

CALIFORNIA STATE MINING BUREAU
FERRY BUILDING, SAN FRANCISCO

FLETCHER HAMILTON

State Mineralogist

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[July, 1915

REPORT XIV

OF THE

State Mineralogist

Mines and Mineral Resources

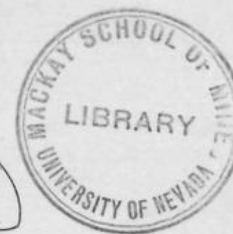
OF PORTIONS OF

CALIFORNIA
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Lloyd L. Root,

STATE MINERALOGIST.
Chapters of State Mineralogist's Report

Biennial Period 1913-1914



CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO

1916

No placering is reported to have been carried on in the region north of the Chocolate Mountains. Washes of considerable extent occur in that region and the possibilities look almost as favorable as they do to the south.

A few prospects of gold and copper-bearing ore are reported in Hodge's Mountains west of Rannels.

COPPER.

This material is shown by surface stains to be widely disseminated through a considerable area 3 miles southeast of Picacho village. Some drilling has been done here, without satisfactory results. At present Wm. D. Sibley and T. A. Ashby, of Picacho, hold a number of claims on this ground and are carrying on assessment work.

IRON.

A deposit of iron oxide, said to carry 50 to 60 per cent of metal, lies about 3 miles northeast of Mammoth Station at the foot of the Chocolate Mountains.

NICKEL.

This metal has been found on the south slope of Coyote Mountain by W. H. Trenchard, of San Diego, who has located a claim upon it. The ore is chiefly Garnierite, a nickel, magnesium silicate. The extent of the deposit has not been ascertained.

SILVER AND LEAD.

Silver occurs sparingly in connection with lead, 1 mile south of the Colorado River, 5 miles east of Picacho. This ore is lead carbonate and galena in small veins and pockets. Some of it has yielded up to 90 ounces of silver. Wm. Swain, of Picacho, holds some claims there. The principal one, called Mayflower, has a 90-foot shaft.

Located on the south side of a cove in the northern part of Barren Mountain is the old Paymaster silver mine. It would probably be located somewhere in the south half of Sec. 17, T. 11 S., R. 21 E., were the land subdivided. The claims were located about the year 1867 and worked for superficial chlorides. Supplies were brought in from San Francisco by boats which came up the Colorado River and landed near the mouth of Arroyo Seco to the northeast.

Water was pumped from the Colorado River by a plant located on Milpitas Wash near the mouth of Arroyo Seco.

At about the 400-foot level the rich ore had been worked out, and the silver values in the galena being low, the property was abandoned by the original owners. No work has been done since about 1880.

Late prospecting has shown that large bodies of galena, containing

low silver values remain. The ore body is about 42 feet wide at the bottom of the old workings. An assay of ore, taken from average samples across the ore body, is as follows:

Assay by the El Paso Smelting Company, of El Paso, Texas, for Mr. J. H. Lightfoot, of Blythe City.

Gold,	Trace.
Silver,	6.2 oz. per ton.
Lead,	73.3 per cent.
Copper,	.0
Insoluble,	7.2 per cent.
Iron,	.5 per cent.
Zinc,	0
Sulphur,	11.0 per cent.

The ore is said to lie along the contact of schist and granite and the ore body strikes about N. 45° E., and dips at an angle of about 75°. It is said that two 400-foot shafts were sunk at a distance of about 1,000 feet apart on the ore shoot, and 200 or 300 feet of stoping done in each shaft. In its days of production there was a stamp mill on the property, which was moved away. Three mining claims are at present held on this property by Robert de Luce, of Dome, Arizona, and William D. Hickey, of Neighbors, California. The claims are called El Tesoro, El Banquero, and Plata Real.

MARBLE.

Bulletin 38, page 107.

The chief deposits of this material in Imperial County are in Coyote Mountain, T. 15 S., R. 10 E. This mountain is largely formed of crystalline limestone but not all of it is fit for marble. Here valuable deposits, within 6 miles of the San Diego and Arizona Railroad, now under construction, are owned and controlled by the Golden State Mining and Marble Company, 309 Watts Building, San Diego, C. A. Walker, president; H. H. Sparks, secretary.

This company owns fourteen deposits, each deposit being of different grade and color. Several have the grade and texture of famous imported marbles.

The Creole group consists of four claims of 20 acres each, covering an outcrop of marble about 4,500 feet long and averaging 600 feet wide. All of the development has been done on Creole claim No. 1. Here are three distinct strata of marble. The first is deep blue-black with a hardness of $3\frac{1}{2}$, free from quartz, chert, or other impurity. It is of uniform color, free from holes or blemishes and is impervious to moisture so that it can not be stained even by red ink. The quarry will produce blocks of large size even at the surface. This is suitable for borders, exteriors and pillars and is probably well suited for monuments.

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

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CHAPTER OF
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COVERING

MINING IN CALIFORNIA

AND THE

ACTIVITIES OF THE STATE MINING BUREAU



CALIFORNIA STATE PRINTING OFFICE
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SACRAMENTO, 1926

IRON.

A deposit of iron oxide, reported to carry 50 to 60 per cent iron, occurs about three miles northeast of Amos Station on the western slope of the Chocolate Mountains.

Dan Simpson of Niland, J. H. Churchill, and Edgar Wear of Los Angeles, have recently located a group of claims in Sec. 33, T. 9 S., R. 16 E., S. B. B. and M., on a deposit of magnetite that occurs in the Chocolate Mountains, 17 miles northeast of Niland.

LEAD AND SILVER.

Lead-silver ores occur in the county in the Paymaster district on the eastern slope of the Chocolate Mountains, 17 miles northeast of Glamis, a station on the Southern Pacific Railroad. Lead carbonate and galena also occur in the Picacho district, the principal deposit being located five miles east of Picacho, and one mile south of the Colorado River. The most productive mine was the Paymaster which was worked from 1867 to 1880. Since the latter date, spasmodic attempts have been made to work the property, and in recent years the tailings from previous mill operations were treated by the cyanide process.

Mines.

Homestake Mine comprises three claims located one mile northeast of Paymaster Mine, and two miles west of Midway Well, in the Poorman's mining district. Elevation 750 feet. Owners, Vaughn Langlin and V. Bloomer, of Brawley.

The vein has a width of 6 feet, strikes N. 60° E., and dips 70° N. The formation is granitic gneiss and monzonite. The ore is lead carbonate and galena, carrying values in silver. Developments consist of a shaft sunk on the vein to a depth of 75 feet, a crosscut tunnel 25 feet in length and some shallow opencuts. Idle.

The Mayflower Mine comprises six claims located in Sec. 11, T. 14 S., R. 22 E., S. B. B. and M., five miles east of Picacho and one mile south of the Colorado River.

The ore is lead carbonate and galena which occurs in small veins and pockets in the schists. It is reported that some of the ore mined carried as high as 90 oz. silver per ton.

