ore was encountered. This ore was mined by the leasing company until the first of January 1929, when the owners took possession and continued to mine and further develop the

property until June 1930. The leasing company found several small associated lenses of high grade molybdenite ore, the best of which were mined and shipped separately in 1927 and 1928. Lower grade molybdenite-pyrite-chalcopyrite ore was mined in 1929 and 1930 and was shipped to Nogales for treatment in a small flotation plant. The mine produced about 1,700,000 pounds of copper, 9000 ounces of associated silver and 200 tons of high grade molybdenite ore and concentrates, from 1926 to the end of 1929.

Morning Glory Mine. About two miles north-west of Mowry is the Morning Glory Mine. The mine was first located in the eighties as a silver mine by David Neal who is said to have mined and treated, together with A. S. Henderson, considerable ore from the outcrop.*

Sulphides were reached at shallow depth, carrying much lower silver values. The property was abandoned until the better copper market of the late nineties, when it was relocated by Richard Farrell and wife.

Little work was done until 1907 when it was purchased by C. B. Wilson, then residing in Helvetia. Under the stimulus of the abnormally high copper market of that year, the main shaft was deepened and about 1000 tons of low-grade ore were shipped. On the collapse of the market at the end of the year the mine was closed. It was not reopened until four years later when the copper ore was further developed and about 5000 tons were shipped. The mine was again closed in 1913, and was not reopened until 1918 when it was developed at further depth by a crosscut tunnel. A large pipe of mineralized groung was cut in the tunnel and connections were made with the

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*Schrader, Frank, C., "Mineral Deposits of the Santa Rita and Patagonia Mountains, Arizona." U. S. Geological Survey. Bulletin 382, 1915, p. 306.

shaft. A little ore was shipped.

The mine passed to new owners three years later when J. B. Schriever of Scranton, Pa., organized the Morning Glory Mining Company to take over the mine. The crosscut tunnel work was continued to the end of 1923 when the mine was again closed. Schriever reorganized the company in 1927 as the Morning Glory Mining and Smelting Company. The reorganized company with much new capital reopened the mine and equipped it to treat by flotation the low-grade ore from the mineralized pipe cut in the cross-cut tunnel. A 100-ton concentrator was completed in 1929 together with a Diesel-run electric power plant and camp buildings. The concentrator was operated a few months, after which the property was again closed.

The total production of the mine from 1907 to 1939 inclusive has been approximately 374,000 pounds of copper and 20,000 ounces of silver, chiefly mined during the high copper market periods. The production in silver from the surface ore is not known, but was not great as the tonnage shipped was small.

World's Fair Mine. The history of this well-known silver producer is intimately associated with two picturesque pioneers of the Patagonia Mountains, Frank and Josephine Powers. The mine was entirely developed by Mr. and Mrs. Powers with almost no initial capital. It was one of that rare species of which prospectors dream, one that paid its way from the "grass-roots."

The early history of the property is not known. It is supposed to have been worked in a small way by Spanish miners previous to the American occupation in 1853. It was not located by Americans until 1879* when McNamee worked the surface ores two years and then abandoned the location.

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*Ibid. p. 248.

It was relocated two years later by William MOran who sold it in 1884, a year after location, to Frank Powers for the succeeding twenty years. Frank and his wife Josephine slowly developed the property, occasionally making small rich shipments sufficient to make them a comfortable living. In the middle nineties, after the oxidized ores had been replaced by enriched sulphides, a 10-stamp gravity concentrator was installed, but was not operated long. A rich pocket of ore was encountered at about this time from which a single 20-ton car load returned $14,200, mostly in silver. The property began to attract attention. The Powers set the purchase price at $1,000,000 and continued to ship ore at intermittent periods until 1909 when the property was bonded for $500,000 for a short time to a company known as the World's Fair Mining Company. On the relinquishment of the bond, the Powers continued to make rich shipments of cupriferous silver ore, with occasional bonanza car loads until 1912 when the mine was bonded to Phelps Dodge and Company. On the relinquishment of the bond after six months examination, the property again reverted to the Powers. Shipments were resumed in 1914 and were continued irregularly to the end of 1917 when the mine was bonded to the Commonwealth Development Company of Pearce. A concentrator was installed in 1918 and was operated for about a year when the bond was surrendered and the machinery was removed.

The mine was then leased to the Bachman-Merritt Metals Company, owners of the Tres de Mayo Mine, but little was done by this company, and the mine remained virtually closed until it was leased in 1823 to Louis L. Ferry, Carl Scheler and Michael Hogan. Shipments were resumed and were continued to the end of 1926. During the duration

of the lease the property became involved in litigation, resulting in its being placed in the hands of a receiver in 1927. It was then bonded to a company known as the Zero Mining Company. The old concentrator was remodeled into a flotation plant which was started in the fall of 1928. The company was insufficiently financed, and in the succeeding year its assets were acquired by the Trench Mining Company financed by the machinery house which had erected the concentrator. This company acquired the neighboring Trench and Josephine Mines, and operated the concentrator on ore from the three properties.

The Powers interests in the property became badly clouded after the start of litigation in 1925, although they continued to maintain their residence at the mine throughout.

The rpoduction of the mine prior to 1900 is not of exact record. It was probably about $50,000 chiefly in silver with some copper and lead. The production since 1900 to the end of 1929 has been about $550,000 in silver copper and lead, making the total production about $600,000.

Hermosa Mine. The Hardshell, Hermosa, Alta, January, Trench, Josephine, World's Fair, Flux, and Three R Mines have been the principal producing properties in the northern end of the Patagonia Mountains. These deposits are closely associated with a large intrusive mass of rhyolite and granite porphyry, the most prominent outcrop of which is in Red Mountain south of Patagonia. The Hardshell and Hermosa Mines are at the Eastern extremity of this zone followed to succession to the west by the January, Trench, Josephine, World's Fair, Flux and Three R Mines. The total width of the zone from the Hermosa to the Three R is about four miles.

The Hermosa silver mine was not worked, as far as is known, by

the Spaniards, and was not discovered by American prospectors until after the revival of prospection initiated the Colyer Peace Commission in 1873. It was first located, according to Schrader,* in 1877 and was sold within two years of location to a New York Company known as the Hermosa Mining Company. The mine was energetically developed and by September 1880 over 4000 feet of work had been done, 824 feet of which was tunnels, and 4000 tons of ore were reported on the dump. A 100-ton stamp amalgamation mill had been constructed and started operating August 20th. It was then crushing 75 tons a day. The company headquarters and mill were established about a half a mile from the mine, and became the nucleus for the town of Harshaw, which for many years was the metropolis of this part of the mountains. The mill while in operation was the largest in Arizona. The ore consisted of altered rhyolite carrying values in silver chloride. The production for the year 1880 according to the U. S. Mint Report was $365,654.49. The company continued to operate the mine until the latter part of the next year, when the better ore was exhausted. The total production in bullion for the run of a little more than a year was, according to the Tucson Star of January 5th, 1882, $1,155,154.49.

After the close of the mine and mill, the town of Harshaw was almost deserted. The mill was sold two years later to the operators of the Peerless Mine at Quijota and was moved there. The mine was sold in 1887, six years after its close, to James Finley of Tucson. It was not reopened by Finley until 1890 when he installed a small Huntington Mill at Harshaw, and is reputed to have produced $150,000 worth of bullion. During this time the mine was bonded for a short time to Senator McGoverney of Canon City Colorado. On the drop in the price of silver in 1893 little further work was done. The last

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*Ibid. p. 272.

operation was in the late nineties by a company known as the Hermosa Mining Company, financed from Guthrie, Oklahoma. This company enlarged the mill and drove 900 feet to work below the old stopes, with negative results. The total production after the original operation was comparatively small, and the deepest commercial ore found was 825 feet below the outcrop.

The net profit made by the original company was over $500,000, and this was used as the basis for the formation of the Prietus Mines Company, which made a spectacular success in the exploitation of the La Colorado Mine of Sonora, Mexico.

Hardshell Mine. The original claims on ore of which the mine was later discovered were located on both sides of Hardshell Gulch about a mile south of Harshaw, as a base for the search for the source of boulders of rich ore found in the Gulch. The locations were made about the same time as those on the Hermosa by David Harshaw and Jose Andrade, who shortly sold the locations to R. R. Richardson. For ten years Richardson, one of the most active pioneers of the district, searched unsuccessfully for the ledge and abandoned the locations. Several years later he relocated the ground and after further search finally found the ledge in 1895. The following year he bonded the mine to the Empire Mining and Milling Company. This company sank an inclined shaft 400 feet on the ledge, took out 4000 tons of ore and shipped 3000 tons to El Paso. The company then erected a 100-ton blast furnace at what was then known as Rollin, two and a half miles south of Crittenden, which was blown in in August 1897. The Flux Mine was also bonded by the company and the smelter was operated chiefly on ore from the two mines. The settlement of Rollin became the nucleus of the town of Patagonia, now the mining center

of the Patagonia and Southern Santa Rita Mountains. The smelter was operated for three months, after which the Hardshell reverted to the original owner, R. R. Richardson.

Two years later in the fall of 1899 the Patagonia Mining Company was organized by Richardson, and a fifty-ton concentrator was built which was operated throughout the year of 1900 and until May 1901 and is said to have treated about 15,000 tons of ore. The mine was again closed and was not reopened for four years when, in 1905, the Patagonia Mining Company was reorganized by Benj. Heney of Tucson. The shaft was deepened and considerable development work was done in 1906 and 1907, after which the mine was again closed and was not reopened until 1913, when the Patagonia Mining Company reorganized as the Hardshell Flux Mining and Development Company, mined and shipped a small tonnage of ore and then closed down the mine, after which the property reverted to Richardson.

No further work was done until 1917 when it was bonded to H. W. Welch of Tucson. The concentrator was remodeled to make a high manganese concentrate and a new vertical shaft was sunk 400 feet to develop the ledge at greater depth. Work in the shaft was discontinued after a large flow of water more than taxed the capacity of the pumps installed. The property again reverted to Richardson, in 1921, and has been held by his estate since his death. A small production is made, as market conditions warrant, from the operations of lessees.

Trench Mine. The mine is said to have been located for the first time, prior to the Civil War, by Colonel H. T. Titus, one of the early owners of the Mowry Mine. Not much work was done at this time, and the mine was abandoned on the outbreak of the Civil War in 1861. It

was not relocated until about 1872 during the general revival of prospecting of that year, and is said to have been developed in the next eight years by Senor Padrez.*

It was sold in May 1880 by Samuel Hughes of Tucson, trustee for the owner, to W. G. Galigher, acting for Haggin and Hearst of San Francisco. Development started in December and a 400-foot shaft was sunk on the vein which was completed in the following July, when the work was discontinued due to the low-grade of the ore encountered.

After the completion of the Benson smelter in 1882 the mine was leased by Hagan and Tevis and considerable ore was mined and hauled to the smelter. After its close other lessees shipped reduction works in Texas and New Mexico until the demonetization of silver in 1893. The subsequent drop in the silver market made further operations unprofitable, and all work ceased in 1894. During the operations of the lessees, a small gravity concentration plant was erected and was operated intermittently.

The mine remained closed until 1905 when it was developed for about two years, but little ore was shipped. The mine was again closed and remained down for about eight years when, late in 1912, it was bonded to Senator Clark of Montana. After three years of development work from the old shaft, a new 600-foot shaft was started in 1915 and shipments of ore were commenced in 1918 and were continued on a small scale to the end of 1925. The mine was operated under the name of Trench Consolidated Mines Company. It was operated on lease account in the last three years by John Hoy of Patagonia. It was again closed for two years until late in 1928 when it was leased by

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*Hinton, R. J., Handbook to Arizona. San Francisco and New York, 1878, p.126.

Frank Ahlberg, who also leased the World's Fair Mine, and both mines were reopened and the ore was treated at the World's Fair flotation plant erected by the Zero Mining Company in 1927.

The new company organized as the Trench Mining Company operated the two properties together to the end of 1929.

The total production of the Trench is not known. Since 1905 to the end of 1929 it has been about $20,000 in lead, and silver. The production by lessees prior to 1894 was intermittent. Two carloads shipped to the Crittenden smelter in 1899 by Powers were said to have run 40 percent lead and 60 ounces in silver.*

If 200 tons is assumed as shipped of this grade the gross yield would have been about 1,500,000 pounds of lead, and 120,000 ounces of silver worth about $170,000. It is probable that including the lower grade ore milled, the yield was not over $250,000, which with the recorded yield since 1905 would make a probable total production of about $190,000.

Josephine Mine. The vein, worked at this mine is a continuation to the northwest of the Trench vein. It was located at the same time as the Trench but was not opened until five years later.** It is said to have been most extensively worked from 1893 to 1897 by Farrel, William, Powers, and Morrison who developed the mine to a depth of 500 feet and are said to have shipped at an average rate of three cars a month (60 to 90 tons). The grade was about the same as that of the Trench. Little has been done since 1899, when it was relocated by Farrel, Powers, and Morrison.

The production is not recorded. If, during its productive life

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*Schrader. op.cit. p. 253.
**Schrader, op. cit. p. 254.

of five years, an average of 60 tons a month of 40 percent lead and 60 ounces of silver is assumed as shipped, this would have yielded a gross production of about 2,000,000 pounds of lead and 200,000 ounces of silver worth about $200,000.

Flux Mine. This mine, about a mile and a half northwest of the World's Fair in Flux Gulch, a tributary of Alum Gulch, was said to have been worked by the Spaniards and Mexicans prior to the Gadsden Purchase in 1853. Although not mentioned by Mowry,* it is supposed to have been located prior to the Civil War and to have had the richer surface ore smelter in an adobe furnace near the mouth of Alum Gulch.

It was not relocated until 1882 when Salisbury, owner of the Benson Smelter, opened up the mine, built a road from Sonoita Creek to the mine at a cost of $5000, and in 1884 shipped at a rate of about a car a day (20tons). No exact figures are recorded. At the 1884 rate several thousand tons were probably shipped of ore carrying about 60 percent lead and about 15 ounces of silver.

No further work was done until 1897 when it was relocated by R. R. Richardson, and the mine was reopened and bonded, together with the Hardshell to the Empire Smelting Company whose history has since been given under the Hardshell Mine. About 2000 tons were smelted from both properties during the three months run of the smelter after which the company relinquished the mines to Richardson, early in 1898. Richardson then organized the Patagonia Mining Company to operate both the Flux and Hardshell Mines. The principal operations were conducted at the Hardshell where a concentrator was built, a few shipments of high-grade lead-silver ore were made to El Paso from the Flux, but not much work was done until the reopganization in 1905 of the company by Benj. Henry. The mine was opened by a series of

tunnels and connecting shaft and raises. A little ore was shipped after which the mine was closed in 1909.

No further work was done until 1914 when it was bonded to a California company. This company built a dry concentrator at the junction of Flux and Alum gulches, and connected the mine and mill with a 9000-foot aerial tramway of unusual design. A small tonnage was mined but the mill was unable to save the values and the property was abandoned and reverted to Richardson in 1917, who operated it himself for a year. It was then bonded for $150,000 for five years to a syndicate from Bisbee organized as the Flux Mining Company, managed by Fred H. Kohlberg. A 250-ton flotation concentrator was built at the site of the older dry concentrator to treat the low-grade oxidized lead-silver ore of the upper workings by sulphidizing followed by flotation. A pumping plant was installed on Sonoita Creek. A considerable tonnage of ore was treated and concentrates were shipped in 1918 and 1919. The oxidized ore proved refractory to flotation and the milling was discontinued early in 1919 to await further developments in the lower level sulphide zone. The mill was reopened in 1920 to treat a small tonnage of complex sulphide ore. The company went into the hands of a receiver in 1921. The mine was closed and the equipment was sold. The mine again reverted to Richardson who reopened it in 1923 and there has been shipped intermittently a small tonnage each year to the end of 1929.

The total production of the mine from 1897 to the end of 1929 has been about $70,000 in lead and silver. The production previous to 1897 is not recorded but probably was about 4,000,000 pounds of lead and 60,000 ounces of silver with a gross value of about $230,000, making the probable total yield to the end of 1929 about $300,000.

Three R Mine. This mine at the northwest end of the Patagonia Mountains mineralized belt, is the largest copper mine of the area. It was discovered in August 1897 by R. R. Richardson. Little work other than that necessary to hold the location was done until about 1900, when it was bonded for a short time to Colonel Green of Cananea, Mexico. Preliminary payments were made but the option was surrendered in 1907. The mine was then worked under option agreement by the General Development Company, but the option was surrendered after a short development campaign. Richardson then organized the Three R syndicate, composed of local and Tucson men, of whom Benj. Henry was the principal. For two years the mine was extensively developed and a few carloads of rich chalcocite ore were shipped. A lower extraction tunnel was driven and the mine was connected to the railroad by a wagon road. In April 1912 it was bonded to N. L. Amster of Boston for $550,000 with a substantial cash payment. Under the Amster management the high grade ore body was further developed and over 30,000 tons of about 10 percent ore were shipped up to September 1914 when the bond was relinquished due to litigation between Richardson and Henry. After settlement of the suit, the mine was optioned by Richardson to the Three R Mining and Milling Company early in 1916. This company, financed in Texas by the Harrison Brothers, continued shipping high grade ore, and built a combined gravity and flotation concentrator at the mine, installed a pumping plant on Sonoita Creek, and built a large power plant at the mine. Over 11,000 tons of ore were shipped and about 55,000 tons were milled from April 1916 to April 1919. The company was unable to make the final payment on the purchase price, and the property reverted to Richardson. In the fall of the same year it

was optioned to the Magma Copper Company of Superior, Arizona. A subsidiary company was organized, known as the Superior and Patagonia Mining Company. This company confined itself to development by diamond drilling for a year, after which the final payment was made and the mine was closed and offered for sale. The road and plant were practically abandoned and considerable damage was done by a serious flood in 1926. The property was finally sold in 1928 to George S. Hulings who organized the Three R Mines Company. The road was repaired, the old stopes were reentered and a new all-flotation concentrator of 200 tons capacity was built at the mine. Production of concentrates commenced in 1929 and were continued until the break in the price of copper in 1930.

The total production of the mine has been well over 100,000 tons of ore yielding about 85,000,000 pounds of copper and 900,000 ounces of silver with a gross value of about $2,500,000.