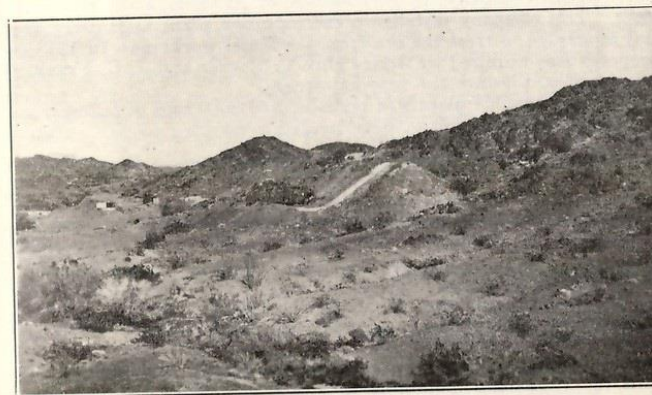
Developments consist of opencuts, short tunnel and shafts 50 to 90 feet in depth. Owner, W. H. Trenchard, of Laguna.

Paymaster Mine comprises thirteen claims located as the *Flagpole Group* but known as Paymaster Group of mines, situated in Secs. 19 and 30, T. 11 S., R. 20 E., and in Sec. 24 and 25, T. 11 S., R. 19 E., S. B. B. and M., on the eastern slope of the Chocolate Mountains, 25 miles by road northeast of Glamis, a station on the Southern Pacific Railroad, and three miles west of Midway Well. Elevation 800 feet. Owners, Judge Guy P. Hocker and J. C. Frank, 827 Stock Exchange Building, Los Angeles.

The mineralization occurs along a vein that is on the contact of granitic gneiss and monzonite which strikes N. 45° E., and dips 70° NW. A series of parallel rhyolitic porphyry dikes that strike south, intersect the Paymaster vein 500 feet east of the shaft. The vein

can be traced on the surface for a distance of over 4000 feet. The ore is lead carbonate, carrying silver values. Two ore shoots were developed by means of shafts. The Paymaster shaft was sunk to a depth of 385 feet on a 70° incline and ore stoped from 200-foot level to the surface for a distance of about 250 feet in length. Width of ore mined was from 8 to 15 feet. Two veins were worked on the Paymaster claim, known as footwall and hanging-wall veins. Levels were driven every 100 feet on the vein, with crosscuts run to footwall vein on each level. On the 300-foot level, northeast of the shaft, a winze has been sunk to a depth of 85 feet on the vein.

About 1500 feet to the east of the Paymaster workings is the President shaft and underground workings. This shaft was sunk to a depth of 425 feet on the footwall side of the vein and about in the middle of the ore shoot. The ore was stoped from about the 200-foot level to the surface, for a distance of 250 feet in length on the vein,



Paymaster Mine, showing view of Paymaster shaft. Chocolate Mountains, Imperial County.

the width stoped being from 15 to 35 feet between walls. Levels were driven from the shaft every 50 feet below the 200-foot level. Most of the stopes are east of the shaft, and only the hanging-wall section of the vein was worked on the 300 and 400-foot levels. The vein has a maximum width of 35 feet and shows streaks of galena in the drifts on these levels. From a study made of the stopes, it appears that the orebody worked from the surface ended at the 150-foot level; then another lens of ore was worked from the 200-foot level to probably the 350-foot level. It is reported that the ore milled from the President workings carried 20 oz. in silver and from 7% to 10% lead.

About 1800 feet east of the President workings are the Hazel workings. Here two shafts have been sunk on the vein to depths of 50 and 100 feet. The vein exposed in these workings is 15 feet wide. The ore is lead carbonate and galena, carrying small values in silver. It is said that samples taken from drifts on the vein carried 6 oz. silver and 10% lead.

The owners of the property also own 40 acres of patented land located in Sec. 15, T. 11 S., R. 20 E., on which is located a well and pumping plant with a 2-inch pipe line $3\frac{1}{2}$ miles in length running from the well to the mine. The pumping equipment consists of gas engine, Gould Triplex pump and storage tank.

The Paymaster Mine was first located in 1867 and about 1870 a 10-stamp mill was installed on the property and operated until 1875. This mill probably treated 30,000 to 40,000 tons of ore from the Paymaster and President workings. It is reported that at one time there were about 20,000 tons of tailings on the property but a good proportion was washed away by cloudbursts and there are now about 6000 to 8000 tons, reported to assay 6 to 8 oz. in silver.

From 1880 to 1916 this property was located by a number of different parties but no production was made during this period. In 1916 the property was acquired by the Anaheim Exploration and Development Company; C. E. Holcomb, of Anaheim, California, president. This company installed a concentration plant at Midway Well and attempted to treat the ore from the Hazel workings. In 1918 the property was acquired by Judge Guy P. Hocker and J. C. Frank, of Los Angeles, who are the present owners.

In 1923 a cyanide plant was installed and 8000 tons of tailings, said to assay 6 to 8 oz. in silver, were treated, recovering \$50,000 in silver. Idle.

MANGANEESE.

Commercial deposits of manganese ore occur in the Paymaster district, in an outlying spur from the southeastern part of the Chocolate Mountains and in the Palo Verde district, in the Palo Verde range of mountains.

The Palo Verde Mountains are a mass of deeply-eroded volcanic flows extending from the vicinity of the Colorado River, eight miles south of Palo Verde, northwestward for about 20 miles. The manganese deposits occur in a number of short veins or shear zones that cut the basic lava flows.

In the Chocolate Mountains the veins containing the manganese deposits cut lavas of Tertiary age, and a conglomerate that is probably Quaternary.

The manganese ore consists of the oxides, psilomelane, pyrolusite and manganite. Psilomelane is the dominant oxide in all these deposits.

The deposits in the Chocolate Mountains are accessible from Glamis, on the Southern Pacific Railroad, by wagon road 32 miles long, and the Palo Verde deposits are about 37 miles by road from Glamis.

Manganese ore was mined and shipped from the deposits in the Chocolate Mountains in 1917 and 1918 and from the Palo Verde District early in 1917. Operations were suspended in the latter part of 1918 on account of the resumption of imports of high-grade foreign ores.

The Ebony Group, formerly known as the Ebony group of claims, is located in the northwestern section of the Palo Verde Mountains, six miles south of Wiley Well, and about 40 miles by road northeast of Glamis, a station on the Southern Pacific Railroad. The elevation is 1100 feet.

A number of narrow veins containing manganese and having a general northerly strike, occur in the basic lava. These veins are from a few inches to several feet in width. Psilomelane is the principal manganese oxide but it is more or less mixed with iron oxides and calcite. A number of shallow open-cuts have been made on the different vein outcrops, exposing 6 to 12 inches of manganese ore. No ore has been shipped from the property.

Bibl: State Mining Bureau Bull. 76, pp. 34-35.

Everharty or Tres Amigos Deposit is located in the Chocolate Mountains, 32 miles by road northwest of Glamis, a station on the Southern Pacific Railroad, in T. 11 S., R. 21 E., S. B. B. and M., in the Paymaster district. The elevation is 1200 feet.

The deposit was worked in 1917 by J. J. Everharty, who shipped a considerable quantity of high-grade ore. In 1918 the property was leased to the Tres Amigos Company, of Los Angeles, and a small amount of ore was shipped. It was then subleased to Suffern & Company, of New York, who operated the property until August, 1918, when it was relinquished to J. J. Everharty. It is reported that the greater part of the ore contained more than 40 per cent of manganese and less than 8 per cent of silica. The ore was hauled by motor truck to Glamis and then shipped to furnaces in Pennsylvania and Illinois.

The deposits of manganese ore are contained in fissure veins that cut both the sedimentary and igneous rocks. The veins strike from N. 10° W. to N. 50° E. The majority of the veins strike N. 25° E. and dip from 65° to vertical. These veins vary in width from one to four feet.

On what was formerly known as the Black Mountain Claim, a vein which strikes N. 10° W. and dips 80° E. has been exposed for a distance of 150 feet by two tunnels. A considerable tonnage of ore was mined from the upper tunnel. The vein can be traced southward from this tunnel for a distance of 1300 feet to another tunnel. Between these two tunnels are croppings of ore from one to four feet wide. The vein worked in the south tunnel was two feet wide.

A shear zone 10 feet wide which cuts volcanic breccia occurs on the southwest side of the arroyo. This zone contains numerous veinlets and seams of psilomelane for 100 feet along its strike. A tunnel 40 feet long has been run in this shear zone. A quarter of a mile south is a fissure vein which cuts an andesite breccia. This vein strikes N. 50° E. and dips 75° SE. The vein has been developed on the surface by an open-cut about 150 feet long, and by a tunnel 50 feet long. In the open-cut the vein exposed is three feet in width. The ore on the surface is hard and is mostly psilomelane but in depth the ore becomes softer and manganite and pyrolusite become more abundant.

Bibl: U. S. Geol. Surv. Bull. 710-E.

Palo Verde Deposits of manganese are located in the Palo Verde Mountains about five miles west of the wagon road between Palo Verde and Glamis, in T. 9 and 10 S., R. 19 E., S. B. B. and M. Elevation is 1000 feet.

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STATE DIVISION OF MINES
FERRY BUILDING, SAN FRANCISCO
CALIFORNIA

of 12 miles. The cyanide plant has a capacity of 70 tons per 24 hours. Forty men are employed at mine and mill.

Bibl.: State Mineralogist's Reports XII, p. 242; XIII, p. 343; XXII, p. 259.

Paymaster Mine (silver-lead). The property comprises 12 claims, situated in Sec. 19 and 30, T. 11 S., R. 20 E. and in Sec. 24 and 25, T. 11 S., R. 19 E., S. B. M., on the eastern slope of the Chocolate Mountains, $3\frac{1}{2}$ miles west of Midway Well and 25 miles by road north-east of Glamis, a station on the Southern Pacific Railroad; elevation 800 ft.; owners, L. W. Jackson and Harold Jackson, 1539 Beverly Blvd., Los Angeles. The property is under lease and bond to William Green, Morgan Leshner and associates, of Los Angeles.

The mineralization occurs along a vein that is on contact of granite gneiss and monzonite which strikes N. 45° E. and dips 70° NW.; width 8 to 15 feet. Developed by three shafts, known as Paymaster, 385 ft., President 325 ft. and Hazel, 100 ft. Recently, a new shaft has been sunk on the vein to a depth of 100 ft., between Hazel and President shafts. Development work has exposed 4 ft. of ore. The ore is lead carbonate and galena, with gold and silver values. Ore is reported to carry gold 0.03 oz., silver 11.4 oz. and lead 9.2%.

Equipment consists of hoists and compressor, with trucks. Mill consists of ball mill, concentration tables, with a capacity of 10 tons per 24 hours located at Midway Well.

Four men are employed.

Bibl.: State Mineralogist's Report XXII, pp. 262-264.

Picacho Mines. The property comprises 36 claims located in T. 13 and 14 S., R. 22 and 23 E., S. B. M., about 5 miles south of Colorado River and 20 miles north of Yuma, Arizona; elevation 580 ft.; owners, Picacho Gold Mining Co.; E. L. Jones, President, 315 W. Ninth St., Los Angeles; Hugh Park, general manager, Yuma, Ariz.; under option to the *Nipissing Mining Co., Ltd.*, Quebec, Canada.

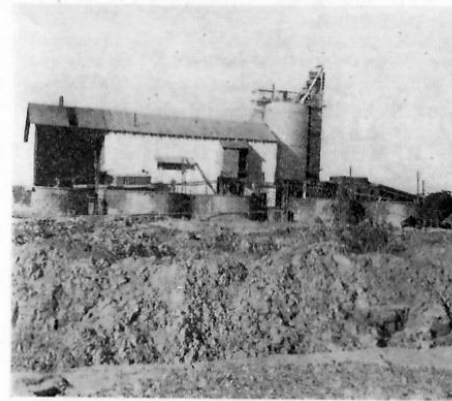
Three parallel lenses of ore occur in schist and these ore-bodies are known as Oro Grande, Picacho and Pennsylvania. General strike of the lenses is N. 45° W., with dip of 45° SW. For the past three years the property of the company has been tested with drill holes to determine the extent of the mineralization and grade of ore to determine the size of mill to be installed.

Equipment consists of vacuum drills developed by the company and portable compressor. Thirty men are employed.

Bibl.: State Mineralogist's Reports XII, pp. 237-243; XIII, pp. 331-346; XIV, pp. 729-730; XXII, pp. 260-261.

Sovereign Group of Mines. It comprises 12 claims situated in the Cargo Muchacho mountains, in Sec. 1 and 12, T. 15 S., R. 20 E. and in Sec. 6 and 7, T. 15 S., R. 21 E., S. B. M., in Tumco Mining District, $4\frac{1}{2}$ miles northeast of Ogilby, a station on the Southern Pacific Railroad; elevation 700 ft.; owner, Ben Harrison, Ogilby, Calif. The property is under lease and bond to Sovereign Mining & Development Co.; Courtney Baylor, president; Thomas L. Woodruff, general manager; W. M. Ballanger, superintendent; offices, 30 Bay State Road, Boston, Mass.

The vein occurs along a bedding plane in quartzose schist; strike N. 40° E., dip 25° SE. Widths vary from 4 ft. to 8 ft. Development consists of incline shaft 450 ft. in depth, with four levels and several thousand feet of underground workings. Ore mined is hauled by truck to the company's cyanide plant, a distance of 3 miles. The capacity of the mill is 30 tons per 24 hours.



35-ton Cyanide Plant, Sovereign Development Co., Ogilby, Imperial Co.

There was recently installed a 75-h.p., 2-cylinder Fairbanks-Morse diesel engine, direct connected with generator. They plan to increase the capacity of the mill to 60 tons per 24 hours. Twenty men are employed.

Telluride Mine (Golden Queen). The property comprises 7 claims situated on the west slope of the Cargo Muchacho Mountains, in the Tumco Mining District, 7 miles north of Ogilby; elevation 800 ft.; owner, Telluride Gold Mining Co.; A. J. Griffin, president; Roscoe Rupp, secretary; R. N. Griffin, general Manager, P. O. Box 21, Yuma, Ariz.

Quartz vein occurs in gneissoid granite; strike NE. and SW., dip 15° NW.; width 2 to 4 feet. Development consists of two shafts, one vertical shaft 50 ft. deep and incline shaft 136 ft. deep. On 136-ft. level, a crosscut is being driven north to intersect vein developed in vertical shaft.