Miscellaneous Mines. In addition to the mines whose histories have been given there are a great number of smaller mines, most of which have had checkered careers and have produced at irregular intervals. The most important of these have been the Alta, close to the Hardshell, developed first in the late seventies and early eighties, from which a little high-grade silver-lead ore was shipped to the Benson and Charleston smelters; and the Blue Nose or Abe Lincoln Mine situated between the Morning Glory and Trench Mines, which was first located in the seventies, and which was worked during the life of the Benson smelter. It was practically abandoned until 1927 when it was optioned by the Richardson Estate to the Big Jim Mines Company of Los Angeles. The mine was further developed and a 100-ton flotation mill was built, and a small tonnage

was treated. The Guajolota or Four Metals Mine, southwest of Mowry, is reputed to have been worked by the Spaniards prior to the Gadsden Purchase. It was relocated prior to the Civil War but little work was done. In 1904 it was purchased by the Four Metals Mining Company and in the next four years considerable work was done in driving long tunnels in the hope of developing a disseminated copper deposit but unsuccessfully. The Andes Mine in Red Mountain was extensively developed by R. R. Richardson and associates from 1915 to 1920 in the attempt to develop a disseminated copper deposit. Several thousand feet of work were driven from a long cross-cut tunnel and a low grade copper ore body was partly blocked. The Tres de Mayo Mine, southwest of the Three R, was reputed to have been worked by Mexicans prior to the Civil War. It was acquired in 1918 by the Bachman-Merritt Metals Company who did a considerable amount of development work and shipped a little lead-silver ore at various times. The American Mine, north of Mowry, produced a small amount of rich silver-copper ore in the late seventies, and was reopened in 1916. Its principal production was made in 1924. During the high silver market from 1918 to 1924, the Black Eagle Mine in Hardshell Gulch, was leased by C. A. Pearce of Patagonia and a large tonnage of manganese-silver ore was shipped. On the western slopes of the mountains there have been several properties which have been worked in a small way at various times. The more important of these are the Gladstone-Proto, a copper-silver mine, the Golden Rose, Buena Vista, and Gross.

The total production of the Patagonia Mountains from 1858 to 1929, largely estimated, has been about $13,000,000 in copper, lead zinc, silver, and a little gold. Details are shown in the Appendix.

Southern Santa Rita Mountains. The principal production and development in this range of mountains, a continuation of the Patagonias north of Sonoita Creek, has been in its northern end in Pima County. The histories of the principal camps, Helvetia, Rosemont and Greaterville have already been given in Chapter 13.

The principal centers of mining in the Santa Cruz County end of the range have been at Salero-Alto, Temporal Gulch, and Montosa.

Salero-Alto Area. The silver mines of this center of mineralization on the western side of the range were worked by the Spaniards and Mexicans prior to the Gadsden Purchase. It is probable that most of the work was done under the supervision of the Tumacacori padres, and that the ore was smelted at crude works near the mission. At the time of the American occupation, the mission had been abandoned and no mining was being done in Arizona. Exploration companies were soon organized to acquire or locate mines in the territory, made famous chiefly by the legends of the Plancha de Plata silver placers found near the border.

Salero Mine. One of these exploration companies organized by New York and Cincinnatti capitalists as the Santa Rita Mining Company, acquired the Salero and adjoining mines, and a large grant of land including the old ruined Tumacacori Mission. The company, under the management of H. C. Grosvenor, repaired some of the buildings at the Mission and used them as headquarters. After opening the mine and establishing a camp there, Raphael Pumpelly, a young American mining engineer, was engaged to build a smelter to treat the ore. He arrived in 1859, built a small blast furnace at the mine which made only one run of ore before the outbreak of the Civil War. The mine was abandoned after the withdrawal of the troops and the murder

of Grosvenor, and Pumpelly fled across country to Fort Yuma. The description of the condition of the country, the overland trip from St. Louis to Tucson and the flight in mid-summer across the desert to Fort Yuma are vividly portrayed by Pumpelly in his autobiography printed in 1918.*

The mine remained abandoned after the Civil War for over ten years, and was not relocated until the revival of prospecting in 1872 when George Clark of Tucson and his partner Peterson reopened the mine and shipped $10,000 worth of ore from the upper workings. It was again abandoned for over twenty years when it was leased to John Vier of New York in 1897 and a little development work was done. It was sold by Clark and Peterson in 1900 to C. H. Gerry and Professor Wm. P. Blake, who organized the Salero Mines Company. This company under the supervision of Blake equipped the mine and sank a new vertical shaft, and developed the mine intermittently until 1911. The mine is located on an old Spanish land grant known as the Baca Float No. 3. The Texas owners of the grant started suit against mining claim locators.

Alto Mine. This mine was also supposed to have been discovered and worked by the Jesuits and Franciscans in the eighteenth and early nineteenth centuries. It was not relocated by Americans until the revival of prospecting after 1873, when Mark Lully of Nogales relocated it as the Gold Tree. It passed into the hands of L. Zechendorf and Company of Tucson in the eighties and a little ore was mined and shipped to the Selby Smelter at San Francisco. In 1902 it was purchased by the Alto Consolidated Mines, Smelting and Transportation Company, financed and promoted by Boynton of New York. Active work on the mine started in 1903. Roads were built, a long tunnel was

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*Pumpelly, Raphael, My Reminiscences, H. Holt and Co.,1918, Vol. 1.

driven and several shafts were sunk. In 1906 the two companies operating the Alto and Mowry were consolidated as the Santa Cruz Mines and Smelter Company. A railroad was contemplated between Patagonia and Mowry and the Alto ore was to have been reduced at the Mowry Smelter. The plans were abandoned in July 1907 due to the panic of that year. A little ore containing lead-copper- and silver, with high zinc content, was shipped from development work. The mine reverted to the original company in 1907. Development work was continued at irregular intervals until 1911 when all work ceased due to litigation with the Baca Float owners. After three years of litigation, the suit was won by the Alto Mines Company, but the mine was not reopened except by lessees, who operated parts of the property from 1922 to 1926, and again in 1929.

Baca Floats Mines. South of the Alto Mine are a number of small mines now owned by the Baca Float Mining and Cattle Company, the owners of a part of the Baca Float no. 3 land grant. The uncertainity of titles to claims on the grant delayed development work for many years. A little work by lessees commenced in 1916 on the Eureka Mine, and in 1921 work on a more ambitious scale started on the Jefferson, Eureka, Bonanza, and Apache. The ore occurs as silver-bearing lead sulphide with a little associated copper sulphides in a system of veins cutting quartz diorite. The ore was mined and hauled to Patagonia for shipment to lead reduction works. A small flotation plant was erected at the Eureka Mine in 1925 which was run intermittently for less than a year. The principal work was done at the Jefferson Mine, from 1921 to the end of 1928, during which time regular shipments of ore were made.

Bland Mine. This copper-silver vein to the east of the Baca Float

boundary was first developed in 1910 by a 300-foot shaft. A rich pocket of copper-gold ore was found and shipped, after which the mine was closed until 1919 when it was reopened by lessees who shipped a small tonnage of copper ore until the post-war depression at the end of 1920.

Wandering Jew Mine. This lead-silver vein was acquired in 1910 by R. R. Richardson, and considerable work was done, but little production resulted, and the mine was closed early in 1911. It was not reopened until 1916 when it was bonded to a Nogales syndicate, and in the following year a 75-ton flotation concentrator was erected, which was run for about six months, after which the mine was closed.

Josiah Bond Mines. In 1910 the silver canyon prospect was bonded by Josiah Bond who sank a deep shaft on the vein. Other prospects were acquired, chief of which were the Jersey Girl, Silver Sally and Merry Widow, all of which were developed intermittently by Bond, but little production resulted.

Temporal Gulch Area. This area on the eastern slope of the mountains is less mineralized than the corresponding area, just described, on the west slope. As far as is known no mines were worked there by the Spaniards or Mexicans prior to the American occupation and it was not entered by American prospectors until after the completion of the railroad in 1884.

Mansfield Mines. The Sweet and Black Cap Mines have been the most energetically prospected in the area. They were acquired in 1906 by a Kansas City company organized as the Mansfield Mining and Smelting Company. This company located a large group of claims surrounding the two mines, sank several shafts from which a large amount of development work was done and in 1908 built a 30-ton matting smelter which was never operated. A little ore was shipped in 1911 after

which the mine and plant were closed. The company was reorganized in 1912 into a holding company for two operating companies known as the Ruby Copper Company and the Southern Arizona Mining Company, but little further work was done until 1924 when the Black Cap Mine was operated for about two years by lessees who shipped a little lead-silver ore.

Happy Jack Group. The principal mine of this group is the Mountain View, a vein carrying copper-silver ore with minor amounts of lead. It was acquired about 1900 by the Happy Jack Mining Company, organized by W. H. Barnett and Frank Powers. The principal work was done from 1906 to 1908.

Augusta or Hosey Mine. This mine was first located about 1905 and the rich copper-silver ore of the outcrop was shipped in 1907 and 1908. It was then bonded to a syndicate of railroad men headed by William Kemp of Tucson. The low grade pyritic ore encountered at depth was developed and shipments at a large rate were made to the Old Dominion Smelter at Globe for about a year after which the mine was closed. It has been reopened at irregular intervals since then by lessees.

Ivanhoe Mine. This copper-silver mine was first extensively worked in 1907 after its acquisition by the Ivanhoe Mining Company. It produced at irregular intervals rich copper-silver ore from 1907 to 1924, and its most active year was 1911.

Miscellaneous Mines. Other small intermittent producers in the area are the Gringo, a gold mine which was operated quite extensively in 1907 by a Tombstone company known as the Arizona Mines and Milling Company, but has been quiescent since; the Blue Lead and American Boy Mines which have both produced at irregular intervals from 1912 to

1923; the Dragaz, which was operated a small concentrator in 1921; and the Victor and Mohawk Mines operated in 1928 and 1929 by the Square Gulch Mining and Milling Company on whose property a small flotation plant was erected.

Montosa Area. This area on the western slope of the range, northwest of the Salero-Alto area is reached most readily from Amadoville, a settlement in the Santa Cruz Valley, north of the old town of Tubac. The mineral deposits here were not discovered until after the completion of the railroads.

Elephant Head Group. This group of copper claims in Chino Basin was originally located by Tremaine and Daniels about 1910. It was purchased about 1912 by the Elephant Head Mining Company. The principal work done by this company was to drive a 1500-foot crosscut tunnel to develop a surface showing of disseminated oxidized copper-gold ore. Low grade sulphide ore was encountered and over 1000 tons were hauled in 1914 to the Pioneer Smelter near Sahuarita. After the close of the smelter, all work was stopped.

Sheeby Group. This group of claims, formerly owned by the Sheeby brothers and O'Donnell of Tucson, is in Montosa Canyon in a limestone belt known as the Devil's Cash Box. The surface ore composed of replacement pockets of lead carbonate were first worked in 1911. The carbonate ore was found to be underlain by a high grade mixture of lead and zinc sulphides. After the exhaustion of the oxidized ore, a large tonnage of this complex ore was mined and shipped until the virtual exhaustion of the shoot in 1916. A final small shipment was made in 1925.

Santa Rita Mines. The Treasure Vault and Santa Rita Mines in Agua Caliente Canyon, northeast of the Sheeby group, were developed chiefly

by the Santa Rita Copper Mining and Smelting Company from 1901 to 1908. The company was promoted by A. A. Post. The ore in the Treasure Vault vein occurs as pockets of gold-bearing copper sulphides and sulph-antimonides. A little ore was shipped from the higher grade pockets. The last work of the company was done from 1907 to 1908 on the Santa Rita Mine. The ore in this vein consists of low-grade gold associated with lead and iron sulphides. A 5-ton amalgamation and concentration mill was built in 1907 which produced a little bullion in 1908, but the ore was too low grade to mine and treat economically and no more work has been done since.

Montosa Mine. The lead-copper deposits of this mine are in Montosa Canyon, on the south end of the Limestone Belt in which the Sheeby Mine is located. The mine is reputed to have been worked by the Spaniards long prior to the American occupation. It was not relocated, however, at the time of the first work by Americans prior to the Civil War. The first modern locations were not made until after the stabilization of conditions in 1873, when Clarke and Peterson of Tucson are said to have done some work, the records of which are lost. The mine was relocated about 1900 by Freeman and Smith of Tucson, and was bonded in 1901 to the Calabasas Copper Company of New York. A considerable amount of development work was done from several openings and a 36-inch 30-ton water-jacket smelter was built to treat the copper-silver ore found. It is reported* that the only run of the smelter lasted 4 1/2 days and that $9,600 was produced in bullion which was shipped to Dadoux and Company of New York. After the close of the furnace, a pocket of high grade silver-bearing

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*Schrader, op. cit. p. 188.

lead carbonate ore was mined and hauled to the railroad by lessees. After the exhaustion of this pocket the mine was abandoned. Freeman's interest in the property was willed on his death to the University of Arizona.

Oro Blanco Mountains. The mineralized belt in this range of mountains west of Nogales is virtually the northern extension of the Altar Belt of Sonora. It was in this belt close to the international line that the fabled Planchas de Plata silver placers were found by the Spaniards in the eighteenth century. It is probable that some of the gold ledges and placers in the district were exploited by the Spaniards and Mexicans prior to the American occupation, but no records are available.

The first locations by Americans were made in 1873 by Leatherwood, Hopkins, Hewitt and Marsh of Tucson. The principal ledge located was the Oro Blanco. In the succeeding two years the Ostrich and Yellow Jacket were located. Arastras were built and the richer ore was mined by Mexican leasers. After completion of the Southern Pacific Railroad into Casa Grande in 1876 several mills were built. The first to be completed was the Ostrich Mill at the end of 1880, operated by the Orion Company on Warsaw and Montana ore. The mill was equipped with a roasting furnace to treat refractory sulphide ore. The superintendent of the company was J. M. Kirkpatrick. The mill was run intermittently due to water shortage. The company purchased the Montana Mine in 1811, and was financed in part by owners of the Tombstone Mill and Mining Company. A second mill, the Warsaw, was erected in 1882 and was operated as a custom plant. A third mill was built in 1884 by the Esperanza Mines Company to treat the ore from the Indestroth or Blane Ledge. A water supply for this mill

was assured by the construction of a masonry dam to impound flood waters in the creek above the mill.

By 1884 the Orion Company had been reorganized as the Montana Company which was controlled by the Tombstone Mine and Milling Company under the general management of John A. Church. Other mines which had been partly developed were the Franco-American, Choctaw, Yellow Jacket and Blue Wing.

The higher grade outcropping ore had been nearly exhausted by the end of 1886 when most of the mines were closed, and only intermittent placering and prospecting was done until the demonetization of silver in 1893 again stimulated gold mining. By September 1894 the Engineering and Mining Journal reported that mills were operating at the Austerlitz and Yellow Jacket Mines, that mills were being put up at the Montana and Old Glory Mines, and that the Ragnarole, Golden Eagle, St. Patrick, Tres Amigos, San Juan, Frankie, Cleveland, Oro, Nel Desperandum, and Last Chance Ledges were being developed. The largest operation at this time was at the Old Glory when from 35 to 40 tons of ore were treated daily. The Montana Mill was completed early in 1895, and was operated on the oxidized portion of the vein for about a year. The companies operating the Oro, Fino and Golden Eagle Mines built small mills in 1896 which were run intermittently.

The Old Glory Mill operated more or less steadily, depending on the water available, until about the middle of 1898, when it was closed down due to the exhaustion of the better grade of ore.

The Montana Mine was developed and the mill was operated under the supervision of George Cheyney, of Tombstone and Tucson. A large dam was built across the creek to impound the flood waters, and the complex lead-zinc sulphides encountered below the oxidized

gold were developed. A concentrator to treat the complex ore was being built, but all work ceased early in 1903 on Cheyney's death.

After the close of the Old Glory Mill and Mine in 1898, no further work was done until 1902 when it was bonded to Brand and Ish of Tucson. A new 20-stamp mill was built and a masonry impounding dam. Work was resumed in February 1903, but after a short run the mine was again closed.

In 1903, a general revival of the district took place chiefly in the promotion of Eastern companies. The largest of these were the Gold Zone Mining Company organized to exploit the Golden Eagle Mine; the Sierritas Mining Company to operate the Oro Blanco Mine; the Sorrel Top Gold Mining and Milling Company to operate the Sorrel Top and Tres Amigos Mines; and a Bridgeport company headed by S. L. Foster, D. H. Jennings and J. J. Quinlan to operate the Ragnarole Mine. Mills using both amalgamation and cyanidation were built by these companies, but were operated intermittently due to water shortages, a most serious disadvantage of the district. By the end of 1904 almost all work had ceased.

Little further work was done in the district until 1912 when the Austerlitz and Oro Mines were reopened. A concentrating plant was erected at the Austerlitz which was operated a little over a year. After the close of the mill, the district remained quiescent until e early in 1917 when the Montana Mine was optioned to the Goldfield Consolidated Company of Nevada. The mine was energetically developed and a small concentration plant was erected which was run until February 1918 when the option was surrendered.

The district again remained quiet until 1925 when the Idaho Mine was acquired by the North Star Mining and Development Company of

Kingman. A small flotation plant was built and the mine was developed, but little production was made.

The first large-scale operation in the district was started in 1927 when the Montana Mine passed into the hands of the Eagle Picher Lead Company of Illinois. The mine was reopened, the shaft was deepened and an extensive diamond drilling campaign was inaugurated. After a year's work a sufficient tonnage of complex lead-zinc sulphide ore was developed to warrant the building of a 250-ton combined gravity and flotation plant. Water for milling was to have been obtained from the old reservoir produced by the dam built by Cheyney. The shaft was deepened with the expectation of augmenting the supply, but in January 1929 it was realized that a larger supply was necessary, and a water right was purchased on the Santa Cruz River, a pumping plant was established, and a fifteen-mile pipe line was laid to the reservoir. The concentrator was reopened in August and was run continuously until July 1930, when it was closed due to the drop in the metal market. The concentrates produced were hauled about forty miles to Amadoville and were from there shipped to El Paso and Amarillo for reduction. The mine was purchased on the recommendation of F. W. Lerchen who remained as agent in charge of operations.

The total production of the Oro Blanco Mountains from 1873 to 1929 inclusive has been approximately $2,000,000 in lead, zinc, copper, gold, and silver. The early production from 1873 to 1905 is largely estimated from U. S. Mint Reports and local press reports and was principally gold and silver shipped as bullion. Details are shown in the Appendix.

CHAPTER 15

PINAL COUNTY

(Exclusive of Ray and Superior)

In Pinal County the greatest amount of mineral wealth has come from the northeast corner of the county, north of the Gila River. The histories of the two largest centers there, those of Ray-Hayden and Superior, have already been given in Chapters VI and VIII. In addition to this area, there are smaller centers at various scattered places. The most important are the Mammoth-Schultz and Copper Creek areas in the drainage basin of the San Pedro river, the Casa Grande area in the Papago desert country southwest of Casa Grande, the Tortolito Mountain area near the border of Pima County, north of Tucson, and that part of the Catalina Mountains north of the Pima County line, centered at Oracle. A short historical sketch of each of them is given in the following paragraphs.

Mammoth-Schultz Area

The San Pedro river, one of the principal streams of southeastern Arizona, and a tributary of the Gila river, had been partly explored and settled by the Spaniards in the early days of the penetration by the Jesuits in the 17th century. The settlements were not permanent however, as they were constantly in danger of raids by the Apaches, and they had all been abandoned at the time of the United States occupation in 1854. All that remained were the wild cattle and horses in the surrounding mountains.

In the years before the Civil War a start was again made at settlement by Americans in the upper San Pedro valley, and in 1857 the San Diego

and San Antonio stage line established posts at what are now Benson and Winkelman, and built a road down the San Pedro river valley between these two stations. Prospecting of the bordering mountains followed, and in 1860 F. Biertu*, a metallurgist for the Howry mine reported the Maricopa Mining Company as operating a copper mine near the junction of the San Pedro and Arivaca rivers three to four miles south of the Gila river. The mine was under the direction of A. B. Gray, ex-surveyor of the United States attached to the commission of the Mexican Frontiers, and engineer-in-chief of the Pacific Railroad. He reported also that Hopkins was engineer in charge at the mine and the house of Soulter of New York was the principal owner. Although the description of the location does not exactly fit, it is probable that the mine worked was the Collins gold-copper lode, a part of the holdings of the Mammoth Gold Mining Company at Schultz. Antigua workings were reported by the later locators at this mine, and it is highly improbable that Spanish miners penetrated as far north in the pre-Mexican year. After the outbreak of the Civil War all mines except the Howry in southern Arizona were abandoned.

The first modern locations were made by Frank Schultz in 1881. The Mammoth, Collins and Hohsok mines were the principal locations. After about three years of shallow development work chiefly at the Mammoth this mine was sold to George M. Fletcher, and considerable development was done under the supervision of Captain Johnson. A large deposit of high grade gold ore was proved, and a 30-stamp amalgamation mill was erected at the river, three miles from the mine and the town of Mammoth was established there.

In 1887 negotiations were commenced with a British syndicate for the sale of the property, and in 1888 the Mammoth shaft was deepened from the 300-foot to the 800-foot level in anticipation of the sale, which was consummated in 1889.

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*Howry, Sylvester, Arizona and Sonora, Harpers and Brothers, N.Y. Third Edition, 1864.

cyanidation. A separate cyanide plant with a capacity of 200 tons a day was erected for this purpose. Active mining and milling commenced early in 1898, and continued without interruption for five years until the end of 1901 when all operations ceased due in part to litigation and in part of the exhaustion of the better grade of ore. The Collins and Mammoth mines were connected underground and both were worked. The final depth reached at the Mammoth was 725 feet, at which level water was encountered in such quantities as to prevent sinking further. The average gold recovery in the mill was about $6 a ton, with about a 40 percent loss, most of which was recovered in the cyanide plant.

After the close of the mine in 1901 it remained idle for fifteen years, when, in 1916, it was optioned by the Great Western Copper Company of Courtland. The old Mammoth shaft was repaired, and the mill tailing was treated by tabling to recover the wulfenite (lead molybdate) contained. A small amount of concentrates was made which was hauled to Hayden for shipment, and an attempt was made to sink the shaft below the 700-foot level, the deepest level hitherto reached. The previous operators had been unable to attain greater depth due to the expense of pumping. After a year of work the option was surrendered. The mine was then optioned by Epes Randolph and associates of Tucson and Los Angeles, and the St. Anthony Mining and Development Company was organized to work the tailing and old stope fills for the wulfenite content. After the Armistice in 1918 the abnormal market for wulfenite ceased and operations were suspended.

The Mohawk mine, the ore bodies of which are continuations of the Mammoth to the east, was purchased by Hartford Connecticut capitalists from Frank Schultz in July 1892. The Mohawk Gold Mining Company was

organized. In the succeeding three years the mine was developed to a depth of 300 feet and one large ore body was explored by lateral work on the 100 and 200-foot levels. Early in 1896 a ten-stamp mill was erected at Mammoth, and production started May 1st of that year. Production at a rate of about 70 tons daily continued until the end of 1897 when the mine was closed. Twenty more stamps were added to the mill in 1898 but the mine was not reopened, and remained closed for ten years.

The company was reorganized under the same name in 1906 and was placed under the management of Williams Roberts. The Mammoth-Collins mine was not operating at this time, but had been developed to the water level. The Mohawk Company arranged to use the water of the Mammoth to operate a new mill built at the mine. A thirty-ton combined amalgamation and concentrations plant was built, a new vertical shaft was sunk to a depth of 500 feet and new ore bodies were opened up. Production started in 1907. The new company continued mining and milling to the end of 1912. The grade of ore treated was considerably lower than that of the neighboring Mammoth.

The last operation in the camp was started in 1926, when a group of claims known as the New Year, adjoining the Mohawk on the east, was optioned from the heirs of Frank Schultz by Sam Houghton. A shaft was sunk, and lateral work penetrated mineralized ground with gold, vanadium and lead values. A small mill was constructed in 1932.

The total production of the camp has been about $3,000,000, chiefly in gold, of which the greater part was produced by the Mammoth and Collins mines.

Copper Creek Area

Copper Creek, a tributary of the San Pedro river into which it flows near the town of Mammoth, rises in the Galiuro mountains, a continuous northwest trending mountain range with a total length of 70 miles.

Copper Creek and its tributary arroyos have carved a basin on the southwest flanks of the range about three miles in width. It is in this basin that the ore deposits are found.

The first locations were made in the early eighties, but little work was done due to the inaccessibility of the district and to the low copper market which prevailed. The nearest rail point was then Willcox on the Southern Pacific Railroad about 70 miles by road and trail southeast of the district.

The first attempts at exploiting the deposits was in 1897 when the Table Mountain Copper Company organized by George H. Sisson purchased a group of claims in the district, and built a 70-mile wagon road from Willcox to the mine. A small water-jacket furnace was built in the following year, but little production was made due to the great transportation expense.

No further work was done in the district until 1903, when the Old Reliable and other claims were purchased by the Copper Creek Mining Company, organized by Frank J. and R. R. Sibley. The inaccessibility of the district prevented much work until 1905 when the construction of the Arizona Eastern Railroad from Phoenix to Winkelman brought the district within 35 miles of the railroad, as contrasted to 70 miles before it was built. On the completion of the Arizona Eastern, the El Paso and South Western Railroad planned to build down the San Pedro River from Benson to Winkelman, which would have brought the district to within twelve miles of railroad transportation. All the districts in the San Pedro and Gila River drainage area immediately responded to the stimulus. In the Copper Creek or Bunker Hill district, the Copper Creek Mining Company actively developed all the mines of its group, and in 1906 the Calumet and Arizona Mining Company of Bisbee acquired a group of 35 claims, known as the

Clark-Scanlon group, which was extensively developed by shafts and diamond drill.

The Copper Creek Mining Company started shipping, on the completion of the Arizona Eastern, in October 1905, but discontinued the first of the year pending the building of elaborate concentration and smelting works at the mine. The Sibleys continued to develop the various mines of the group in a conserative manner until 1908, when stock manipulation of a questionable character commenced. In order to raise further funds they organized the Minnesota-Arizona Copper Company in April 1908 to acquire an additional group of claims and enlisted the financial aid of Martin Tew. In 1910 they organized the Calumet and Copper Creek Mining Company as a holding company for the Copper Creek and Minnesota-Arizona. A 180-ton concentrator was started at the end of 1909, a 2 3/4 mile narrow gage railroad was built connecting the Old Reliable with the mill, and a dam was built across the creek to develop an 8,000,000-gallon water reservoir. The literature of the company at this time was highly extravagant. Large tonnages of high grade ore were claimed as blocked out, and ridiculously low operating costs were estimated. The El Paso and Southwestern Railroad change of plans in 1909, when it was decided to build into Tucson from Fairbank instead of down the San Pedro Valley to Winkelman, much retarded the development of the district. The Calumet and Arizona Mining Company stopped developing the Clark Scanlon group, and it became necessary for the Copper Creek Company to consider still further reduction of the ore by smelting. A 250-ton smelter was started in 1913 but was not completed due to lack of funds. The last operation was in 1914 when 8400 tons of low grade sulphide ore were concentrated and the concentrates were hauled to Winkelman for shipment. Finally in 1915 the Calumet and Copper Creek Company went into voluntary bankruptcy and was purchased by a stockholders' protective committee. A reorganization was effected as the Copper State

Mining Company with Martin E. Tew as president, and W. C. Stenbing as manager. Production was recommenced in November 1916 and continued to the end of 1917, since which time the property has been idle. The total production has been approximately 700,000 pounds of copper which contain a small amount of silver and gold with a gross value in all of about $137,000.

Other small properties which have produced intermittently have been the Blue Bird mine, the Sombrero Butte mine and the Bunker Hill. The Blue Bird was purchased in 1918 by Thomas N. Wills from George C. Young. Together they organized the Blue Bird Silver Mining Company. The property was developed intermittently for the next six years and in 1925 it was acquired by the Twin S. Mining Company and shipments of high grade lead-copper-silver ore were made by that company in the three years ending with 1928. The company was reorganized at the end of 1928 as the Fields Mining Corporation by Samuel Fields and Irving K. Stone of Phoenix. A development campaign was started and shipments of high grade ore were continued until the drop in the metal market at the end of 1930.

The Sombrero Butte mine was optioned in 1920 by the Magma Chief Copper Company. This company was organized originally to exploit a group of claims in the Superior district near the Magma mine. The Superior claims proving disappointing, the company optioned the Sombrero Butte mine on which considerable development work had been done by past owners. Small shipments of copper ore were started and were continued until the end of 1920. The company was reorganized in 1922 as the Magma Chief Consolidated Copper Company. The mine was further developed, and production again started in 1925, and was continued to the end of 1926. A small flotation mill was constructed at the end of the year, which was operated in 1930 for a short time.

The Bunker Hill mine, near Sombrero Butte, was acquired in 1917 by

the Bunker Hill Copper Company. Production of lead-copper ore started in 1918, which was continued to the end of the year. The mine was re-opened in 1923, and it produced intermittently to the end of 1929. The last two years the property was operated on lease account.

The Calumet and Arizona Mining Company's Copper Giant mine, which had lain idle since 1909, was leased in 1925 and again in 1929 and 1930, and a small production of copper sulphide ore was made.

Other smaller properties which operated intermittently from 1917 to 1929 were the Table Mountain, and Fortuna mines, operated by lessees.

The total production of the district has been approximately 1,400,000 pounds of copper, 2,400,000 pounds of lead, 120,700 ounces of silver, and 270 ounces of gold, worth about $511,000.

Casa Grande Area

The desert ranges in the Papago Indian country south and southwest of Casa Grande were little prospected until after the completion of the Southern Pacific railroad into Casa Grande in 1876.

The first property to be located was the Vekol Silver mine, on the west slope of the Vekol Mountains, about forty-one miles by road southwest of Casa Grande.

It was located in 1879 and was purchased shortly afterwards by Judge John D. Walker. The mine was slowly developed in the succeeding four years and high grade selected silver ore was shipped intermittently. The Tucson Star reported that 100 tons were shipped in 1881, netting $19,600. By 1883 larger shipments were made to various reduction works, and the U. S. Mint Report of that year credited the property with a production of 240 tons of ore with a value of $84,000 and reported that over 3,500 feet of work had been done on the property. The Arizona Star in its mining notes reported that in 1882 Judge Walker shipped at a rate of 10

tons a month, ore worth $300 a ton, to Denver and San Francisco, and reported a total value of $22,509 in ore shipments for 1882 from Casa Grande exclusive of Silver King shipments. A ten stamp mill was moved in 1884 by Walker from Queen Creek near the Silver King mine, but litigation with the owners of the mill prevented its use until 1885. Water was developed at the mine by sinking a 350-foot well and the stamps commenced to drop on July 8, 1885. The mill was operated steadily until about April 1889, and treated an average of about 470 tons a month.

The total production during the time was about a half a million ounces of silver worth about a half a million dollars. The mill was described in detail by Alex Trippel of Globe, reporting to the U. S. Director of the Mine for the year 1887. The mill was of ten stamps, and used the pan-amalgamation method. The pans were charged with 3000 pounds of ore, ten pounds of salt, three pounds of copper sulphate and 5/8 of a pound of quicksilver for each ton of ore. Operation was intermittent. Each run was six hours of which one hour was for grinding. The fuel consumption was 1597 1/2 cords of wood a year at a cost of $6 a cord. During the year 1887 567 1/2 tons were treated which assayed 23.03 ounces of silver. The total yield for the year was 123,181 ounces of silver bullion. The extraction for the year was 83.3 percent, and the cost of mining and milling was $14.07 or 67.3 percent of the gross production. The value realized from silver was 97.16 cents an ounce which returned a profit of $6.85 a ton of ore treated.

After the close of the mill in 1889, the ore was again carefully hand-sorted, and high-grade shipments were made to the El Paso Smelter until the death of Walker in 1894, followed shortly by the death of his brother who was also interested in the mine. Litigation then ensued between the heirs of the two brothers, and the mine was closed except at short periods.

It was not reopened until 1908 when it was bonded to a New Orleans and Texas Company. This company confined itself almost entirely to deep development work with negative results. The bond was surrendered after four years of work during which little production was made.

The mine was reopened in 1918 by a group of Phoenix men who reconditioned the mill and added concentration tables. It was planned to treat the large accumulation of mine dump, in part sorting rejects as low grade ore, but the attempt was a failure.

The mine was owned in 1929 by Paul R. Daggs of Upland, California. Its total production has been about $1,000,000, almost entirely in silver.

Several other smaller mines were discovered near the Vekol about the same time as the Vekol, the largest of which was the Great Eastern. This mine was quite extensively developed, and ore is reported to have been both shipped and treated at the Vekol mill. No reliable production records are available. Compared to the Vekol the production was probably small, and that milled was probably included in the reported Vekol production.

Reward Mine

On the eastern side of the Vekol mountains, about five miles from the Vekol mine is a group of mines whose predominent value is copper. The principal one of them was the Reward. It was discovered about the same time as the Vekol. It was acquired in 1883 by a strong company known as the Reward Mining Company. By the end of the year this company had sunk a 110-foot inclined shaft on the discovery, and reported to the director of the U. S. Mint as having 700 to 1000 tons of 26 per cent ore on the dump ready for treatment. In the following year, after the development of water in an 800-foot driven well near the shaft, a small water-jacket blast furnace was erected which was blown in in 1885 and pro-

duced according to the Tucson Star, 37,660 pounds of black copper. The drop in the price of copper to 11 cents in 1885 and to 8 3/4 cents in 1886 discouraged further work and the mine and smelter were closed for seventeen years. In 1902 the property was acquired by a British company organized as the United Arizona Copper Company. The smelter was rebuilt and enlarged to a capacity of 30 tons and a small production was made in 1903. Two years later during the boom copper market prior to the panic of 1907 the property was bonded by the Casa Grande Development Company promoted by H. B. Hovland and Hoval A. Smith. After the shipment of a small tonnage of high grade ore to El Paso in 1907 and 1908 the mine was again closed, and the option was surrendered in 1910. It passed into the hands of the present owners, Kimball Pomeroy and Dr. Schorneck of Mesa, shortly afterwards. During the World War, they shipped a little ore and did considerable development work. The last operation was the shipment of about 1000 tons of slag by lessees in 1929.

The total production of the mine has been about 450,000 pounds of copper valued at $75,000.

Christmas Gift Mine

The only other mine with any considerable production record in this part of the Vekol Mountains was the Christmas Gift mine that adjoins the Reward to the north. It was discovered about 1883 by Burnham and Chilson. A rich pocket of gold ore associated with a little galena and lead carbonate was found outcropping. After the shipment of about $5,000 worth of ore the mine was sold to Eals and Chamberlain of Ohio who continued to develop the pocket and are reported to have shipped $45,000 worth of ore, which exhausted the pocket. A little further exploratory work was done in the search for more ore with negative results, and the property was then abandoned.

Republic Prospect

Southwest of the Reward mine there are found a number of croppings of oxidized copper ore replacing limestone as pockets in close association with porphyry dikes and small stocks. Considerable work in the aggregate has been done on these showings but little production has been made.

Copperosity Mine

This copper mine, said to have been worked by the Spaniards before the Gadsden purchase, is on the southern slope of the Vekol mountains. It was discovered by American prospectors about the same time as the Vekol and Reward mines. Very little work was done until 1890 when considerable work was done under the superintendence of S. T. Bonsall, who continued to develop the one ore outcrop until 1906 when the mine was sold to the Copperosity Mining Company of Texas. Ore was shipped during the high market of 1907 after which the property was closed. No further work was done until the World War years 1915 to 1917 when the company was reorganized and refinanced. After sinking a vertical extraction shaft considerable high grade ore was shipped until 1917 when the mine was again closed. A further reorganization was effected in 1922 as the Houston-Arizona Copper Company, but no further work has been done.

The total production has been about 360,000 pounds of copper valued at about $80,000.

Lake Shore Mine

This copper property is at the southern end of Slate mountains, a typical desert hog-back ridge about eight miles east of the Vekol mountains. The ore outcrop in the bottom of a shallow arroyo was discovered in the early eighties by Trout and Atchinson. By the end of 1884 it was reported by the director of the U. S. Mint as being developed by a 112-foot shaft and by drifting, that had proved an ore body 700 feet long by 100 feet wide. The severe drop in the price of copper in 1884 dis-

couraged further work and the property was abandoned for many years.