Equipment consists of 6-h.p. gas-driven hoist and Gardner-Denver compressor, driven by 15-h.p. Fairbanks-Morse compressor. Four men are employed.

Black Hill Manganese Deposit. It comprises 8 claims situated in Sec. 18 and 19, T. 11 S., R. 21 E., S. B. M., in the Paymaster Mining District in the Chocolate Mountains, 7 miles south of Midway Well and 30 miles east of Glamis, a station on the Southern Pacific Railroad; owners, R. R. Reno, E. S. Gillette, E. J. Moreno, Yuma,

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14673

100 ft. and 60 ft. west, with a 30-ft. winze about 30 ft. east of shaft. The east shaft on Golden Eagle Claim is about 1500 ft. east of West Shaft. This shaft was sunk 450 ft. on a 25° inclination. On the 112-ft. level there is a drift southwest 400 ft. to a fault. At 60 ft. west of shaft, there is a stope 60 ft. long, 40 ft. high and 6 ft. wide.; drift east from shaft 25 ft. At the collar of this shaft, a tunnel has been driven southwest 300 ft. At 20 to 40 ft. below the surface, this ground has been stoped at intervals to the surface. The width of the vein was 4 ft. to 6 ft. This shoot was also developed from 200 and 300-ft. levels, the total production being 5500 tons which averaged \$10.00 per ton. Ore was hauled from mine, a distance of 2½ miles southwest of Tumco to mill with a capacity of 30 tons per day and consisted of the following: 15-ton bin, belt feeder to 9-in. by 15-in. jaw crusher; elevator to circular steel bin, 100-ton capacity; belt conveyor to 10-ft. Lane mill, hydraulic classifier to 2-ft. by 12-ft. amalgamation plates to sump; from sump by 2-in. centrifugal pump to Doreo diaphragm pump to six 12-ft. by 5-ft. steel tanks where it is leached by cyanide solution, to zinc boxes. Mill was driven by 2-cylinder, 75-h.p. diesel engine.

Production from this property is reported to be \$50,000.00. Idle.

Bibl.: State Mineralogist's Report XXXVI, pp. 20-21.

Telluride Mine (Golden Eagle). The property comprises 7 claims situated on the west slope of the Cargo Muchacho Mountains, in the Tumco Mining District, 7 miles north of Ogilby; elevation 800 ft.; owner, Telluride Gold Mining Co., A. J. Griffin, president; Rosco Ruff, secretary; R. N. Griffin, manager, P. O. Box 21, Yuma, Ariz.

Quartz vein occurs in gneissoid granite; strike NE.-SW., dip 15° NW. Width is 2 ft. to 4 ft. Development consists of two shafts, one vertical 50 ft. in depth and an incline shaft 136 ft. deep. On the 136-ft. level, a crosscut is driven north to intersect vein developed in vertical shaft.

Equipment consists of 6-h.p. gas-driven hoist and Gardner-Denver compressor driven by 15-h.p. Fairbanks-Morse compressor. Four men are employed.

Bibl.: State Mineralogist's Report XXXVI, p. 21.

IRON

Deposits of magnetite occur in the Chocolate Mountains, northeast of Amos, a station on the Southern Pacific Railroad.

Bibl.: State Mineralogist's Report XXII, p. 262.

LEAD AND SILVER

Lead-silver ores occur in the county in the Paymaster District on the eastern slope of the Chocolate Mountains, 17 miles northeast of Glamis, a station on the Southern Pacific Railroad. Lead carbonate and galena also occur in the Picacho District. The most productive mine was the Paymaster which was worked extensively from 1867 to 1880. Since the latter date, the property has been worked off and on by the owners and was under lease to William Green and associates, of Los Angeles, during 1938-1939 and several small shipments of ore were made to the United States Smelting Co., Salt Lake City, Utah.

Homestake Mine comprises 3 claims located one mile northeast of the Paymaster Mine and 2 miles west of Midway Well, in the Paymaster Mining District; elevation 750 ft.; owners, Vanya Laughlin and V. Bloomer, Brawley, Calif. Idle.

Bibl.: State Mineralogist's Report XXII, p. 262.

Mayflower Mine comprises 6 claims located in Sec. 11, T. 14 S., R. 22 E., S. B. M., 5 miles east of Picacho; owner, W. H. Trenchard, San Diego, Calif. Idle.

Bibl.: State Mineralogist's Report XXII, p. 262.

Paymaster Mine comprises 12 claims situated on the eastern slope of the Chocolate Mountains, in the Paymaster Mining District, in Sec. 19 and 30, T. 11 S., R. 20 E. and in Sec. 24 and 25, T. 11 S., R. 19 E., S. B. M., 25 miles by road northeast of Glamis and 3 miles west of Midway Well; elevation 800 ft.; owners, L. W. Jackson, Harold Jackson, Pasadena, Calif., and M. E. Stark, Beverly Hills, Calif.

The Paymaster vein strikes NW.-SE. and dips 60° to 70° NW. Width of vein varies from 15 ft. to 30 ft. The hanging wall of the vein is diorite, with granite as the footwall. Three ore shoots were developed along the vein which outcrop for a distance of 4000 ft. The ore shoots are known as Paymaster, President and Hazel. The Paymaster shaft was sunk to a depth of 385 ft. on a 70° incline, and ore stoped from 200-ft. level to the surface for a distance of 250 ft. in length. Width of ore mined was from 8 ft. to 15 ft. Two veins were worked known as Footwall and Hanging Wall. Levels were driven every 100 ft., with crosscuts run to the Footwall vein on each level. On the 300-ft. level, a winze was sunk to a depth of 85 ft. northeast of the shaft. About 1500 ft. east of the Paymaster workings is the President shaft and underground workings. The shaft was sunk on the footwall side of the vein to a depth of 452 ft. Drifts were driven on the vein on the following levels: 150, 200, 250, 300, 350 and 400-ft. The ore shoot was 250 ft. in length and 15 ft. to 35 ft. between walls. The footwall section of the vein was stoped from the 200-ft. level to the surface, while the hanging wall section of the vein was worked on the 300 and 400-ft. levels. The principal stopes are east of the shaft. The vein worked had a maximum width of 35 ft. The ore mined was silver chloride associated with lead carbonate and galena. Estimated tonnage of ore in the President Mine workings is about 80,000 tons, with an assay value of 8.2 oz. in silver; .015 oz. in gold; and 3.5% lead. Estimated tonnage between 100 and 400-ft. levels, is 35,000 tons, with an assay value of 12.09 oz. in silver; .01 oz. in gold; and 2.9% lead.

About 1800 ft. east of the President workings are the Hazel workings. Two shafts have been sunk on the vein to depths of 50 ft. and 100 ft. The vein exposed in these workings is 15 ft. wide. The ore is lead carbonate and galena, with values in silver. The ore mined is reported to assay 10% lead, with 6 oz. in silver. A new shaft has been sunk to a depth of 92 ft. between the Hazel and President shafts, developing a new ore shoot. This shaft is located 600 ft. west of the Hazel shaft and about 1100 ft. east of the President shaft. The vein strikes NE.-SW. and dips 70° NW. Width is 15 ft., with calcite

filling between diorite and granite. On the footwall, there is 4 ft. of ore developed, reported to assay 10 oz. in silver; 10% lead; and .06 oz. in gold. The ore is lead carbonate and galena. Selected ore shipped ran 36% lead, with 40 oz. in silver. At the 45-ft. level a crosscut has been driven 15 ft. to the hanging wall of the vein. The owners of the property also own 40 acres of patented land located in Sec. 15, T. 11 S., R. 20 E., S. B. M., on which is located a well and pumping plant.

Equipment consists of 6-h.p. gas hoist, 9 in. by 8 in. C. P. compressor, 12-h.p. hoist. Idle.

Bibl.: State Mineralogist's Reports XIV, pp. 732-733; XXII, pp. 262-264.

Silver King Mine comprises 2 claims located in the Chocolate Mountains, 14 miles northeast of Glamis, in Sec. 23, T. 12 S., R. 19 E., S. B. M.; elevation 900 ft.; owners Charles Kurton, Glamis, Calif.; Robert D. Gunn, Royal D. Glick, Colton, Calif.

An aplite dike strikes No. 10° W. and dips 60° W.; width 15 ft. to 25 ft. The dike occurs in a gneissoid granite and is mineralized with gold, galena and copper oxides. The galena occurs in irregular bunches along fractures in the aplite dike. Some samples taken from the vein assayed 5 oz. in gold, 20% to 30% lead.

Development consists of shaft sunk on the footwall side of the aplite dike to a depth of 20 ft. Two men are employed on development.

MANGANESE

Commercial deposits of manganese occur in the Chocolate Mountains, east of Midway Well and in the Palo Verde Mountains, south and west of Palo Verde.

The most productive area has been in the Paymaster District, east of Midway. During 1917 and 1918, 3148 tons of ore was mined and shipped from Imperial County, value at \$85,040. The largest production was from the Tolbard Manganese Mines, now operated by the Whedon Manganese Mines, Inc.

Chocolate Drop Manganese Mines comprise 4 claims situated in T. 9 S., R. 20 E., S. B. M., 6 miles south of Wileys Well, near the boundary line of Imperial and Riverside counties and 30 miles southwest of Blythe; owner, E. O. Tetzleff, Banning, Calif.; under lease to Mine Development Co., H. S. West, president, 610 South Broadway, Los Angeles; J. I. Moore, manager, San Bernardino, Calif.

The veins of manganese occur in an andesitic conglomerate and coarse layers of orange-colored sandstone. The general dip of the conglomerate is 10° to the northeast. The manganese occurs as psilomelane, occupying definite fissure veins. These veins are in the conglomerate. The veins strike N. 25° W. and dip west. Other veins cutting the conglomerate southwest of shaft, strike N.-S., N. 25° W. and N. 15° E., respectively, and have vertical dips. The contact of the conglomerate upon the underlying lava is exposed about one-half of a mile southwest of shaft. Just west of the contact, a vein of psilomelane, with N.-S. strike, cuts the lava with a vertical dip.

Development consists of shallow shafts and trenches. Assays of sorted ore are as follows:

Mn. -----	45.2%
Insol. -----	2.0%
BaO -----	13.8%
CaO -----	nil
Fe -----	2.2%
Available O -----	8.4%

In 1917, three hundred tons of ore was shipped from the property reported to average 46% Mn, with 2% SiO₂ and 2.2% Fe. Present operators shipped 40 tons of ore; average 43% Mn. Six men are employed on development work.

Desert Bloom Group of Manganese Claims. It comprises 4 claims situated on the east slope of the Palo Verde Mountains, in T. 9 S., R. 20 E., S. B. M., 6 miles southwest of Palo Verde; owners, Henry L. Jackson, Brawley, Calif., and Edward Rochester, Winterhaven, Calif.

Here, manganese occurs in andesitic conglomerate. Where exposed by open cuts, it is 8 ft. in thickness, strikes NE.-SW. and dips 35° SE. The ore contains a large amount of wall rock and rounded pebbles and is reported to carry 20% Mn. Idle.

Hodges Manganese Group of Claims. It comprises 4 claims situated in the Paymaster Mining District, on the northeast slope of the Chocolate Mountains, in T. 11 S., R. 21 E., S. B. M., 3 miles east of Midway Well; owner, Edward Hodges and associates, Yuma, Ariz.

A series of parallel veins of manganese occurs in andesite breccia. The veins strike N. 30° W.; dip vertical. Widths vary from 12 in. to 3 ft. Development consists of open cuts, short tunnels and shallow shafts. Two men employed on development work.

Lugo Manganese Mine. It comprises 4 claims situated in the Palo Verde Mountains, in Sec. 35, T. 9 S., R. 20 E., S. B. M., 5½ miles southwest of Palo Verde; owners, T. Lugo and P. D. McIntire, Blythe, Calif.; elevation 1000 ft.

There are 4 distinct veins on Donkey No. 2 Claim. They strike N. 55° E. to N. 60° E. and dip 60° to 70° SE. to vertical. The country rock is a dark-gray andesite. The vein material is black manganese oxides (psilomelane) calcite and fragments of wall rock. The fragments of wall rock are often impregnated by black oxide and are sometimes partially replaced by the manganese mineral. The northernmost of the veins shows two layers of ore about 2 ft. each in thickness. A short distance to the south is the most important vein on the property. This can be traced along its strike for a distance of 500 ft. The width of ore exposed is from 2 ft. to 3 ft., some of the ore being high grade but some of it being mixed with wall rock. About 100 ft. south of this vein, another outcrops for a distance of 50 ft. The vein material is calcite, associated with manganese oxides and ore of good grade has a thickness of 8 in. to 12 in. The fourth vein is 60 ft. southeast of the above-mentioned vein and is of the same character.

Development consists of shallow open cuts and short tunnels. About 150 tons of ore was shipped from the property during 1918 said to average 40% to 44% manganese.

Bibl.: Bull. 76, p. 59; State Mineralogist's Reports XVII, p. 269; XXII, pp. 265-266; U. S. G. S. Bull. 710-E.