About 1905 it was acquired by B. S. Wilson of Casa Grande, who shipped a little carefully sorted ore during the high market before the 1907 panic. In 1914 the mine was purchased from Wilson by Frank M. Leonard, the present owner. A new vertical shaft was sunk to water level, at a depth of 285 feet, and the ore body was systematically blocked on three levels. This work is reported to have developed over a million tons of low grade oxidized ore. The mine was bonded early in 1917 to the Atlas Development Company and ore was stoped from the richer northern part of the ore body, and was hauled about 17 miles to the Sasco Smelter for treatment until July of that year when the option was surrendered. Leonard continued to develop the mine in 1919, and in 1929 a small tonnage of ore was carefully sorted from the mine dumps and was hauled to Casa Grande and shipped.

The total production has been approximately 200,000 pounds of copper valued at about $64,000.

Jack Rabbit, Turning Point, Desert Queen and Orizaba Prospects

These silver prospects are found at the north end of Slate mountain. The first to be found was the Jack Rabbit. According to U. S. mine reports, a little carefully-sorted 300-ounce silver ore was shipped in 1883. The following year the Orizaba mine reported the shipment of 5 tons that netted $2000 in silver, and also reported 600 tons of $5 to $100 silver ore on the dumps. But little further work was done until 1892 when the Jack Rabbit mine was acquired by the Casa Grande Copper and Gold Mining Company of Denver. The mine was developed intermittently in the succeeding ten years, but little production was made. A large flow of water was encountered at a depth of 250 feet. A cyanide plant was erected in 1901 but was not a success.

In 1908 the mine passed to the hands of the Tube City Mining and Milling Company of McKeesport, Pa. The main shaft was sunk against a large flow of water to a depth of 400 feet and a little rich ore was sacked and shipped. The mine was abandoned in 1910.

The Turning Point that adjoins the Jack Rabbit on the west was found at the same time, but was not developed until 1890. A small stamp mill was erected in 1902 but little ore was treated, and the production from the mine has been small.

The Desert Queen mine adjoining the Jack Rabbit to the south was first worked from 1905 to 1907 by the Desert Queen Gold Mining Company. Considerable shallow work was done and a 4-stamp Tremain mill was built, but little production was made.

The Orizaba mine, about two miles northwest of the Jack Rabbit in one of a number of foot-hills of Slate Mountain, was abandoned after the work in the early eighties until 1915 when the mine was developed by a deep vertical shaft, and a small mill was erected. But little production was made, and the mine has been virtually abandoned since, except for intermittent lessees' operations, chiefly from 1923 to 1925.

The total production of the four mines has been small. About $20,000 in silver was probably shipped in the early eighties, and probably an equal amount in later years.

Old Mammon Mine

This gold mine was discovered in the central part of Slate mountain in 1892 by John Morand and Peterson, who organized a small company to exploit it. By 1893 a well had been sunk and a twenty-stamp mill had been completed which was operated intermittently until 1897. About 2500 tons of ore were treated which netted about $14 in gold. The total yield was about $35,000. The property is now owned by Mrs. Elizabeth Elliot of Casa Grande.

Silver Reef or Nugget Mine

This old silver prospect in the Silver Reef range of hills north Slate mountain was probably discovered in the early eighties although no mention is made of it in the U. S. Mint reports. The first extensive work was done in 1905 by a company known as the Arizona Mercantile Transportation and Smelting Company. A 20-stamp mill and a 50-ton cyanide plant were erected, but after a short mill-run the mine was closed. It remained idle until 1914 when it was relocated by B. S. Wilson of Casa Grande who discovered a new vein about 2000 feet east of the old workings, and shipped about 1000 tons of silver ore during the high market of the late World War years. The mine was purchased in 1919 by Frank M. Leonard and associates, Charles B. Leonard, Frank Boyer, James W. Gerard and John Hays Hammond. A two-compartment shaft was sunk on the vein mined by Wilson after which the mine was again closed. In 1925 Frank M. Leonard, Jr. obtained a lease on the part of the property and shipped 1000 tons of 22-ounce silicious ore left by Wilson in the walls of the vein. He continued to ship at about the same rate until 1929 when the mine was bonded to the Silver Reef Mining and Milling Company promoted by Percy Williams. A deep extraction tunnel was driven and 250 tons of silicious 15-ounce silver ore were shipped after which the option was surrendered.

The total recorded production has been about $60,000 in silver.

Greenback Mine

This gold prospect in the Cimarron hills south of the Vekol mountains, attracted considerable attention due to the rich discovery ore. The mine was originally located as a copper prospect in the nineties, but little work was done until 1916 when ten claims covering the copper-stained outcrops were located by Humphrey of Casa Grande which were purchased in the succeeding year by Paul Henshaw of the same city.

Other claims were added to the group in the following year, more notably a group known as the Greenback, covering the principal outcrop of a prominent series of quartz ledges. The Pinal Grande Mining Company was then organized to exploit the copper claims, and in 1919 a 289-foot churn drill hole was sunk to water level in low-grade oxidized copper ore. Work was discontinued on the break in the copper market in 1920.

Early in 1921 John Anneshfky, who had been left as caretaker, located three claims covering a part of the quartz ledges as the Silver Queen group, and discovered an outcrop of gold ore said to have assayed $20 a ton. The group was shortly optioned to the Vindicator Gold Mining company of Cripple Creek. A 96-foot shaft was sunk by this company on the discovery ore, but as the values ceased at a depth of 50 feet the option was surrendered. The claims were then bought by the Pinal Grande Mining Company. After driving a short drift from the bottom of the ore pocket, work was stopped. In the following year a second high-grade pocket was found on the Greenback group, about 2000 feet to the east of the Silver Queen discovery. Considerable interest was around in the mine, and in 1924 Hinshaw and Frank Royer of Los Angeles organized the Greenback Gold Mining Company to take over all the assets of the Pinal Grande Mining Company. The Greenback shaft was sunk on the new discovery to a depth of about 100 feet, but as values again ceased at a depth of 50 feet and as the vein proved hard to follow, work was transferred to the Silver Queen discovery shaft. The 96-foot shaft was christened the Pinal and was sunk to a depth of 473 feet, and lateral work was driven on two levels. Occasional small pockets of ore were cut but no ore bodies of commercial size or grade. More work was done at the Greenback shaft also with negative results. The Pinal shaft was then sunk to a depth of 688 feet against a small flow of water below the 500-foot level. After

a little deeper lateral work with negative results, the work was dropped in December 1926 and left in the hands of a caretaker. The property is now claimed by Frank M. Leonard through purchase from a relocater of the ground.

Papago Prospect

This mine also in the Cimarron hills several miles west of the Greenback mine was located prior to 1902 and a little work was done. It was relocated in 1902 by W. T. Davis and wife who built a cabin on the ground where Davis now lives.

In 1926 the ground was optioned by the Papago Gold Mining Company by Casa Grande capitalists. This company has done a considerable surface trenching and shallow shaft sinking on a prominent wide quartz ledge. Careful sampling has demonstrated the outcrop of a wide ledge of low grade gold ore. This work was in progress up to 1932 when it was stopped pending a decision on the status of mining claims in the Papago Indian Reservation.

The total production of the Casa Grande area, all of which is included in the Papago Indian Reservation, has been approximately $1,500,000, in silver, copper and gold.

Tortolito Mountain Area

The silver and gold deposits of the Tortolito mountains north of Tucson were discovered in the late seventies or early eighties. The first work done was by the Jesse Benton Mining Company which acquired the By Chance and Lone Mill claims in 1881. The ore was worked in a very crude manner in arrastras until 1884, when a five stamp mill was erected. The better grade ore was shipped to the Burns Smelter and the second class ore was milled. The Tucson Star reported a production of $48,300 for the year 1884 and $62,868 for the following year. There are no further detailed reports for the district until 1887 and 1888 when a

5-stamp mill was used to work gold ores at the Tortolitos with a production in 1887 of $10,000. The mill was reported by the Star as operating steadily in 1888 with an abundance of good ore. The district was abandoned in the late eighties and remained dormant until 1923, when the Vaquero, Star and Cintas de Plata claims were worked and a little gold-silver ore was shipped. In 1925 Wayside and Cintas do Plata claims were purchased by a company which shipped a small quantity of copper ore in 1925 and 1929.

The district has produced about $136,000 in silver, gold, and copper.

Northern Catalina Mountains

The principal production in that part of the Catalina mountains in Pinal county has come from the Southern Belle gold mine southeast of Oracle, and from the Canada del Oro placers. Other prospect which have been operated intermittently are the Copper Hill copper prospect, the American Flag, Mandina, Guadeloupa, Colonel Bill, Cuba, Superior, Farris, Golden Eagle, and the Pearl and Sunset, operated by the Dripping Springs Copper Company.

The Southern Belle mine was opened in 1884. The production was small, probably not over $20,000 in gold. Neighboring claims, more notably the Mandina, Guadalupa and Colonel Bill, were developed in 1905 and 1906 and the ore was reduced in a 3-stamp mill equipped with Wilfleys. The production was small. This group was operated by the Cody-Dyer Mining and Milling Company, and was financed by Colonel Cody (Buffalo Bill). The veins were worked at first for gold and later for schulite (calcium tungstate). The largest output of schulite was made in 1913. The venture was not a financial success, and operations were suspended in 1914.

Goldfield District

1910 Small production reported from revival of one of old mines and production from test milling plant.

1911 Total gold county (Pinal) from amalgamates 3795 tons yielded 666.96 ounces. Au.= $13,800. From Mammoth and Goldfield Mines. 10 stamp mill at Mammoth. Depth 465 feet at Mammoth.

1912 No reports.

1913 10 stamp mill and 50-ton cyanide plant of Mammoth operated part of year. 304 tons milled.

1914 Production from 3 properties largest being Young Mining Company with 10 stamp 50 ton cyanide plant. 4336 tons 1937.5 ounces $40,000 from Young Mining Company = $9 ou.

1915 Total 1003 tons 535.96 oz. = 11078
Mammoth group (Young Mining Company) principal producer.
20 stamp 50 ton cyanide plant operated 3 months. $11 ou.

1916 Young Mines produced.

1917 No production.

1918 No production.

1919 Nothing.

1920 Buckham and Boulder properties shipped small quantities.

1921 Nothing.

1922 Nothing.

1923 Lessees worked Goldfield Mining and Milling Company in 5-ton Gibson Mill (amalgamate).

1924 Lessees operated but did not produce.

1925 Young Mines Company (Mammoth Property) Total 180 tons = $2791.

1926 Young Mines Company idle. Both concentrates shipped from other mines.

1927

1928 Nothing.

1929 221 tons from 3 mines (principal Young Mines Company reorganized as Apache Trail Gold Mining Company) which operated 6 months treated in 10 stamp amalgamate mill. Property leased in December 8 Metallurgical Research and Mining Company of Denver. 221 tons = 1165 = $5 ou.

1930 Metallurgical Research and Mining Company of Denver produced 100 tons. <?>

CHAPTER 16

MOHAVE COUNTY

The first recorded discovery of mineral in the county was made in 1863. In that year Carleton's California Volunteers, on their way to Tucson to drive out the Texas Confederate troops, arrived at the Colorado River, crossed somewhere near Needles, and established a camp at Fort Mohave. Carleton's troops were made up for the most part of miners, and they were accompanied by a following of miners. One of these, John Moss, discovered the rich gold outcrop of the Moss Vein, about 5 1/2 miles northwest of the present town of Oatman, in the Black or River Range. From this outcrop Moss is said to have shipped $240,000 back to San Francisco in the first year's operation. A rush of California prospectors ensued, and most of the more prominent ledges in the Black Range were located. One of the more active of the early pioneers was W. H. Hardy, who located the Hardy lode, south of the Moss, built a mill to treat his own and customs ore, and established the first settlement, named Hardyville, on the river west of the Moss and Hardy mines, where the mill was built. The Moss lode proved to be the only spectacular find made, and to be only a superficial pocket of high grade ore in a large low grade deposit, which has not been successfully worked since.

The first rush of prospectors in 1863 and 1864 spread over the Cerbat and Wallapai Ranges to the East of the Black Range. Many locations were made especially in the Chloride-Mineral Park belt, but the hostility of the Northern Wallapai Indians prevented any work being done

until 1870, when they were persuaded to enter the reservation set aside for them north of Truxton and Peach Springs.

In 1870 and 1871 a second rush into the Cerbat Range was made, and the town of Hardyville and the mines in the Black Range were almost completely abandoned. Camps were established at Chloride, Mineral Park, Cerbat, and Stockton to work the small but rich silver chloride outcrops of this mineral area. The ore was packed 30 miles to the Colorado River, and shipped either to San Francisco or Swansea, Wales. By 1873 crude furnaces and mills were built at Mineral Park and during that year J. Ross Browne reported in mineral resources 124 tons of crude ore, valued at $500 a ton, and 9 tons of base bullion valued at $600 a ton, were shipped to San Francisco, a total production of $67,400 in gold and silver, lead not being paid for. The first large mill, at Mineral Park, was put up in 1876.

The more prominent of the early pioneers were W. H. Hardy, John Moss, Parker, and T. S. Cristy. The more prominent mines worked were the Buckeye, Alcran, Union, Sixty Three, Lone Star, Keystone, Cupal, Metallic Accident, Porter and Black Smoke, Mayflower, Vanderbilt, Idaho, and Oro Plata. The rich surface ore in most of these mines soon played out and was replaced by base ores of lead, copper and zinc. By 1891 but little work was being done in the district. The completion of the Atlantic and Pacific Railroad in 1882 allowed for the treatment of lower grade ores, but base ore treatment was not generally tried until several years later. The collapse of the silver market in 1892 and 1893 added to the depressed state of the district.

During the summer of 1892, the very rich outcrops of silver chloride ore were discovered at Indian Secret, twenty miles north of Chloride, later called White Hills. These were shown to Henry Schaefer, a prospector

at Gold Basin, 12 miles east, by an Indian, Wallapai Jeff. After making several locations, Schaefer returned to Gold Basin and came back to the find with John Burnett and John Sullivan. These three located most of the prominent ledges, and started mining. The more important of these locations were Chief of Hill, Defiance, Garfield, G. A. R., Horn Silver, Norma, and Occident, all lying within an area of two square miles. A rush of miners soon followed, and ore running up to 3000 ounces of silver and several ounces of gold was taken out from near the surface, and hauled to the sampling works at Kingman. By the beginning of November 1892, five months after the discovery, the principal mines were acquired by a Denver syndicate, headed by R. T. Root and D. M. Moffatt, who paid $250,000 for them. They equipped the more important shafts and built a mill to treat the dumps of low grade material which had accumulated. In January 1893 the camp had a population of 600 and is reported to have reached its largest growth, 1200, in 1894. The Denver syndicate sold out in 1895 to an English syndicate for $1,500,000. This company elaborately equipped the property, with a 40 stamp mill, and large hoists, and built a model town with water mains, electric lights, telephone and other improvements. Theodore Comstock reported White Hills as the largest mining center in Mohave County in 1898, with two companies operating, the White Hills Mining Company and the Excelsior Mining Company. The camp continued active until 1901. The last strike of high grade ore was made in the Occident Mine in September 1900 at a depth of 650 feet. After the exhaustion of this ore, the mines were turned over to lessees in 1902, but were almost completely abandoned when Moffatt, for the original Denver syndicate, attached the property for $26,000, due on purchase price, and bought it in at sheriff's sale. The production, all in high grade silver ore, mostly from the G. A. R., Prince Albert, Horn Silver, Chief of Hill,

Schaefer's Treasure, and Occident, is generally reported as $3,000,000. The average grade, as shown from the sheets of the Kingman Sampling Works from 1893 to 1895, was about 500 ounces of silver and from $10 to $100 in gold. The greater bulk of the ore came from depths less than 200 feet.

The camp is now being revived by the White Hills Silver Mines, Inc. of Los Angeles who are testing the G. A. R. Mine at greater depths than reached by the old company. Some encouraging finds have been reported.

During 1894, 1895, and 1896 the Samoa, Tennessee, Tuckahoe, and Minnesota mines at Chloride were worked intermittently, the Samoa by the Chloride Gold Mining Company of Denver. Only high grade ore was mined, which was hauled to Kingman and sold to the sampling works.

Production records from 1871 to 1896 inclusive are very meager for the camps of Chloride, Mineral Park, Cerbat, and Stockton. From 1871 to 1882 it probably averaged about that of 1873, $70,000. After the completion of the railroad, double this production of $140,000 can be safely assumed. Using these assumptions the production would be $2,810,000 for the 27 years' period, without including the White Hills production. Schraeder's estimate of individual mines sums up to about $3,700,000 for this period. A production of $3,000,000 would not be far off.

In the latter part of 1896 Chloride entered into a new phase in its development, with the organization of the Security Mining and Development Company, a Scotch syndicate, to operate the base ore of the Elkhart Mine. Theodore B. Comstock was put in charge, and a large concentrating plant built in 1897. By the end of 1897 the Tennessee and Schuylkill mines on the same large Elkhart Vein were being developed by the Wallapai Mining Company and the Southwestern Mining Company respectively, and the Tennessee completed a concentrator by the end of 1898. In 1895 John Barry started developing the Minnesota-Connor mine in Chloride and shipped a little high

grade gold-silver ore to the Kingman Sampling Works. In August 1898 the Merrimac Mining Company was organized by Cleland to work the Merrimac mine.

All this activity at and near Chloride was instrumental in the organization of the Arizona and Utah Railroad Company. This company started grading for a road from Kingman to Chloride sometime in 1898 and started regular train service in 1899.

The Security Mining and Development Company developed and operated the Elkhart mine under the management of Comstock until sometime in 1901, and under the management of J. M. Scratton until February 1902. During this period the mine produced at the rate of about 100-200 tons of concentrates a month. Assuming an average production of 150 tons a month, the gross production from 1897 to 1902 was about $450,000. In October 1902 the property was abandoned and the equipment was acquired by a new company, who rebuilt the mill, and operated until June 1903 under the management of C. Barmose. During this period about 140 tons a week of concentrates were shipped, a total production of about $45,000. The mine has lain idle since.

The Wallapai Mining Company operated the Tennessee Mine under the management of E. T. Loy from the first of the year 1898 to December 1899, during which 60 tons of $50 ore was shipped a week. In March 1899 a 120-ton concentrator was completed which started milling a 5000-ton accumulation of low grade ore. This mill turned out 30 tons of $50 concentrates a day. E. T. Loy was replaced in 1899 by J. A. Botsford. Up to 1899 the gross production was about $717,000. The mine and mill ran continuously until November 30th, 1901, during which time the capacity of the concentrator was increased to 150 tons. Operations were resumed under a new smelter contract with El Paso instead of Pueblo, in April 1902, and the capacity of the mill increased to 200 tons in June 1902, but

water shortage prevented running full capacity, and the production was much curtailed in September due to lack of sufficient development work. During this five month period about $225,000 was produced. For the next four months the shaft was deepened to the 600-foot level, and considerable lateral work done on the 500-foot level, and in January 1903 the mill was started up again, but the mine and mill were run only intermittently during the year, and in October 1903 the pumps were pulled and the property abandoned. During 1903 about $105,000 was produced. The mine remained dormat until taken over in 1909 by the United States Smelting, Refining and Mining Company.

The Southwestern Mining Company operated the Schuylkill until the end of 1898, after sinking to the 250 foot level. Work was resumed in 1901, and the mine was worked under the management of W. D. O'Neil. The shaft was sunk to the 500-foot level and much lateral work done. The first ore shipment was made in May 1902, and the mine closed in June 1902, after shipping a small tonnage of ore.

In the early part of 1901 E. T. Loy, formerly manager of the Tennessee Mine, acquired the Minnesota-Connor mine and other holdings from John Barry, and organized the Philadelphia and Arizona Mining Company. The Minnesota-Connor mine was actively developed, and a 200-ton concentrator completed by March 1st, 1902. For four months about 100 tons of concentrates were shipped a day, but the water supply proved insufficient, and the mill was forced to close in August. During the shutdown the mine was developed, and good ore found on the 300-foot level. The mill was reopened at half capacity in March 1903, and some high grade ore was shipped direct, but the property was again closed except for intermittent work in June 1903. The production during this time was about $500,000. In the early part of 1904 the mill was renovated, and in March started work onaa 250,000-ton mine dump, and ran until June 1st.

In October all the holdings of the Philadelphia and Arizona Company were leased to the Lehigh and Arizona Mining Company, which company operated the mill on old mine dump until the end of 1906.

The Merrimac Mining Company operated the Merrimac Mine until October 1901. By December 1899 the shaft had been deepened to 400 feet, and by June 1st, 1900, a mill of 10 stamps was started, which ran intermittently through 1900 and 1901. The venture was a disappointment, as the deeper parts of the vein proved too low grade. The values were gold and silver with pyrite, and the ore was treated by cyanidation and amalgamation.

After the completion of the railroad to Chloride in 1899, several of the smaller mines of Chloride, Mineral Park, and Cerbat were worked more or less regularly, the principal ones being the Altata, Tuckahoe, Lucky Boy, Samoa, Sunrise, and Paymaster of Chloride; the Nighthawk, Tub, Golconda, Rico, Climax, Alpha, Oro, Plata, Tom Dick, Vanderbilt and Golden Gem of Cerbat; and the Queen Bee, Keystone, Ark, Metallic Accident, Woodchopper's Relief, Home Pastime, Lone Star, and Lady Bug of Mineral Park.

In the spring of 1902 the owners of the Pinkham copper mine at Chloride after developing the mine started grading for a smelter at Chloride. The smelter was blown in in July 1902, and a lead stack added in October. The venture did not prove profitable due to faulty design and lack of cheap flux, and closed down in December 1902.

On the eastern slopes of the Cerbat Range, at the mines centering around Stockton and Acme, the developments were carried on more or less independently of those on the Western slope. The Arizona and Utah Railroad did not make these camps any more accessible than before it was built. After the exhaustion of the rich surface bonanza ore in the 705 and 805, when the old C. O. D. Mine, with a $500,000 production record

from 1875 to 1892, was bonded to Henry S. McKay. He organized the C.O.D. Mines Company, and by December 1901 a 40-ton concentrator was running. The mine and mill were worked actively until the end of 1904 with a production of about $50,000.

In March 1902 the Treasure Hill Mining Company was organized to work the Treasure Hill Mine at Stockton Hill, and continued work until the summer of 1904, with a total production of about $50,000.

In March 1904 the Stockton Hill Mining Company acquired the Cupel Mine, opened up the old workings and shipped considerable high grade ore. Other properties were acquired but little work was done on them.

The total production of the Cerbat Range deposits from 1897 to 1905 inclusive was about $2,400,000, mostly from the Tennessee, Elkhart, Minnesota-Connor, C. O. D., and Treasure Hill mines.

In 1904 the Star Spangled Banner at Stockton Hill and the Champion at Cerbat were acquired by the Arizona-Mexican Mining and Smelting Company, a subsidiary of the United States Smelting, Refining and Mining Company. This company in 1904 started the erection of a lead smelter at Needles, California, completed early in 1906. This had a greatly stimulating effect on all the mines of the Cerbat Range, and especially those of Cerbat and Stockton Hill.

In 1905 the Golconda Mine, which had been opened up as a zinc mine in 1902, was acquired by the Union Basin Mining Company. This company actively developed the mine and started shipping high grade zinc ore in 1907. These shipments were continued until 1910, when the company installed a 200-ton flotation concentrator, and materially increased production. The mine and mill were actively worked until end of 1907, when the concentrator was destroyed by fire. As the zinc market collapsed shortly before this, the mine was abandoned after developing the vein to a depth of 1400 feet.

In 1905 the United States Smelting, Refining and Mining Company, working through a subsidiary company known first as the Arizona-Mexican Mining and Smelting Company, and later as the Needles Mining and Smelting Company, started active work on the Banner and Champion mines and shipped the ore to their smelter at Needles. In 1909 these mines were turned over to lessees and the company took over the Tennessee Mine under 10 years' lease and bond. This mine had lain idle since 1903, and the old shaft was in such bad condition that it was found necessary to sink a new vertical shaft. The mine was actively exploited and the ore shipped to the company's customs concentrator at Needles. In 1913 the lead smelter was closed, and the concentrator only was run on Tennessee and customs ore. Lead concentrates were shipped to Midvale, Utah, and zinc concentrates to Eastern retort plants.

During the high zinc and lead market of 1915, 1916, and 1917, the mine and mill were run at capacity. On the collapse of the zinc market towards the end of 1917, they were both closed and have not been opened up since. The mine was developed to a depth of 1600 feet.

The operations of both these mines was of the utmost importance to the district, as the continuation of the primary zinc-lead ore in the layer veins to indefinite depths was proved.

Since the closing down of the Tennessee and Golconda mines, the Cerbat Range has been relatively quiet. The Golconda was purchased by Bell in 1919, who organized the Highland Mining Company, and erected a 100-ton flotation mill. The low zinc market and the high freight and treatment charges prevented the undertaking being profitable. At present the Golconda, Oro Plata and other mines have been consolidated into the Oro Golconda Mining Company, who are driving a deep extraction tunnel to exploit their ground.

The Tennessee has been practically idle except for a little development work between the Tennessee and Schuylkill since its close in 1917. A reorganization known as the Monarch Lead Company has recently taken place to work the Tennessee and Schuylkill mines together, under the management of Mr. M. J. Keily. A vigorous development campaign is scheduled.

In 1920 the Hidden Treasure group was optioned, and the Chloride Mining Company organized to develop the ground under the management of Frank C. Smith. A deep cross-cut tunnel was driven and considerable work done to develop the principal vein. The values are in lead, zinc, silver, and gold. In 1925 further money was raised to build a 200-ton differential flotation concentrator. This was completed in 1926, and was run more or less regularly on its own and customs ore until the end of 1927, when the drop in the price of both lead and zinc caused suspension of work.

At Stockton Hill all the holdings of different companies were optioned and worked in a small way through several organizations, the principal one being the Comstock Silver Mines Company, organized by Frank N. Manson. A small differential flotation concentrator was erected in 1921 and was run intermittently through 1927. It is now idle. Recently all the more important Stockton Hill Mines were optioned by Manson and turned over on bond and lease to the Old Colony Mines, Ltd., who plan a vigorous development campaign in the near future.

The chief difficulty experienced with the deep base ore of the Cerbat Range is the high treatment charge on zinc concentrates, made necessary by their high gold and silver content. As zinc blende is the principal content of most of the ores, this has proved a serious drawback to their exploitation, except during times of abnormally high zinc market. An attempt is now being made to meet this condition by J. S. Murray

and associates, operating the Twentieth Century Mine at Chloride. They have erected a plant at Kingman to subject the zinc concentrates to a chloridizing roast, thereby making a differential separation of the lead-gold-silver, and the zinc, which are precipitated from the vaporous state in a bag house. The clean zinc product is then to be shipped to the retort plants, commanding the minimum rate, and the leady gold-silver product shipped to a lead smelter.

The old Schenectady Mine is now being reopened by the Great Tennessee Mining Company at Chloride, and intermittent work is being done at a number of small properties at Chloride, Mineral Park, Cerbat and Stockton Hill.

The total production of the Cerbat Range from 1906 to 1925 inclusive was according to the figures in Mineral Resources, $13,014,100, chiefly from the Golconda, Tennessee, and Banner mines, over twice the total previous production from 1871 to 1905, and the greater part made during the years 1909 to 1917 inclusive.

The Black Hills gold camps comprising the settlements of Hardyville, Oatman, Gold Road, Thumb Butte and Katherine, although the first to be discovered, were the last to be extensively exploited.

After the abandonment of Hardyville in 1871, practically no work was done until 1897, when Thomas Ewing and Grayson of San Francisco bonded the Sheep Trail mines, west of the present settlement of Katherine, from Monaghan and Murphy. By May 1898 they were employing 15 to 20 men in development work and building a 10-stamp mill. After working the mine in a desultry way for a year, it was sold in February 1899 to the Arizona and New England Company of Boston, who actively developed the mine, and enlarged the mill to 20 stamps. The gold proved too fine to be caught satisfactorily on the plates, and the mine and mill were closed towards the end of 1900. The tailings were cyanided in 1902 by Davis and Avery.

In the early part of 1903 work was done towards developing the Katherine Mine, discovered in 1900. The Sheep Trail and Katherine were acquired by the New Comstock Mining Company of San Francisco. The Katherine was developed to the 300 foot level, and the Sheep Trail mill reconditioned, and a test run made of 600 tons of Katherine ore. In December 1903 the mine was leased to the North American Exploration Company, who mined out the richer parts of the vein down to the 300-foot level, and closed early in 1904.

In October 1900 bonanza ore was found in the Gold Road vein by a Mexican prospector, Joe Jeneres, grubstaked by Henry Levin of Kingman. The mine was acquired soon after by Joseph Burkhart and Byron Erichbrecher, who followed the rich ore down to a depth of 200 feet. In December 1901 they bonded the mine to Col. O. P. Posey, Clarence K. McCormick and William Bayley of Salt Lake City, who did considerable work on the property, and in July 1902 incorporated a $1,500,000 company and raised most of the money in France. The mine was actively developed, 50 men being employed by September, and a cyanide plant started. By February 1903, 150 men were employed at the mine and in grading for a 150-ton cyanide plant. The mill was completed in June 1903. The first cyanide clean-up yielded 383 ounces of gold in July. The force at the mine was increased to 300 men and regular weekly bullion shipments made of $12,000 to $30,000 up to the end of 1907, with a total gross production of about $2,250,000, mostly in gold. In 1908 and 1909 the mine production was much curtailed and development work pushed, and the mill run on part time.

Full production started again towards the end of 1909, and in July 1911 the property was sold to the Needles Mining and Smelting Company, a subsidiary of the United States Smelting, Refining and Mining Company. This company operated until the end of 1916, when the mine was exhausted except for a small tonnage left in the upper level. In 1922 and 1923, it

was reopened and 31,109 tons of this ore was treated. The mine closed down at the end of the year, and only intermittent work has been done since by lessees.

The strike in 1900 at the Gold Road started active search for similar deposits, and a boom was soon started. The first venture to start after the Gold Road was the Leland and Mitchel, optioned October 1901 from West and Bedell by Col. Thomas Ewing of San Francisco. Regular shipments of high grade ore were under way by April 1902. In September 1902 the property was bonded to the Mohave Gold Mining Company of San Francisco, who, without adequately developing the mine, started elaborately to equip it for production. A large ore-bin was built at the entrance of the lower extraction tunnel, a 40-stamp mill was put up on the flat, 7 miles from the river and 10 miles below the mine, and a subsidiary company, known as the Mohave and Milltown Railroad Company, built a narrow gage railroad from the mine to the mill, and from the mill to a point opposite Needles on the Colorado River. The mill was started in January 1904 and ran part of the year, but the ore proved too low grade, and the mine closed and has not opened since. A divident of $25,000 was paid and a total production of $45,000 made. At least ten times this amount was spent in equipment.

During the summer of 1902 the German-American Mining Company was organized to work a group of 20 claims near the Leland. In December 1902 the property was bonded to the Gold Road Company, who did some work in 1903 and relinquished their bond. The property was worked intermittently from 1903 to 1906 and the ore treated in a 10-stamp mill and cyanide plant, erected in 1903. About $27,000 was produced.

The Blue Ridge vein, later known as the Tom Reed, was located in the first rush after the Gold Road strike, in 1900, and was shortly afterward owned by Eli Hilty, Jo Anderson, and T. Tooker of Chloride. The mine

was bonded in March 1902 to Capt. De La Mar, but the bond relinquished. In 1903 the mine was bonded to the Gold Road Company, who sank two shafts, one on the Ben Harrison and one on the Tom Reed, both to a depth of about 100 feet. The ore in both shafts was low grade and the bond relinquished without further work.

Sometime during the summer of 1904 the property was bonded to the Blue Ridge Gold Mining Company for $75,000, $7,500 down. This company equipped the property with a 20-stamp mill, sank the Ben Harrison shaft to a depth of 200 feet, and did considerable stoping. The company was unable to meet its payments, and in June 1905 was closed after a production of about $100,000. The property passed into the hands of the Title Insurance and Trust Company of Los Angeles. In December 1906 they sold the mine to the Tom Reed Gold Mining Company of Pasadena, the present owners. This company actively developed, equipped it with a 40-ton mill of 10 stamps, and started production in February 1908. A moderate production was made in 1908 and 1909, and in 1909 the mill was entirely rebuilt and electrified, using power from the Kingman Power Company. From 1910 to June 1924 the mine and mill were run steadily on ore from the Tom Reed, Ben Harrison and Gray Eagle ore-bodies, and was then turned over on lease account to Jack Shank, formerly assayer for the company. He worked the mine on a reduced scale, and ran the mill as a customs plant during 1924, 1925 and 1926, and developed a new ore-body in ground adjoining the Gray Eagle. In 1927 the company decided to work this new ore-body and took over the mine, putting Shank in charge as superintendent. The mill was run part of the year on customs and company ore, but was closed down to await decision on sinking a new extration shaft for the Gray Eagle ore. Towards the end of 1927 a 1000-foot shaft was started by the Tom Reed and Gold Ore companies jointly, and the mill was reopened in January 1928, and is now running as a customs plant. In the early boom

period, other noteworthy promotions were the Swiss-American Mining Company, operating the Ben Doran Claim in 1904; the Leonora Mill at Hardyville, started in December 1901 and run on ore from the Hardy and Moss veins until September 1902; the Richardson Brothers Claims in Union Pass, located in 1902 and bonded to the Portales de Oro Mining Company who operated during part of 1903; the Virginia Mine in the Weaver district, west of Chloride, which started up in 1902 and operated a 10-stamp mill in 1903; the Mossback mine, opened up by S. M. Slocum in 1904; and the Victor-Vivian (later located as the Gold Dust), worked in 1904 and 1905 by Col. Thomas Ewing and later sold to the Victor Paymaster Company, who built a 20-stamp mill and operated a part of 1908. By 1909 the district had settled down to a two-mine district, and only spasmodic work was done on ground not held by either the Gold Road or Tom Reed.

In 1913 J. L. McIver and George Long optioned the Tom Reed Extension claim, through which a split portion of the Tom Reed vein was known to pass. The surface exposure of this split portion was very weak, but the vein was strong underground. Work had been done on this split vein for a short distance by the Tom Reed, but with little encouragement. McIver and Long were convinced that there was a possibility of an ore shoot ahead of the work done. They incorporated the United Eastern Mining Company in November 1913, and raised sufficient money to start a shaft in March 1914. After sinking 40 feet, work was stopped until more money could be raised to take up the option on the ground and do the necessary development work. With the aid of W. K. Ridenour $13,000 had been raised, but it was not until the venture was brought to the attention of Frank A. Keith, who enlisted the aid of Seeley W. Mudd and Philip Wiseman, that sufficient capital was raised. In the latter part of 1914 the shaft work was resumed and in March 1915 a cross-cut on the 465-foot level

went through 25 feet of $22.93 ore. By the end of 1916 a $6,000,000 ore-body had been blocked out, a 200 ton cyanide mill built and a new shaft in the hanging was completed and equipped. The ore from development work was treated in the Gold Road mill. In 1917 the new mill started up and continued uninterruptedly until June 1924, when the mine was exhausted.

The strike at the United Eastern, on ground with very meager surface showings, started a boom in the district, a great many promotions were started, and a large amount of money spent. Only one successful venture emerged, that of the Big Jim, which struck and developed the faulted segment of the Gray Eagle vein of the Tom Reed Company. In 1917 the Big Jim was sold to the United Eastern, and immediately suit was filed by the Tom Reed against the United Eastern, claiming apex rights on Big Jim ore. The case was tried at Kingman, starting March 25th, 1921, and decided against the Tom Reed on the grounds that the amount of horizontal throw could not be proved. The decision was upheld, on appeal to the Supreme Court of Arizona, in September 1922.

Before the abandonment of both the United Eastern and Tom Reed mines, considerable work was done with diamond drills to test the possibilities at depth, but with discouraging results.

From June 1924 to date, the only noteworthy new development at Oatman besides the Gray Eagle ore, has been the development on the Sunnyside vein by the Sunnyside Consolidated Mining Company. The vein is proving to be rich, although not as wide as the Tom Reed or United Eastern. The Western Apex Mining Company has had moderate success in developing a low grade vein on their ground.

In 1921 the New Comstock Mining Company, which still held title to the Katherine and Sheep Trail mines west of Union Pass, decided to develop the Katherine vein. A subsidiary company, the Katherine Gold

Mining Company, was organized, a new shaft sunk to the 600-foot level, a cyanide mill and diesel plant installed, and production started in 1925. In 1927 the shaft was further sunk to 900 feet, and considerable reserves blocked out. The vein is a wide one, but is badly disturbed by thrust faulting. The success of the Katherine caused a small boom in the vicinity from 1925 to 1927, but no further mines have been developed, although work is still under way.