Silica—continued

Name, location, owner	Geology	Remarks and references
NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 1, T16S, R9E, SBM, Carrizo Mountain quadrangle (7 $\frac{1}{2}$ minutes), Coyote Mountains, 25 miles west of El Centro, 5 miles north of Ocotillo, 1 mile southeast of Carrizo Mountain. Pine Tree Cement Company, c/o H. W. Soutle, P.O. Box 306, Vista; B. A. Sweet, Escondido	feet thick and crops out over an area of only 100 to 200 feet in diameter. The beds strike N 65 degrees W and dip 30–35 degrees SW. The base of the unit is not exposed. It is a white, medium-grained, poorly cemented, friable sandstone composed of subrounded, well-sorted grains of quartz (80–90 percent) feldspar (10–20 percent) with very minor muscovite. Magnetite and other ferromagnesian constituents are absent or rare and the iron oxide content is low.	quently. (Tucker 21:271; Sampson and Tucker 31:436; 42:139).
Elliot prospect SW $\frac{1}{4}$ of SW $\frac{1}{4}$ of sec. 5, T18S, R9E, SBM, In-ko-pah Gorge quadrangle (7 $\frac{1}{2}$ minutes), Jacumba Mountains extreme southwest corner of the county, 5 miles due east of Jacumba, and 3.4 miles S 8 degrees E of Mountain Spring. J. E. Elliot, address undetermined (1961)	A pegmatite dike in quartz diorite. The dike trends N 30 degrees W and is about 100 feet long by a few tens of feet wide. It consists of a central zone of pure quartz, about 25 feet in diameter. This is bordered by a feldspar-quartz zone containing books of muscovite as large as 4–6 inches in diameter.	Little or no production. The only development consists of a shallow cut on the northwest side of the hill.
Fish Creek Mountain deposit Reported in secs. 10, 15, 21, T14S, R9E, SBM, 14 miles north of Coyote Wells; not confirmed, 1962 Undetermined, 1962; W. A. Waters, Pasadena (1942)		Uncorrelated old name; not visited, 1962 (Tucker 26:281; Sampson and Tucker 42:139–140).
Snow White deposit Middle of N $\frac{1}{2}$ sec. 8, T16S, R9E, SBM, Carrizo Mountain quadrangle (7 $\frac{1}{2}$ minutes), south flank of Coyote Mountains, 5.9 miles N 43 degrees W of Ocotillo, 3.4 miles S 55 degrees W of Carrizo Mountain. L. O'Callahan, address undetermined, 1961. Possibly could be contacted through Ross O'Callahan, Box 131, Ocotillo.	Three sub-parallel pegmatite dikes in gneiss. The dikes lie within and approximately parallel to the northwest-trending Elsinore fault zone which marks the contact between Pliocene Imperial Formation to the southwest and gneiss to the northeast. The dikes are somewhat deformed and sheared but have an overall strike of N 20–30 degrees W and a nearly vertical dip. They are several tens of feet wide and measure 100–200 feet along the strike. Both the Imperial Formation and the gneiss-pegmatite rocks are overlain by mildly deformed fanglomerate. The dikes are composed mainly of quartz, potash feldspar, biotite, and muscovite. Irregular bodies of pure quartz occur within two of the dikes. The larger of these bodies, 50–75 feet in diameter, is exposed at the head of the north-trending canyon containing the mine road. A dike composed predominantly of feldspar crops out a few hundred feet up slope and northeast. The dike containing the smaller quartz deposit crops out a few hundred feet southeast of the large quartz body.	An estimated 200–400 tons of silica has been mined from the property in 1928–29. Development consists of an open pit 50 feet by 75 feet and several smaller open cuts.
Southern California Marble and Development Company deposit		See Coyote Mountains deposit.

Silver-Lead

From 1907 through 1960 in Imperial County 97,250 ounces of silver and an undetermined amount of lead were mined. Production of silver is recorded for nearly every year from 1907 through 1942. Prior years were doubtless more productive; but county totals are not available, as Imperial County was then a part of San Diego County.

Earliest known production was in 1867, at the Paymaster mine, which continued to produce until 1880. It remains through this writing the most productive

silver and lead operation in the county. If a rough estimate of production from the Paymaster mine is included, total production from the county would be about 250,000 ounces of silver.

The Paymaster mine is in the Paymaster district about 3 miles southwest of Midway Well. Other silver deposits in the same area are the Homestake, Little Buckaroo and True Friend-Silver Moon and Silver King prospects. The two remaining known silver-lead mines are the Mayflower and Marcella mines.

Silver—Lead—continued

Name, location, owner	Geology	Remarks and references
Consolidated Buena Suerte		See Rainbow prospect.
Emilia mine		See Paymaster mine.
Hazel mine		See Paymaster mine.
<p>Homestake prospect Middle of N$\frac{1}{2}$ of NE$\frac{1}{4}$ sec. 19, T11S, R20E, SBM, Quartz Peak quadrangle (15 minutes), in the Paymaster district, 2.6 miles S 70 degrees W of Midway Well, 18 miles north-northeast of Glamis. Undetermined, 1961, V. Laughlin and V. Bloomer, Brawley (1942).</p>	<p>Vein strikes N 75 degrees E, dips 70 degrees southeast in coarsely grained granitic rock. The vein consists principally of altered wall rock, quartz, calcite, hydrous iron oxides and minor amounts of lead and silver.</p>	<p>Workings consist of a 30-foot shaft and a 25-foot crosscut-adit driven S 30 degrees E through the vein. Little or no production. Apparently abandoned. (Tucker 26:269; Sampson and Tucker 42:197; Goodwin 57:448; Oesterling and Spurck 64:150)</p>
Imperial Buttes mine		See Marcella prospect.
<p>Little Buckaroo prospect Approximately T11S, R20E, SBM, Quartz Peak quadrangle (15 minutes), central Chocolate Mountains, not confirmed, 1962. W. D. Morrison, Box 1187, Yuma, Arizona (1952)</p>		<p>Not visited, 1962. One ton of ore containing about 10 ounces of silver and 300 pounds of lead was reported shipped in 1952.</p>
<p>Marcella (Imperial Buttes) prospect NW$\frac{1}{4}$ sec. 30, T9S, R15E, SBM, Iris Pass quadrangle, 10 miles N 20 degrees E of Niland at the southern tip of a small hill at the southwestern base of the Chocolate Mountains. List within Chocolate Mountains Aerial Gunnery Range, Marcella Mining Company, Niland (1916)</p>	<p>Quartz vein in schist strikes due north and dips 45 degrees W. The vein is 3-5 feet wide and is exposed along the strike for more than 150 feet. It is parallel to the foliation in the schist and is composed almost entirely of quartz. Sparse blue copper staining is present in some parts of the vein, but no sulfide minerals were observed. A narrow rhyolitic dike is exposed on top of the hill several tens of feet to the west, and was encountered at an undetermined place in the workings.</p>	<p>This property has a recorded production of more than 100 tons of ore containing an average of 7.4 percent lead, 2.4 percent copper, 0.96 ounces of silver and 0.11 ounces of gold per ton. It is developed by an inclined shaft at least 75 feet deep with undetermined appended workings.</p>
<p>Mayflower mine NW$\frac{1}{4}$ sec. 29, T13S, R23E, SBM, Picacho quadrangle (7$\frac{1}{2}$ minutes), southwestern Chocolate Mountains, about 21 miles north-northeast of Yuma, Arizona, 3.8 miles N 85 degrees E of Picacho, about 0.3 miles south of the Colorado River. Undetermined, 1962; W. H. Trenchard, San Diego (1942)</p>	<p>Two veins strike N 60 degrees E in schist; the southeast vein dips 45 degrees SE and the northwest vein is nearly vertical. The veins are about 100 feet apart at the surface, and the southeast vein, the most prominent, can be traced at least 500 feet. The vein consists of iron-stained fault gouge containing calcite and, reportedly, cerussite and argentiferous galena. The veins lie within $\frac{1}{2}$-mile-wide major east-trending fault zone which extends 2 miles east and west of the deposit (see geologic map pl. 1).</p>	<p>Discovered and developed about 1900. Total reported production is less than 100 tons of ore containing an average of 0.36 ounces of gold and 0.30 ounces of silver per ton. Ore containing 90 ounces of silver per ton has been reported earlier but not substantiated. Ore was probably hauled to the Picacho mill, about 4 miles up river. The southeast vein is developed by two 50-foot shafts, a 25 and a 30-foot shaft (all 50 feet apart) and a 30-foot open slope 10 feet deep. The northwest vein is explored by a vertical shaft of undetermined depth which may be the 90-foot shaft mentioned in early reports. (Aubury 02:71; Merrill 16:732; Tucker 26:262).</p>
<p>Paymaster (Emilia, Hazel, President) mine SE$\frac{1}{4}$ sec. 19, NW$\frac{1}{4}$ sec. 30, T11S, R20E, SBM, Quartz Peak quadrangle (15 minutes), northeast arm of the central Chocolate Mountains, 3$\frac{1}{2}$ miles N 34 degrees E of Mount Barrow, 3 Miles S 62 degrees W of Midway Well. Harold S. Jackson, 5595 Oasis Ave., P.O. Box 283, Twenty-nine Palms (1961)</p>	<p>A fissure vein along a contact between gneiss (footwall) and a foliated fine to medium-grained granitic rock. The vein ranges from 3-42 feet in width and has been explored for at least 4000 feet along the strike. Average width is 4-10 feet. It strikes from N 35 degrees E in its southwestern parts to N 65 degrees E at its northeast end, and dips 65-75 degrees NW. Both walls of the vein are severely brecciated for as much as 10 feet on either side of the vein. The primary ore minerals contained in the vein are galena, argentite and minor chalcocopyrite and sphalerite. Secondary ore minerals include cerussite, cerargyrite, and various copper oxides. Gangue minerals include quartz, calcite, barite, pyrite and hydrous iron oxides (private report). The productive parts of the vein are divided into three parts, the Paymaster, President, and Hazel workings. The Paymaster workings contained one principal ore shoot. It was essentially vertical in its longest</p>	<p>This mine was worked as early as 1867, and its principal period of activity was from that date until 1880, but no official record of production is available. A 15-stamp mill was erected on the property during that period. This and other supplies and equipment were shipped from San Francisco by boat via the Gulf of California and the Colorado River to a point near Arroyo Seco about 13 miles north-east of the mine. Water was pumped from the same point to the mill. After the mine closed in 1880 the mill was disassembled and removed to the Cargo Muchacho mine in the Cargo Muchacho Mountains. Production is recorded also for the years 1919-1921 and 1938-1939. In 1922 and 1923 tailings from the millsite were cyanided. Total production based on rough calculation of open ground is about 25,000 tons, valued at \$170,000. Value is based upon the average grade of ore mined</p>