From 1900 to 1925 inclusive the production of the Black Mountains, including Oatman, Gold Road, Union Pass, Katherine, and Weaver, has been 2,410,500 tons with a gross value, mostly in gold of $31,438,900.

In the Wallapai Mountains the most important producer was the American Flag mine, located in 1874 by W. M. Shoulters, and sold to Pemberthy, Prisk, and Corin, who did most of the work, mined out the rich silver ore, and shipped it to San Francisco and Swansea, in the next ten years. The production is reported as about $400,000. The mine was reopened in July 1902, but little work was done.

In November 1902 the Enterprise Mining Company optioned the Enterprise mine, north of the American Flag, and started work. The mine was developed to June 1903, when construction was started on a 100-ton mill, completed by September. By March 1904 ore and concentrates were being shipped, and the mine was worked until June 1904, when the option was surrendered. The primary ore consists of complex sulphides of copper, lead, and zinc. Since the close of the Enterprise, but little work has been done in the northern part of the Wallapais.

On the southeast slopes of the Wallapai Mountains, near the settlement of Cedar, the first recorded work was by a company known as the Cedar Valley Gold and Silver Mining Company, starting November 1896 on two gold-silver veins. A 5-stamp mill, worked by the previous operators was

enlarged to 15 stamps, and work continued under the management of George Fisher into 1898. No further records of this company are on hand until March 1904, when the Queen Mine operated by a company of the same name was reported to have opened up some rich silver ore, to have finished a wagon road by May of the same year and to have been running on good ore at the end of the year. The mine was idle in 1905 and 1906 but was opened up by a new company in 1907, but closed soon afterwards. The production was small.

In September 1902 the San Francisco mine was acquired by the Yucca Cyanide Mining and Milling Company, who started to develop and equip. By February 1903 the shaft had been sunk 300 feet, and a 50-ton mill was installed. By March 1904 the shaft had been deepened to 400 feet, where the vein was reported as 20 inches thick. The mine and mill were run to the end of 1907 with a total depth reached of 600 feet. The production was not great.

The Cedar district was quiet until 1911, when the Yucca-Arizona Copper Company was organized to develop a strong copper ledge. Most of the work was done in 1914, after which the property was sold.

In October 1914 the Leviathan Mines Company was organized to develop a strong ledge of copper and molybdenite ore. Considerable ore was mined in 1916, 1917, and 1918, and was treated in a concentrator making a bulk concentrate of copper and molybdenum sulphides, running 15% molybdenum. This concentrate was shipped to Los Angeles. The mine was closed in 1918. No further work was done until 1927, when the property was leased by the Molybdenum Corporation of America. This company has completed a differential flotation concentrator, and is shipping molybdenite and copper sulphide concentrates.

In the southeastern corner of the county is situated one of the

early bonanza silver mines of the state, the McCracken Mine. This was located in 1874 by McCracken and Ownes, and worked by a San Francisco company during the 70's. A 10-stamp mill was erected 12 miles east of the mine on the Sandy River, near the present settlement of Signal. This mill was later increased to 20 stamps. By 1884 Patrick Hamilton reported the mine had been closed for several years. He estimated a production of about $1,000,000. Very little work was done at the property until the early part of 1902, when the Levy Brothers of Kingman opened up the old workings, built a small mill at Signal, and shipped a car of concentrates. The mill was closed in August 1902. The Levys continued to develop the mine until 1903 when they closed it down. From 1918 to 1920 the mine was again reopened and the ore treated in a 100-ton dry concentrator at the mine, but with indifferent success. In 1922 the Signal Mines Company was organized to take over the property. This company developed water in the mine at 600 feet, sufficient to run a 150ton flotation concentrator built at the mine. Operations were conducted intermittently up to July 1925, when the property was closed down. The long haul of 45 miles to Yucca has so far proved too big a burden. A very considerable tonnage of low grade lead-silver ore is reported developed.

Several miles northeast of Signal, in Burro Creek Canyon, a large low grade gold deposit had considerable work done on it by the Monmouth Development Company, from early in 1903 to November 1904. The ledge was variously reported as 12 feet of $22.25 ore, and 40-100 feet of $7-$12000. The work was done by Dr. J. P. Wallace who installed a mill. No work has been done since.

In the Artillery Mountains, south of Signal, a copper deposit had considerable work done on it in 1918 to 1920 by the Cactus Queen Company, organized by George Long and J. L. McIver of the United Eastern. Considerable money was spent on equipment, roads and development work, but

never reached production. It was closed on the collapse of the copper market towards the end of 1920, and has not been touched since.

In the Peacock Mountains, west of Hackberry, an important early producer, the Hackberry Mine, is situated. This mine was located in 1874 by W. K. Ridenour and was worked during the next ten years with a credited production of from $1,000,000 to $2,000,000. Very little work was done after the early work until 1916 when lessees reopened the mine. In 1917 the Hackberry Consolidated Mining Company was organized to work the property. The old shaft was retimbered, and a flotation and table concentrator installed, and in 1919 treated a considerable tonnage of ore without doing any development work. The mine closed at the end of 1919 after a production of about $150,000 in silver, gold, and copper.

Near the town of Hackberry the Walkover Gold Mine was operated and produced in a small way from 1911 to 1915, and the Copper Giant Copper Mine was worked from 1914 to 1916 by the United Verde Copper Company. Both are now idle.

North of Hackberry, on the slopes of the Grand Wash Cliffs, is the Muni Mountain District, which has had a small past production from a small mineralized area. Most of the work was done by the Gold Mining Company, first organized in 1886, and reorganized in 1892, who worked the Ellen Jane mine and treated 700 tons in an 8-ton mill in 1892. Intermittent work by lessees was done to the spring of 1903. In 1915 the Lucknow and Music Mountain Company was organized to work the veins of the district. A vertical shaft was sunk 400 feet and 30-ton amalgamation and cyanide mill built. This company ceased operating at the end of 1915.

In the northeastern part of the White Hills, about 12 miles east of White Hills, is a small gold camp known as Gold Basin. The veins were discovered in the 80's. Very little work was done until the organization

of the Cyclopic Gold Mining Company in 1902. This company bought the Cyclopic Mine from A. B. Robbins, and equipped it with a mill, using part of the original Elkhart mill at Chloride. Operations were carried on intermittently until the middle of 1920. In 1904 the Eldorado Mine was acquired by the Minnesota and Arizona Mining Company, who completed a 30-ton cyanide plant in Wallapai Valley, four miles from the mine. The company also acquired the O. K., Excelsior, Mascot and Golden Rule mines, and the mill ran on ore from all these mines, but chiefly from the Eldorado until May 1906 when the mill burnt down. Since 1920 the camp has been virtually idle.

North of Gold Basin and South of Gregg's Ferry, is situated the Lost Basin district in which several promising copper deposits are reported. Some development work has been done on them and a little ore was shipped in 1918. The district is now idle.

North of the Colorado River, on the slopes of Grand Wash Cliffs, a very considerable production has been made from several copper deposits, the most important of which are the Grand Gulch, Savanie, and Copper Mountain. These deposits were worked by St. George and Salt Lake City capital from 1901 to 1902 and again from 1906 to 1920 inclusive, the ore being carefully hand sorted to over 40% grade and hauled to Moapa, Nevada, from which it was shipped to Salt Lake smelters. The production from 1901 to 1902 was $100,000 and from 1906 to 1920 $1,377,500, making a total of nearly one and one half million dollars on copper and a little silver. These deposits can only be worked during abnormally high copper prices, as they are extremely inaccessible.

Summary

Mohave county has had a high production in the past of gold, silver, lead, and zinc, and a notable production in copper ore. The total approximate production through 1925 was very close to $60,000,000. A summary from the several districts is given in the following Appendix table.

CHAPTER 17

SOUTHERN YUMA COUNTY

EARLY HISTORY

Prior to the Mexican War Southern Yuma County was used only as a roadway between Sonora and California. A small settlement was established in the early part of the 18th century at the site of Yuma City, where the principal Colorado River crossing was located. The location of the crossing was fixed at the junction of the Gila and Colorado Rivers, as at that time, before the days of irrigation, the Gila River was navigable for flat-bottomed boats the greater part of the year from Yuma to its junction with the Salt River. Even during dry seasons some water flowed, and for this reason its bed was the only feasible land route from northern Mexico to California.

There are no records of any mining or prospecting in this part of Arizona until after the American occupation in 1848. A fort was established there on the right bank of the Colorado River known as Fort Yuma, and settlements of American and Mexican adventurers were started on both banks at the crossing at the start of the '49 gold rush. Gold prospectors at that time located rich placer ground on the Gila River near the present site of Dome Siding, and further finds were made on the east bank of the Colorado near the site of Laguna Dam, north-east of Yuma. These fields were soon exhausted, and but little further prospecting was done until ten years later at the start of the Civil War when the bonanza La Paz field was found sixty miles by boat up the Colorado River from Yuma,

in the dry washes on the west side of the Dome Rock Mountains. A rush to this field very much stimulated prospecting in the whole of this part of Arizona, and within three years the rich silver and silver lead deposits of the Eureka, Silver, and Castle Dome districts were found, and work on them commenced. Regular river service in flat-bottomed steamers was inaugurated in the late sixties from the mouth of the Colorado to Callville in Mohave County, and for about ten years all entry into central Arizona was by clipper ships to the mouth of the Colorado River, followed by river boats, followed in turn by overland trail. Silver mining in the river ranges continued after the completion of the railroad into Yuma in the late seventies. River service was continued until after the completion of the Santa Fe Railroad in 1883 when the boats were abandoned. Ore and bullion were thereafter hauled to the nearest railroad point. The mines continued to produce until the middle eighties when the exhaustion of the better ore forced them down.

LATE HISTORY

Mining in Southern Yuma County practically ceased, except for the small amount at the Castle Dome district, after 1887. After the demonitization of silver in 1893 an active search for gold deposits started and in 1896 the first of the famous Southern Yuma gold veins, the La Fortuna, was found. This proved to be a bonanza. In the same year a second rich vein, the King of Arizona, was discovered in the S. H. Mountains, followed the succeeding year by the discovery of the North Star vein in the same range. In the succeeding fifteen years these three deposits yielded a gross sum of nearly ten million dollars in gold.

After the exhaustion of the gold mines the area again relapsed into dormancy. Only one district, that of Castle Dome, has remained persist-

ently active from its discovery in 1863 to the end of 1929. Sporadic attempts to revive other old districts have been made, but unsuccessfully. The only notable production made since, aside from that from Castle Dome, has been a small amount of placer gold, won during the wetter months of the year from the old placer fields on the banks of the Gila and Colorado rivers.

In the following paragraphs, detailed histories of individual districts are given.

CASTLE DOME

The lead-silver deposits of Castle Dome, forty miles northeast of Yuma were discovered in 1863 but were abandoned shortly due to the paucity of the ore in silver. The district was reopened in 1867, but was again abandoned. In 1870 several owners and captains of Colorado River packet boats became interested in the properties and organized companies to exploit the deposits. There were two principal mines: the Flora Teeple worked by Captain Polhamus and Company, and the Castle Dome worked by William Miller and Company and Captain Eagle. The superintendent of the Flora Temple was George Tying who reported the following costs of operation:

Mining	$10.00
Sacks	2.00
Freight to River	10.00
Freight to San Francisco	10.00
Lighterage to smelter	1.50
Assay and incidental	1.50
Total	$35.00

The ore was carefully hand-sorted to a grade of between 58 and 69

percent lead and from $23 to $190 in silver. The ore was hauled twenty miles to the river at Castle Dome Landing for shipment by river boats to the mouth of the river, and by clipper boats from there to the Selby Smelter in San Francisco.

The early locators reported traces of Spanish "antigua" workings and old trails to the river where ancient slag piles were found.

In 1875 Captain Nagle erected a small smelter at Yuma City but it had a short life due to the completion in 1876 of the Southern Pacific Railroad from Los Angeles to Yuma, which brought it into direct competition with the Selby Smelter.

For several years after the construction of the railroad, the river boats continued to operate, but on the completion of the Santa Fe Railroad in 1883 railroad competition proved too great a handicap, and the boats were taken off and all ore was hauled direct to the railroad at Dome Siding.

The total production from 1870 to 1876 was about 2000 tons of ore which yielded about 2,200,000 pounds of lead and 100,000 ounces of silver. The Castle Dome lead ore commanded a premium as a flux due to the absence of zinc and antimony.

No good records exist for the camp from 1877 to 1883. The U. S. Mint Report for 1880 credits the district with $3600 in ore shipped. During this year the ore was purchased by a white-lead plant in Oakland, California, operated by Prof. W. P. Blake. 887,000 pounds of lead were produced (as oxide) and about 23,000 ounces of silver. The principal producing company in 1883 was the Castle Dome Mining and Smeltering Company, managed by Farrar, according to the U. S. Mint Report of that year. No production figures were given. The probable yearly average production during the period was not greater than 500,000 pounds of

lead and 15,000 ounces of silver, with a gross value of about $255,500.

Operation on a large scale ceased in 1883 but the camp continued to make a small intermittent production. The U. S. Mint Report for 1887 credited the camp with twelve tons of 60 percent lead ore which yielded $840 in silver.

The camp was reopened in 1890 by Gaudolfo and Sanguinetti of Yuma. Shipments started in June of that year to the Selby Smelter near San Francisco, and were continued regularly to the end of July 1896. A total of 906 tons were received by the smelter which yielded 1,000,000 pounds of lead and 25,000 ounces of silver, with a gross value of $57,000. It is probable that shipments were continued after 1896 and up to the end of 1904 to El Paso, although no good records exist. Over 150,000 pounds of lead were credited to the district from shipments to El Paso in 1905 by the U. S. Geological Survey Mineral Resources for that year. A conservative estimate for the period 1890 to the end of 1905 at the 1890 to 1896 rate would be 2,300,000 pounds of lead and 70,000 ounces of silver worth $170,000.

After 1905 the yearly production was reported by the U. S. Geological Survey Mineral Resources. The total from 1896 to 1929 inclusive has been about 3,000,000 pounds of lead and 83,000 ounces of silver.

Several attempts were made in the twentieth century to open the deposits on a large scale, but the high cost of water and of transportation have prevented success. A small production continued to be made in the camp in 1929 fromcarefully hand-sorted ore, and from concentrates produced by a Stebbins dry concentrator.

A common gangue mineral of many of the veins is fluorspar.

The first attempt at mining this was in 1902. De Luce, an important

owner of several groups of mines in the camp, obtained a market for the product at the Riverside Portland Cement Company at Riverside, California. Carefully hand-sorted pure crystals and screened material were shipped to the end of 1904. No further shipments were made until 1908 when a few tons were mined, and again in 1909 and 1913. The spar was then used as a flux in the production of cement clinker.

During the World War, due to the impossibility of obtaining potash from Germany, several new sources of potash were developed in the United States. One of these was the saving of potash in cement manufacturing. It was developed at the Riverside Cement Company's plant. In the process the flue dust, which contains a large quantity of insoluble potassium silicate, is calcined with fluorspar and the potash combines with the fluorine to form soluble potassium fluoride. This second flue dust is collected and the potassium fluoride is dissolved with water, and further treated to recover potash and fluorine. On the perfection of the process at the end of 1915, and on the rise of the price of all materials during the war, a revival of fluorspar mining started. Fluorspar shipments were made from 1916 to the end of 1918. Over a thousand tons were shipped from Castle Dome during this period, but at the close of the War the the reopening of the German market forced the bi-product potash manufacturing out of business, and the fluorspar industry of CastleDome ended. The principal production was made by De Luce.

The total production of the Castle Dome lead and fluorspar mines from 1870 to the end of 1929 has been approximately 11,700,000 pounds of lead, 350,000 ounces of silver and about 2000 tons of high grade fluorspar with a gross value of about $650,000 in metals and about $30,000 in fluorspar.

Since 1906 the Geological Survey has included in the district production placer gold, and gold and copper-gold production from the Castle Dome Mountains east and southeast of the district proper. These deposits occur from ten to fifteen miles from Castle Dome in that part of the mountains between Big Eye and Thumb Butte. The first discoveries were made in 1884 of dry placer diggings. The production from their discovery to the end of 1902 is unrecorded. The Mint Report for 1887 reported that in that year the field was worked in a crude way by Mexican dry-workers. Since 1908 a total of $25,000 has been recorded. Very little has been done since 1925. The production rate from 1908 to 1916 was about $3,000 a year. Assuming this rate from 1884 to 1908 the total would be between $75,000 and $100,000.

The occurrence of gold-bearing veins in the Castle Dome Mountains was probably known for many years but little work was done on them until 1912, when the Big Eye vein was acquired by a company which developed the mine and erected a small cyanide mill. The mine and mill were operated in a small way to the end of 1917.

A second vein, the Copper Glance, several miles southeast of the Big Eye near Thumb Butte, was worked in a small way and intermittently from 1918 to 1929 with a production in ore shipped of about 12,000 pounds of copper and $1,194 in gold. The total production in gold and copper from this end of the district has been very small. The total from 1913 to 1929 inclusive has been about $37,000.

EUREKA AND SILVER DISTRICTS

These two contiguous districts are located forty miles north of Yuma City in the Trigo Mountains, a range bordering the Colorado River. They were first worked in 1879 or early in 1880. The first locations

were in the Eureka District, followed shortly afterwards by the Black Rock, Pacific, and Red Cloud locations in the Silver District to the the north. The town of Silent was established at the richest mine, the Red Cloud, at that time. In 1882 a new find of bonanza silver ore was made, christened the James G. Blaine, or Silver Clip Mine, five miles north of Silent. It was acquired by Hubbard and Bowers of San Francisco, and by the end of 1883 a road had been built from the mine to the river, and a ten-stamp mill was constructed in 1884. Production started in that year and the mine and mill were operated until April 1887 when the mine was closed and the tailing was retreated to the end of the year. The total yield was about $950,000 in silver bullion. The deposit proved to be very superficial.

The Red Cloud's original owners shipped rich lead-silver ore from the outcrop to the Selby Smelter at San Francisco and were reported to have realized about $30,000. In 1880 the mine was acquired by an Eastern company which built a smelter at Silent, designed by J. J. Williams of Bisbee-Williams and Company of San Francisco. It did not prove successful at first but was operated fro about three years intermittently.

The Black Rock and Pacific owners developed their vein, but made few shipments. In 1883 a 40-ton smelter was erected at the river and during the month of June was reported as turning out a ton a day of lead bullion.

Other producers in the district in the early eighties were the Engineer, Emma, and Silver Plume, operated by Crawford, and the Remnant, operated by Gilchrist and Downey. The district produced $124,000 in ore shipments in 1887 chiefly from the Red Cloud and Black Rock Mines.

The last work of this period was done in 1889, when a dry concentrator was erected at the Red Cloud to treat the mine dumps, but it did not prove successful.

The district was abandoned after the drop in the price of silver in 1893 and the town of Silent became a ghost town and was forgotten.

An attempt to revive the district was made during the high metal markets of the World War. In 1817 the Red Cloud Mine was acquired by the Red Cloud Consolidated Mines Company. A concentrator, consisting of crusher, rolls, and Stebbins dry concentrators, was installed and a few small shipments were made of concentrates until the destruction of the mill by fire in 1918.

In 1926 the old Clip or Blaine Silver Mine was acquired by the Silver Mines Consolidated Company, a Los Angeles Corporation. A pipe line was laid from the river to the mine and a 100-ton cyanide plant was completed in June 1927. The supplies for the mine and mill were hauled from Yuma on the western bank of the river, and were ferried across opposite the site of the old Clip Mill. Considerable difficulty was experienced with the ferry, and a large consignment of cyanide was lost and never recovered. The mill was rebuilt in 1928 and about 700 tons of ore were treated in 1929.

The total production of the Silver District in the eighties was about 1,900,000 pounds of lead and 1,370,000 ounces of silver with a gross value of about $1,400,000 of silver. The Clip Mine bullion shipped in 1926 and 1929 was small, about 7000 ounces of silver with a value of $3600.

GILA CITY PLACERS

This placer field was the first to be located. The exact date of

discovery is uncertain, but it was shortly after the start of the '49 gold rush to California. The richest deposits were found on the north bank of the Gila River near the site of Dome Siding, twelve miles east of Yuma. Considerable rich ground is reported to have been worked and the production has been variously estimated. It is probable that at least $500,000 has been won, chiefly during the first three years of work. The town of Gila City was built at the time and is said to have reached a population of several hundred inhabitants. It had been practically abandoned by 1860. Mexican dry washers continue to make a meager living from the diggings, and other ground has been found in dry washes within a radius of ten miles on both banks of the Gila River. One of the most important of these finds is in a dry wash near Muggins Peak, about eight miles northeast of Dome Siding.

LAGUNA PLACERS

Shortly after the discovery of the Gila City placers, a smaller field was found near the site of Laguna Dam, north of Yuma, in dry washes on the east bank of the Colorado River. These deposits were exhausted in a few years and have had little production since.

QUARTZITE AND VICINITY

In the fall of 1861 an Indian trapper bought an eagle quill full of placer gold into Yuma City and showed it to Pauline Weaver, one of the most noted American trappers and guides of the period. Weaver went with the Indian to his find, returned to Yuma and organized a prospecting party headed by Jose Redondo. The original find was found in "El Arollo de la Tenaje" seven miles east of the river, a dry wash on the western slopes of the Dome Rock Mountains, east of the present site of Ehrenburg. The party started out in February 1862 with forty men, and

spread out from El Arollo de la Tenaje as a center. Rich gravel was found in several dry gulches, the richest being at Juan Ferra's camp in Ferra Gulch when one 47 1/2 ounce nugget was picked up. A rush from Sonora and California followed and by the end of the year the town of La Paz, established two and a half miles east of the River, had reached a population of 1500. J. Ross Browne* in his report of 1868 estimated that about $1,000,000 was taken out in 1862 and as much again up to the end of 1867. The rich finds in Lynx Creek and Rich Hill in 1863 drew off a great many of the men, but by the end of 1867 there were still left from 75 to 100 men at La Paz. The town was entirely abandoned about 1874 and the placers were reported by Raymond** as practically abandoned in 1871.

On the organization of the Peoples' Party in 1863 which was guided by Weaver and started inland from La Paz, a search for gold lodes was started. The Constancia, Conquest and Cruc were the first locations in the Dome Rock Mountains near the placers. It is probable that the comparatively poor placer fields on the eastern side of the Dome Rock Mountains at Oro Fino and Middle Camp were found about the same time, although no mention of them is found in the early reports. Not much work was done on the lodes until 1873 when the Constancia was acquired by the Constancia Mining Company with Charles Borger as superintendent.

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*U. S. Treasury Dept., Report of the States and Territories West of the Rocky Mountains, 1868.

**U. S. Treasury Dept., Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains, v. 4, 1871.

A ten stamp mill was erected at Tyson's Well (Quartzite) and the ore was reported as carrying $15 to $25 in gold. The venture was short-lived and was inactive in 1876. The Constancia was later relocated as the Goodman Lode, and Jones* reported that it had produced in the past about $40,000.

In the late nineties, Cinnabar (quicksilver)-bearing veins were discovered in the Dome Rock Mountains south of La Paz; the principal veins were acquired in 1904 by the Colonial Mining Company. This company developed them, equipped the property, and produced 100 to 140 flasks of mercury up to the end of 1908. At the end of 1908 the property passed into the hands of the Cinnabar Development Company which produced a few flasks and developed the property up to 1914, when operations were suspended. About $150,000 was spent on the mines, but only $6000 worth of mercury was produced.

In 1926**, the better ground at the old La Paz diggings was acquired by the New La Paz Gold Mining Company which contemplated the installation of large-scale hydraulic machinery to be operated by water pumped from the Colorado River to reservoirs above the workings. The plans had not been consummated by the end of 1929.

LA FORTUNA MINE

The La Fortuna ledge, a prominent quartz ledge cutting the schist county rock of the Gila Mountains 15 miles south east of Yuma had been known to prospectors for over fifty years before it was found to carry

*Jones, Edward L., Gold Deposits near Quartzite, Arizona, U. S. Geological Survey Bulletin 620-c, 1915, p. 45-57.
**Wilson, Eldred D., Arizona Gold Placers, 2nd edition, Arizona Bureau of Mines Bulletin 124, 1927, p. 18.

any values. One of the old trails from the Altar Valley into Yuma is said to have actually crossed the ledge.

It was not until 1895 or early in 1876 that samples were taken and a claim staked. The samples showed values from $35 to $96 a ton in gold.

Within a few months of location the claim was sold to C. D. Lane of San Francisco for $150,000. The La Fortuna Gold Mining and Milling Company was organized to exploit it. F. J. Martin was engaged as superintendent, H. C. Haupt as assistant and J. Golder as mine foreman. By the first of June an adequate water supply had been secured, a pipe line had been laid to the mine, and a twenty-stamp mill of 1425 pound stamps with a rated capacity of 100 tons a day had been completed. A two-compartment inclined shaft had been sunk on the vein, and production started. The first months run netted $284,600 from ore taken out within 150 feet of the surface.

In the next two years, the inclined shaft was deepened to 550 feet and the vein was developed at 100 feet intervals, and the mill was run intermittently on ore from the development faces. Full production started in 1898. About 75 percent recovery was made on the plates, and by the end of 1899 a 100-ton cyanide plant was constructed to treat the accumulated tailing which ran $5 a ton. The banner year for the mine was 1900 when a production from ore and tailing of $467,700 was made.

The vein was lost at a depth of 800 feet, and in 1900 and 1901 the shaft was sunk to a depth of 995 feet, and much deep lateral work was done in an attempt to find the faulted segments but without success. From 1901 to the end of 1904 the mill was run on pillars left above the 800-foot level, after which the mine was closed.

The total production of the mine from June 1896 to December 1904 was $2,587,987 in gold, and the company paid $1,180,000 in dividends.

The property remained dormant until 1913 when it was acquired by the Fortuna Mines Corporation. The shaft was repaired and a small production was made from pillars left by the old company. A careful geological study was made and it was announced in 1914 that the faulted segment had been located on the 800 foot level. The work, however, proved disappointing and the mine was closed at the end of the year.

It was not reopened until 1924 when it was acquired by the Elan Mining Company. Five stamps of the old 20-stamp mill were reconditioned, the mine was reopened, and a small production was made from faulted segments of the vein overlooked by former operators. A thorough geological study was again made, and by the end of 1929 it was claimed that the fault problem had been solved.

KOFA MOUNTAINS MINES

The gold vein of the King of Arizona, on the southwestern side of the Kofa or S. H. Mountains, about thirty-five miles northwest of Mohawk, was discovered in the winter 1876 by Charles E. Eichelberg. The outcropping ore was very rich, and shortly after the discovery the property was sold to the King of Arizona Mining and Milling Company, largely financed by Tucson capitalists headed by Epes Randolph, president of the company. A five-stamp amalgamation mill was erected at Mohawk on the Southern Pacific Railroad and the ore was hauled thrity-five miles over a desert road and across the Gila River to Mohawk at a cost of $8 a tone. The first two tons milled was completed in June 1897.

During the latter part of 1897 several wells were drilled in the

desert plain south of the mine, and at one well water was found at a depth of about 1000 feet. Another well was sunk to insure a sufficient supply.

In May 1898 a 30-ton cyanide plant was built at Mohawk to treat the 2500 tons of accumulated tailing.

After the tailing pile was treated, a 100-ton cyanide plant was started at the mine. A pumping plant was installed at the wells, and a 10-mile pipe line was constructed from the wells to reservoirs above the works. The shaft had by this time reached a depth of 200 feet, and a large ore shoot assured an ample ore supply. The cyanide plant was erected on contract by the King of Arizona Construction Company, a Tucson organization composed of D. M. Riordan, Morgan Smith, and H. W. Blaisdell, the last named also serving as manager of the mine. The mill was completed in August of 1899 and the mine was reopened with a force of 60 men.

By March 1900 the shaft had reached a depth of 500 feet. The ore was found to decrease consistently in value as depth was gained. The mine and mill were run continuously from August 1899 to July 1910. The mill treated an average of about 200 tons a day during this period. The width of the vein varied from a few feet up to thirty feet and averaged about twelve feet. At the surface the ore averaged about $40 a ton and at the lowest developed level, the 750-foot level, the values had shrunk to $3 a ton. The length of the ore shoot was about 1500 feet. The deepest level attained was the 750-foot level, and the mine was closed after the ore was extracted above this level.

The total production according to Jones* was about $3,500,000 from

*Jones Edward L., A Reconnaissance in the Kofa Mountains, Arizona, U. S. Geological Survey Bulletin 620-H, 1915, p. 156-158.

1897 to 1910 inclusive.

A second vein, north of the King of Arizona vein, located as the North Star vein was discovered in 1906, and it was sold to the Golden Star Mining Company in 1907. A fifty-ton cyanide plant was completed by August 1908, which was later enlarged to 100 tons a day.

The mine was worked from a shaft, sunk to an ultimate depth of 500 feet. The gold values decreased with depth here as in the King of Arizona vein. The ore shoots at the North Star were small and the ore was refractory to the cyanide process making for much higher costs than at the King of Arizona. The width of workable vein was about ten feet, and the economic limit $14,00 was reached on the 500 foot level.

The mine produced regularly from 1907 to August 1911 with a gross production according to Jones* of $1,100,000.

MISCELLANEOUS

A small amount of miscellaneous prospecting has been done in various ranges in southern Yuma County, but no mines of note other than those described, have been developed.

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*ibid. p. 158-160

CHAPTER 18

NORTHERN YUMA COUNTY

In the division of Yuma County for this history that part of the county dependent on the Southern Pacific Railroad is put in the southern half and that part dependent on the Parker cut-off branch of the Santa Fe Railroad in the northern half.

BILL WILLIAMS RIVER COPPER DEPOSITS

These copper and copper-gold deposits are found in the Buckskin Mountains on the south bank of the Bill Williams River, from Empire Flat, north of Parker, to Swansea, a distance of twenty-five miles.

The first mention of the deposits was in 1858, when samples of copper ore were reported sent to Doctor Jackson, a mineralogist of Boston.

The first shipments from the district were made in 1862 when 100 tons of selected high-grade ore was shipped from the Planet Mine, twelve miles east of the mouth of the Bill Williams River, to San Francisco. This was reported by Brown* to have netted $100 a ton above all expenses.

Brown reported that by 1865 the district around the Planet Mine shipped 1500 tons, and that three companies had erected or were about to erect smelters. The principal company was then the Great Central

*U. S. Treasury Dept. Reports Upon the Mineral Resources of the United States, by special commissioners J. Ross Browne and James W. Taylor. Wash., Govt. Print. Off., 1867.

operating the Planet Mine which was reported as turning out 80 percent regular. The two other companies were Martin and Greenman, and Knowles and Lightner. Indian, Mexican, and Chinese labor was employed.

On the drop in the price of copper in 1868 the mines were all closed, and remained down until 1872. T. J. Bidwell of Yuma reported to Raymond* that in 1872 there was shipped from the Planet Mine 100 to 150 tons of ore a month to San Francisco. The production dwindled in 1873 to 160 tons for the whole year. The deposits were worked intermittently for the next ten years, but were closed at the end of 1883 due to the sharp drop in the price of copper.

The total production is difficult to estimate. It is probable that it was close to 2,000,000 pounds of copper from 1862 to 1883. The ore and regulus were shipped by river boat to the mouth of the Colorado River, and were then transferred to clipper boats for shipment to San Francisco and Swansea, Wales.

In 1871 the first reports of the copper-gold deposits at Empire Flat, ten miles south of the mouth of the Bill Williams, were given by Raymond** who reported that a little ore was shipped in 1870 to San Francisco from the Los Angeles, Challenge, and Kangaroo Hill Mines.

No further reports are at hand until 1884 when the U. S. Mint Report stated that the Mack and Macy Mines north of Parker were operated that year.

The withdrawal of the river boats and the twelve year period of low copper prices from 1884 until 1896 made the economic exploitation

*U. S. Treasury Dept. Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains. Wash., Govt. Print. Off., v. 6.
**Ibid., v. 4.

of the Copper mines impossible, and the deposits were abandoned and well-nigh forgotten.

It was not until July 1899 that the Planet Mine was again revived. In that year, the Polhanus Group (the old Planet) was bonded to Chicago and Los Angeles capitalists by D. J. Shackrow and James May.

In August 1902 the Planet Copper Mining Company was organized as and Arizona corporation with 150,000 $10 shares. H. S. McCarn was retained as superintendent. The property was steadily developed by shallow incline shafts, vertical shafts and tunnels, and by 1908 the deepest incline had reached a depth of 733 feet, a vertical depth of 365 feet, and it was claimed that 100,000 tons of oxidized ore was developed of about 5.9 percent copper content.

The company was reorganized in July 1909 as the New Planet Copper Mining Company for 800,000 shares of $5 par, of which 342,905 were issued. The old stock was exchanged for 240,000 shares of the new stock, and the General Development Company took 100,000 shares and took an option on 460,000 additional shares. In 1909 and 1910 the General Development Company spent $150,000 in sinking a new vertical shaft to a depth of 350 feet, and in churn drilling the property. The option on the 460,000 shares was surrendered at the end of 1910.

In 1902 at the start of operations, the property was extremely inaccessible, the nearest rail point being Yucca on the main line of the Santa Fe, fifty miles north of the mine. The road was bad and was impassible in wet weather. In 1907 the construction of the Parker cut-off, or Santa Fe short-line, from Wickenburg to Parker shortened the haul to 27 miles. This was still further shortened to six miles in 1910 by the construction by interests allied to the Clara Consoli-

dated Mining Company of a 21-mile railroad from Bouse to Swansea.

The first production made from the property was in the first half of 1914 when 404 tons of accumulated ore from development work was shipped, yielding 97,000 pounds of copper.

No further work was done until October 1915 when the mine was leased for three years to the Northwestern Leasing and Development Company, financed from Globe and Miami. This company reopened the incline shaft, and shipped, from October 1915 to September 1917, about 40,000 tons of ore to the Hayden smelter, yielding about 5,000,000 pounds of copper.

In March 1920 a three-year lease was taken on the property by the Consolidated Arizona Smelting Company. This company shipped a small tonnage of ore from the Planet together with a far larger tonnage from the Clara or Swansea Mine, and part of the ore from both properties was concentrated at a plant erected at Swansea.

Since the expiration of the lease in 1923 the property has been idle.

The Copper Prince Mine, six miles east of the Planet, was probably discovered in the early days, but was not extensively worked. The Signal Copper Company was organized by Col. H. G. Heffron of Kingman, Arizona, sometime before 1905 to exploit the deposit. About the same time there was organized the Clara Gold and Copper Mining Company, managed by J. B. Rodgers, holding contiguous ground. Both these companies were organized during the building of the Arizona and California Railroad (the Parker cut-off) by the Santa Fe Railroad, the right-of-way of which passes twenty-one miles south of the mines.

After the completion of the railroad in August 1908, the Clara

Consolidated Gold and Copper Mining Company was organized by George Mitchell of Los Angeles as a consolidation of the Clara Gold and Copper Mining Company, the Signal Copper Company, and three other smaller groups with a total area of 132 claims. The company was organized for $3,000,000. The principal work was at the Copper Prince Mine which consisted of a 150-foot incline shaft. The company was financed largely in France and Belgium through the help of the Rev. Father Alfred Ouctu who was made a director in the company.

Most of the money raised was spent in building a twenty-one mile railroad from Bouse to the property, in erecting a 750-ton smelter of the Mitchell water-jacket type, and in other costly equipment. A little superficial work was done developing ore by churn drill, and shallow shafts and tunnels. Altogether about 6000 feet of work was done. The smelter was built, torn down, rebuilt, and finally blown in in May 1910. From May 1910 to the end of 1911 the smelter was run intermittently, and the company sank deeply in debt. It went into bankruptcy in Jan. 1912, and was reorganized by a committee of the bond and stock holders as the Swansea Consolidated Gold and Copper Mining Company with Camille Clerc as general manager and W. H. Seamon as smelter superintendent. The reorganized company had a capitalization of 4,000,000 shares of $1 par, and $1,000,000 bonded indebtedness.

The reorganized company attempted to operate the mine and smelter in 1913 and 1914, but was itself forced into bankruptcy in 1914, and was placed under the trusteeship of O. M. Souden of Los Angeles. The mine was leased early in 1915 to Judge W. J. Thomas of Los Angeles. Operations were not started until late in 1916, when 452 cars of ore were sent to the Humboldt smelter mined over a period of four months.