Silver—Lead—continued

Name, location, owner	Geology	Remarks and references
<p>President</p>	<p>dimension. The President workings, about 1400 feet northeast, contained two principal ore shoots, a hanging wall streak and a main streak. Ore shoots at the Hazel which is 1500 feet northeast of President workings, were not determined. Areas between the three workings apparently are unexplored, except for surface trenching and shallow shafts.</p>	<p>during the years since 1919 using 50 cents per ounce of silver, 3 cents per pound of lead and 5 cents per pound of zinc. Tonnage estimate may be as much as 50 percent in error because of poor stope width data, etc.; value is subject to even more error. The Paymaster workings are developed by a 325-foot inclined shaft and several hundred feet of other workings. A stope 125 feet long and 8-15 feet wide extends from the 2nd level to the surface (about 225 feet). The President workings are developed by a 450-foot inclined shaft with levels at 50-foot intervals totaling at least 1000 feet of horizontal workings. Ore has been stoped discontinuously from the 400 level to the surface. The greatest lateral extent mined was about 150 feet. The Hazel deposit was explored by a 50-foot and a 100-foot shaft with undetermined lateral workings. (Ireland 88:516; Merrill 16:732; Newman 22:47; Oesterling and Spurck 64:150; Tucker 26:262-264; Tucker and Sampson 40:90; Sampson and Tucker 42:126, 127, 128; Goodwin 57:448; Oesterling and Spurck 64:150).</p> <p>See Paymaster mine.</p>
<p>Rainbow (Consolidated Buena Suerte) prospect Reportedly in sec. 24, T11S, R20E, S8M, Quartz Peak quadrangle (15 minutes), north side of central Chocolate Mountains, about 3 miles southeast of Midway Well, not confirmed, 1964 Undetermined, 1964</p>	<p>Four-foot-wide vein extending 700 feet at an undetermined attitude; associated with an andesite dike.</p>	<p>Not visited. Developed by a 40-foot shaft. (Oesterling and Spurck 64:150).</p>
<p>Silver King prospect Reportedly in sec. 23, T12S, R19E, 14 miles northeast of Glamis; not confirmed, 1962. Undetermined, 1962; Charles Kurton, Glamis; R. D. Gunn and R. D. Glick, Colton (1942).</p>	<p>Irregular occurrences of galena, gold, and copper oxides along fractures in an aplite dike that strikes N 10 degrees W and dips 60 degrees SW.</p>	<p>Uncorrelated old name, not visited, 1962. Explored by a 29-foot shaft in the footwall side of the dike. (Sampson and Tucker 42:128).</p>
<p>True Friend and Silver Moon mine Reportedly in NW¼ sec. 25, T11S, R20E, S8M, Quartz Peak quadrangle (15 minutes), north side of the central Chocolate Mountains, Paymaster district, about 4 miles southeast of Midway Well, not confirmed, 1962 Undetermined, 1962; Frank Beal, Brawley (1926)</p>	<p>Undetermined silver minerals in a vein composed largely of manganese and iron-stained barite along the contact between gneiss and porphyry. The vein strikes N 20 degrees E and dips 80 degrees NW.</p>	<p>Uncorrelated name, not visited, 1962. Development consists of an adit driven 150 feet S 50 degrees W with a 50-foot crosscut west at 70 feet. Two hundred feet south of the portal over the top of the ridge is a 50-foot shaft. (Newman 22:47; Tucker 26:267; Sampson and Tucker 42:131; Oesterling and Spurck 64:150).</p>

Stone

Building stone was mined from one locality in Imperial County, about 3½ miles southwest of Midway Well. The material is a white, flaggy tuff interbedded with flaggy tufts and thin beds of limestone in a lacustrine sequence of Tertiary age.

This material was used in the construction of structures at the Paymaster mine prior to 1900. A small quantity was sold in the 1950s for an undetermined use.