In May 1917 a ten-year lease on the mine was granted to W. A. Clark of Jerome, calling for 50 percent royalty and the sinking of a 1000-foot shaft. This lease was known as the Swansea Lease Incorporated, and was financed by Charles W. Cairk, J. Ross Clark and others. This company in 1918 erected at Swansea a 200-foot working shaft. A flotation plant was completed in September 1919. Ore and concentrates were shipped to the Humboldt smelter up to the end of 1920, when the low price of copper forced suspension. The mine and concentrator were reopened in 1922 and regular shipments of concentrateswere made to Humboldt until the spring of 1924 when the lease was surrendered. In 1925 the Swansea Lease, which had passed since its original organization into the control of the Southwest Metals Company started suit against the Swansea Consolidated on account of a trust deed executed for the Mining Company's share in taxes. Suit was started also in 1926 by the bond holders of the Mining Company, and a foreclosure was sought. Finally in 1926 the Clara-Swansea Mining Company was incorporated with a $3,000,000 capitalization to take over the property, with O. M. Souden as president and a board of directors formed largely of the French and Belgian holders of the bonds and stock. Ernest C. Lane was appointed superintendent.

In 1928 the mine was leased to Lane who shipped about 5000 tons to the United Verde Extension smelter up to August 1929, when a fifteen-year lease was granted to the American Smelting and Refining Company. A new 250-ton flotation concentrator was erected by this company in 1929 and 1930, but was operated for only a short time due to the drop in the price of copper.

The Planet and Swansea mines producedfrom 1862 to 1929 inclusively

approximately 523,000 tons of ore yielding approximately 29,687,500 pounds of copper, 9100 ounces of silver and 38 ounces of gold, with a gross value of approximately $5,764,000. Detailed figures are shown in the Appendix.

The copper-gold deposits east of Empire Flat, north of Parker, were revived after the district was made accessible by the completion of the Arizona and California Railroad in 1908.

The Carnation Mine was the first to be actively developed. This mine was acquired by the Arizona Empire Copper Mines Company in 1909. A 300-foot shaft was sunk on the Carnation and 6000 feet of development work is reported to have been done from 1909 to 1914, and a small amount of ore was shipped, chiefly to the Swansea Smelter. In 1915 a fifteen year lease was granted to the Empire Arizona Consolidated Company, and large shipments of copper-gold ore were made to the end of 1917, and smaller shipments were continued to the end of 1919. In 1925 a second leasing company, styling themselves the Empire Leasing Company, reopened the mine and made small shipments in 1925 and 1926.

The Billie Mack Mine, which had been operated intermittently from its original discovery in 1870 with an estimated production of about $100,000 in gold, was reopened in 1909 and small ore shipments of copper-gold ore were made to the Swansea smelter until its close in 1914. The mine was sold in 1917 to the Illinois Arizona Copper Company. The Lion Hill Mine was also acquired by this company. 489 tons of copper-gold ore were shipped in the three years of high copper prices.

In 1927 a high grade gold-copper pocket was found in the Lion Hill Mine. The Lion Hill Mining Company was organized to exploit the property, and small shipments of high grade ore were made in 1928 and 1929.

The total production partly estimated from the Cienega district northeast of Parker, from 1870 to 1929, was about 1,200,000 pounds of copper, and 8875 ounces of gold with a gross value of about $437,000. Detailed production figures are shown in the Appendix. The total gross production from the Bill Williams River copper belt has been about 30,900,000 pounds of copper and 8900 ounces of gold with a gross value of about $6,201,000 from 1862 to 1929 inclusive.

HARQUA HALA-MINE

The Bonanza and Golden Eagle gold veins, 12 miles south of the present settlement of Wenden, in the southwest of the Harqua Hala Mountains about a mile apart, were discovered in November 1888 by Harry Wharton, Bob Stern and Mike Sullivan. Nine claims were located. The locators sold their holdings within a month to Hubbard and Bowers, who had previously operated the Clip or Blaine Silver Mine in the Silver District. A small amalgamation mill was erected and it was reported that a $36,000 clean-up was made from the first seven day run in the spring of 1889. Hubbard and Bowers organized the Bonanza Mining Company and this company developed the two deposits in 1889 and 1890. A 20-stamp amalgamation mill was erected in May 1891 at the Bonanza Mine. An estimated production of $1,600,000 was made in bullion in 1891, 1892 and part of 1893, from ore which had a tenor of from $20 to $25 a ton.

In June 1893 the property was sold to a British syndicate known as the Harqua Hala Gold Mining Company, Ltd., for $1,250,000. After remodeling the mill, this company started production in July 1893. A new shaft was sunk in November, and in 1895 a 150-ton cyanide plant was added to treat the accumulation of $3 to $5 tailing.

By August 1895 the two mines were nearly exhausted, and the company turned them over to leasers, but continued to run the mill and to cyanide the tailing. Nearly all work ceased in 1897 on the exhaustion of the tailing pile, and in July 1899 the mine and plant were offered at public auction and were bid in August 1899 by A. C. Hubbard, one of the original owners.

The production of the British Company was $750,000 in bullion, from which a profit of $125,000 was realized, about a tenth of the purchase price. The Bonanza Mine was developed to a depth of 600 feet, at which level the values were below the economic limit.

In 1899 Hubbard operated the mines and mill for a few months under the management of Rickenbacker but was unable to make a profit and closed down. A gross production of about $10,000 was made.

The property remained idle until 1906 when the Harqua Hala Mining Company was organized. This company overhauled the mill, reequipped the two mines, and connected the Golden Eagle Mine to the mill at the Bonanza by a 5000-foot aerial tramway. Production started in 1907 and was continued through 1908. About $52,960 in gold bullion was produced at little or no profit.

The property was again idle until 1912 when the Yuma Warrior Mining Company was organized to treat the tailing, and to operate the mine. $19,000 was realized from the tailing in 1913 and 1914, and in 1915 and 1916, a production of $30,000 was made from the mines.

No further work was done until 1922 when the mine was reopened and a production of $15,000 was made in 1922 and 1923. Lessees shipped a small tonnage of gold-bearing lead ore from the Golden Eagle from 1925 to the end of 1929, with a gross production of about $15,000 in

gold and 142,000 pounds of lead.

The total gross production from the two veins from their discovery to the end of 1929 has been about 120,560 ounces of gold and 142,200 pounds of lead with a value of about $2,500,000. Detailed figures are found in the Appendix.

HARCUVAR MOUNTAINS DEPOSITS

The copper-gold deposits of Cunningham Pass in the Harcuvar Mountains were discovered about 1863 by members of prospecting parties who accompanied or followed the Weaver-Peeple's expedition. The deposits are found close to the most feasible overland routes from La Paz to Prescott and Wickenburg which followed the McMullen and Buttler Valleys. The first account of the deposits were by Browne* who reported that Herman Ehrenburg, a noted German engineer of the times had visited Cunningham Pass in 1865 and had found that the deposits had had 51,200 feet of work done on eighteen lodes, exposing high grade gold-copper ore. The principal work was a 107-foot shaft on the Cunningham vein and a 48-foot shaft on the Qua Sha Qua Ma vein.

The deposits were refractory to amalgamation for the gold, and too inaccessible to exploit for copper, and were soon abandoned.

No further work was done on them until after the completion of the Arizona and California Railroad from Wickenburg to Parker in 1908.

MISCELLANEOUS MINING

Other parts of northern Yuma County in which small-scale intermittent work has been done, and from which a small production has been

*U. S. Treasury Dept. Report of J. Ross Browne on the Mineral Resources of the States and Territories West of the Rocky Mountains, Wash., Govt. Print. Off., 1868.

done, and from which a small production has been made, are the copper-lead and gold deposits of the Plomosa range south of Bouse, the gold deposits of the Harquas Hala range, and the gold deposits of the Little Horn Range, thirty miles south of Vicksburg.

In the Plomosa Range the principal work was at the Little Butte Mine, a copper deposit about five miles northwest of Bouse. This deposit was acquired in 1908 by the Little Butte Consolidated Mines Company. A 338-foot shaft was sunk, and a total production of 73,400 pounds of copper was made in 1908 and 1909. In 1916 the mine was bought by the United Mines Company of Arizona, but was operated for only a year. The inclined shaft was sunk to a depth of 700 feet. In 1922 the property was acquired by the Little Butte Amalgamation Mines Company. No work was done until 1929 when a small production was made of copper-gold ore. Other smaller mines in the district which have produced in small amounts intermittently are the Mudderobank, the Dutchman, Blue Slate, the Desert and Old Maid Mines.

In the Harquas Hala Range, southeast of Wenden, the principal mine is the Socorro. This gold vein was acquired in 1901 by the Socorro Gold Mining Company. By the end of 1905 a shaft had been sunk 675 feet, and 2300 feet of drifting had been done. A 20-stamp mill was built in 1904, equipped for amalgamation concentration and cyanidation. From 1906 to 1914 the mine was worked intermittently and a production of about $20,000 was made in gold bullion.

The chief producing mine of the Little Horn Range, south of Vicksburg is the Sheeptanks Mine. This mine was for many years slowly developed but no production was made. In 1929 a bond and lease was obtained by a syndicate styling themselves the Ibex Mines Company. During the year

this company shipped 801 tons of ore to smelter in the state, which yielded 12,525 ounces of silver and 13,030 ounces of gold with a gross value of $33,609.

The total miscellaneous production of northern Yuma County from 1909 to 1929 was approximately $158,500 in copper, lead, gold and silver. The total for all Northern Yuma County from 1870 to 1929 was approximately $9,280,000. Details are shown in the Appendix.

In 1908 the Cunningham Pass Copper Company was organized by Harold Baxter to exploit the Cunningham Mine, relocated as the Critic. A 400-foot vertical shaft was sunk, and about 1000 feet of lateral work was done on several levels. The nearest railroad point was Venden, twelve miles south. The ore shootsof high-grade ore in the vein were too small to allow for a profit in shipping direct. A few small shipments were made in 1909, and 1912 and 1913 the mine was turned over to leasers, and a small production was made. In 1915 the mine was again leased and a considerable tonnage of high grade sorted ore was shipped during the high prices of the War years.

In 1921 the property was acquired by Joseph Nolacheck. A small test flotation plant was erected, and a few small shipmentsof concentrates were made.

In 1918 the Wenden Copper Company was organized to exploit a rich outcrop of copper-gold ore adjoining the Critic Mine. A few shipments were made of high-grade ore in 1918 and 1919. In 1923 the company was reorganized by Ned Crieghton of Phoenix as the Wenden Copper Mining Company. A 1000-foot shaft was sunk in the next four years, in which ore was encountered.

Other ventures in the district were the Ranier Development Company

and the Desert Mining and Development Company. A considerable amount of work was done by both companies during the War years and a few shipments were made of copper-gold ore, from the Desert.

The district has yielded about 1,550,000 pounds of copper and 3800 ounces of gold, with a gross value of about $400,000 most of which was produced during the War years. Detailed figures are shown in the Appendix.

CHAPTER 19

MARICOPA COUNTY

VULTURE MINE

The first prospecting party to explore the mountains of north-central Arizona was guided by Pauline Weaver, a pioneer trapper and Indian Scout of the Period. After the exhaustion of the richer part of the La Paz placers north of Yuma on the Colorado River, he organized a party of miners in 1862 to travel overland into the mountains. This party started from La Paz and traveled up the Bill Williams Fork and its tributaries and finally reached Antelope Peak north of Wickenburg where rich placer ground was found.

Henry Wickenburg, one of the party, while prospecting south of Wickenburg located the Vulture lode in 1863. He established a camp on the Hassayampa River six miles east of the location, and for the next three years worked the richer parts of the outcrop ore in an arrastre. No records are extant as to his production, but as the Apaches were active it is not probable that much work was done.

On November 1st, 1866, the property was acquired from Wickenburg by the Vulture Company of New York. This company established a camp at the mine, and built a forty stamp amalgamation and concentration mill at Wickenburg using Blake Crusher, 650 pound stamps, amalgamating plates and 18 Hendy concentrators run by an eighty horsepower wood-burning boiler. The building of this plant was an enormous undertaking

in the inaccessible wilderness of those days. All machinery had to be shipped by boat from San Francisco to Guaymas, transferred to river boats and run up to a landing at Port Mohave on the Colorado River west of the present town of Oatman, and hauled overland from there to Prescott and down to Wickenburg through rugged country infested with hostile Indians. This pioneer company operated steadily from 1867 to July 1872. Chinese miners were employed. Concentrates were stored, and the production $91 and the tailing after concentration averaged $5 a ton. By the end of operations over 6000 tons of concentrates had been piled up and about 80,000 tons of tailing. 102 men were employed at the mine, 84 men at mill and 12 or 13 extras to run a vegetable farm. Wages were $70 a month from which $30 was deducted for board. Costs were given as follows:

Mining	$4.12	
Milling	2.81	
Hauling	8.00	(Contracted)
	$14.93	

The total yield was as follows:

1867	$145,623
1868	254,100
1869	500,000
1870	500,000
1871	300,000
1872	150,000
Total	$1,849,743

The property was closed due to excessive transportation costs and to the apparent pinching of the ore at water level.

In 1873 P. W. Smith and Peter Taylor, employees of the Vulture Company, located a claim on the western extension of the lode. They built a 5-stamp mill on the Hassayampa River six miles east of the mine. About 400 tons a month were treated in that year and intermittently for six years after with a production of about $150,000.

In 1870 a new corporation was formed to operate the Vulture and Vulture Extension of Taylor and Smith. This company was known as the Arizona Central Mining Company. An 80-stamp mill was built at the mine, and water was pumped from the Hassayampa at Seymour, through a seven mile pipe line. Power was supplied by wood-burning boilers. Work was continued by this company for nine years on a large scale. A great deal of very low grade ore was treated. No exact figures are available on the production but scattered estimates of the Arizona Daily Star and U. S. Mint reports indicate a probable gross of about $2,000,000. The mine was worked down about 300 feet to a fault which cut off the ore body.

In 1893 the old concentrates and tailing at the Wickenburg mill of the original company were bought and partly shipped to the Salisbury and White smelter at Benson with a probable gross recovery of about $500,000.

After the closing of the mine in 1888, a little leasing was done and the tailing was treated by various lessees by cyanddation. The production is unknown but did not exceed $500,000.

In 1908 the property was acquired by the Vulture Mines Company. After a thoro geological study the fault problem was solved and the faulted segment found. This company at first used 20-stamp mills of the Arizona Central Company Mill. In 1910 a new 20-stamp mill was erected driven by gasoline engine, which treated from 100 to 120 tons a day. This company operated the mine up to 1917. A second fault was encountered, which baffled solution. The gross output of this company which worked on the faulted segment of ore was $1,839,375, 30 percent of which was concentrates and 70 percent bullion.

After the closing of the mine, several attempts were made to treat the accumulated tailing of past operations by cyanidation, with scant success.

In 1927 D. R. Finlayson acquired the property and organized the Vulture Mining and Milling Company. A 5-stamp amalgamation mill was built at the mine using water pumped from the mine, power being supplied by Diesel engine. Old pillars were treated.

In 1929 a diamond drill campaign was started, after a careful geological study, to prospect for the second faulted segment of the ore. Vein matter carrying free gold was encountered. Financial help was enlisted from the United Verde Extension Mining Company of Jerome. In 1930 and 1931 a 500-foot shaft was sunk to prospect the ground cut by the drill. A large vein was encountered. After six months lateral work and a little drilling, work was abandoned.

In September, 1931, the upper workings were leased to Peach and Prince, former employees of the U. V. X. The company is now controlled through stock purchases by the United Verde Extension Mining Company.

Production Summary

Vulture Company	1866 to 1872	$1,850,000
Taylor and Smith	1873 to 1878	150,000
Old concentrates and lessees	1873 to 1890	1,000,000
Arizona Central	1879 to 1888	2,000,000
Vulture Mining Co.	1908 to 1917	1,839,375
	Total	$6,839,375

Mineral Resources - Maricopa County

Past Production:

Vulture Mine (gold)	$6,800,000
Red Rover (silver-gold)	100,000
Phoenix Gold Mining Co. (Cave Creek - gold)	
Winifred District (Jack White Mine etc.-gold)	100,000
Goldfield (in Pinal County near line - gold)	5,000,000
Mesa Baryte deposits (in Pinal County)	
Tonopah-Belmont Development Co.(gold-silver-lead)	
Big Horn Mts. (N. W. of Hassayampa)	607,000
Rowley Mine (Lead-molybdenum , copper-silver)	
Hassayampa R. Placers	
San Domingo Placers	
Onzaba Mine (near Yavapai County line - copper)	
Total	$8,000,000 to $10,000,000

Production:

1917 mines $57,282
placers 3,088
Mostly from Vulture and Wickenburg districts, also Cave Creek, Prosperity, Salt River, and Sunset Districts

1918 mines $16,256
placers
From , Sunset, Vulture, White Pichaco and Rowley

1919 mines $7,936
placers 350
From Big Horn Four Mile, Gila Bend (Rowley), San Domingo, and White Picacho (Morris town)

1920 mines $9,881
placers 200
Agua Fria District, Big Horn, Cave Creek, Vulture, White Picacho, Winifred (Byrich)

1921 mines $8,392
placers 200
Bitter Creek (Morristown), Gila Bend or Painted Rock (Rowley) and Vulture

1922 mines $6,375
placers 200
Salt River, San Domingo, and Vulture

Production (Cont.)

1923 mines $14,363
placers 200
San Domingo (Placer), Vulture, and White Picacho

1924 mines $57,861
placers 200
Big Horn, Cave Creek, San Domingo (Placer), Superstition Mt. and Vulture (retreating tailings)

1925 mines $9,920
placers 125
Big Horn, San Domingo, and Vulture (McNeill Mine taken over by Tonopah-Belmont)

1926 mines $42,407
placers 680
Big Horn, Sunset, Vulture (McNeill)
McNeill $41,000

1927 mines $240,405
Mostly Vulture (McNeill and Vulture)
McNeill $234,000

1928 mines $311,948
placers 150
Cave Creek, Gila Bend, Magazine (Red Rover)
San Domingo, Sand Tanks (Gila Bend), Vulture
McNeill $296,000

1929 mines $185,680
placers 160
Big Horn ( ) Blue Tank, Cave Creek, Ellsworth (Aguila), Magazine (Red Rover - 500 tons of co-ag-ore)
Osborn, San Domingo (placer), Vulture, and Winifred
Jack White
McNeill $36,000

Total McNeill:

1926	41,000
1927	234,000
1928	296,000
1929	36,000
	$607,000

Total Maricopa 1917 to 1929 inclusive: $974,259