Name, location, owner	Geology	Remarks and references
<p>Undetermined Location NW¼NW¼ sec. 30, T11S, R20E, S8M, Quartz Peak quadrangle (15</p>	<p>The material mined consists of white flaggy tuff which occurs interbedded with a Tertiary lacustrine sequence consisting of well-bedded</p>	<p>Undetermined but low production. Development limited to a small surface cut. Apparently this material was utilized for various</p>

STATE OF CALIFORNIA
GOODWIN J. KNIGHT, Governor
DEPARTMENT OF NATURAL RESOURCES
DeWITT NELSON, Director

DIVISION OF MINES
FERRY BUILDING, SAN FRANCISCO 11
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IMPERIAL COUNTY

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION				REMARKS
			SEC.	T.	R.	B & M	
23	Homestake	Vanya Laughlin and V. Bloomer, Brawley (1926)	appr.	11S	20E	SB	Class D, Type 1. Mine located 2 miles west of Midway Wells in the Paymaster district. Elevation 750 feet. Holdings comprise 3 claims. A 6-foot vein striking N 60 E and dipping 70 N, in granitic gneiss and monzonite is mineralized with argentiferous galena, much of which is oxidized to cerussite. Developed by a 75-foot shaft, 25-foot crosscut, and open cuts. No recorded production. (Sampson 42:127; Tucker 26:262)
	Little Buckaroo	W.D. Morrison, Box 1187, Yuma, Arizona (1952)	appr.	11S	20E	SB	Class D, Type 1. Lead-silver ore shipped from the Paymaster district in 1952 contained 15.8 percent lead and 10 ounces of silver.
	Marcella	Marcella Mining Co. Niland (1916)	appr.	9S	15E	SB	Class D, Type 2. Small production of ore in 1916 containing 7.25% lead, 2.42% copper and values in gold and silver. (Eric 48:237)
	Mayflower	W.H. Trenchard, San Diego (1942)	11	14S	22E	SB	Class D, Type 1. Comprises 6 claims about 5 miles east of Picacho, 1 mile south of the Colorado River. Lead carbonate and galena in small veins and pockets in schist. Silver values in some assays ran as high as 90 ounces per ton. Developed by shallow shafts, 50 to 90 feet deep; also open cuts. No recorded shipments. (Sampson 42:127; Tucker 26:262)
24	Paymaster	William Green, Ogilby (1939) Former Operators: L.W. Jackson and Harold Jackson, Pasadena M.E. Stark, Beverly Hills	19, 30 24, 25	11S 11S	20E 19E	SB SB	Class D, Type 1. Comprises 12 claims on the east slope of the Chocolate Mountains. Lead carbonate, galena, and silver chloride in a 15 to 30 foot vein between diorite and granite. The principal gangue mineral is calcite. Developed by a 1200-foot shaft and about 2 miles of drifts. Recorded production 1919 to 1921, and in 1939. The principal value was in silver. Reported assays show 8.2 to 10 ounces silver, 3.5 to 10% lead, and 0.15 to 0.16 ounces of gold per ton. (Sampson 42:127; Tucker 26:262-64)

IMPERIAL COUNTY (CONT.)

MAP NO.	CLAIM, MINE, OR GROUP	OWNER NAME, ADDRESS	LOCATION				REMARKS
			SEC.	T.	R.	B & M	
25	Red Cloud	Red Cloud Cons. Mine Co. (1918)					Class D, Type 1. Shipped silver-lead ore in 1918 containing 30 ounces of silver and 28.6% lead.
	Silver King	Charles Kurton, Glamis, and R.D. Gunn and R.D. Glick, Colton	23	12S	19E	SB	Class D, Type 1. Two claims in the Chocolate Mountains, 14 miles NE of Glamis. Gold, galena, and copper oxides in aplite dike cutting gneissoid granite. Galena occurs in irregular branches along fractures in aplite dike. High assays reported. Developed by a 20-foot shaft. No recorded production. (Sampson 42:128)
26	Southern Star	C.E. Weaver, 105 East 1st St., Los Angeles (1926)	36 30	17S 17S	8E 9E	SB SB	Class D, Type 1. Consists of 4 claims, 4 miles SW of Coyote Wells (at 175 feet elevation). A 6-inch stringer in limestone reported to assay 20 to 60% zinc. (Tucker 26:267)
	Unknown	Charles Kurton and Bob Gunn, Glamis (1942)	appr.	12S	18E	SB	Class D, Type 1. Small shipment of lead-silver ore in 1942. Smelter assay 1.1% lead, 0.6% copper, 1.16 ounces silver, and 0.0914 ounces gold per ton.

was visible now and then to the naked eye in the ore. In May, 1888, the main shaft of the mine was two hundred and thirty feet deep to the lowest level.

It is impossible to give any statement of the amount of total yield of this mine from the beginning. But it is safe to say that it has been large, and it is certain that some of its ore has been very rich. These facts, taken in connection with the circumstance that it has been more or less worked under many disadvantages for so long a period of time, certainly speak well for the mine, and there is no known reason why it should not continue to be a productive and profitable mine for many years to come.

Altitude	4,700 feet
Number of stamps	16
Weight of stamp	750 pounds
Drop of stamps	5 inches
Drop of stamps	100 per minute
Duty of stamp in twenty-four hours	2 tons
Shoes and dies	Steel
Size of screens	No. 40
Dimension of apron plate	4 by 5 feet
Length of sluice	12 feet
Hendy Challenge feeders	1
Frue concentrators	1
Value of sulphurets	\$40 per ton
Length of ore shoot	100 to 300 feet
Depth of ore shaft vertically	230 feet
Quantity of water raised	90 gallons per minute
Cost of tunnel	\$12 per foot
Cost of shaft (labor only)	\$20 per foot
Cost to transport ore to mill per ton	8 cents
Average wages in mill	\$3 50 per day
Average wages in mine	\$3 per day
Average wages for outside work	\$2 50 per day

★ PAYMASTER AND EMILIA MINES.

These silver mines are situated about twenty-two miles northerly from the station of Glamis, on the Southern Pacific Railroad, and about thirty miles northwesterly from Fort Yuma, and eighteen miles westerly from the Colorado River. On the same vein as the Paymaster is the Emilia, each being one thousand five hundred feet in length by six hundred feet wide. The vein courses north and south and dips to the west at an angle of about 55 degrees. On the Paymaster the shaft is about three hundred and twenty-five feet deep; the two on the Emilia are three hundred and fifty and two hundred feet deep, respectively. The walls of the vein are a firm and compact porphyry. No water has as yet been encountered in the mine and very little timbering is required. The ore is quartz, containing some heavy spar and occasionally a little galena. The pay shoot is said to extend over one thousand feet. An air compressor and two Burleigh drills are in use at the mine. The ore is worked in a well appointed fifteen-stamp mill by the continuous Boss process; there are six pans. The engine is of one hundred and fifty-horse power, supplied with steam by two steel boilers, each four by sixteen feet. The silver bullion produced is on an average 002 fine in gold.

SAN DIEGO COUNTY.

By W. A. GOODYEAR, Assistant in the Field.

A considerable portion of the following report on this county is from notes taken in 1872.

Speaking in general terms of the broad mountain range, which, stretching southerly from the San Bernardino Valley, occupies all the western

part of San Diego County, viz: that part which is bounded east by the Colorado Desert, west by the Pacific Ocean, and south by the republic of Mexico, it may be said to be essentially a granite range. Probably more than nine tenths of the whole mass of this range consists of granitic rock, which, however, varies largely in texture, and to a considerable extent also in its mineralogical composition at different localities, much of it being more or less syenitic in character.

In many places, however, and more particularly in the eastern portions of the range, the granite is traversed here and there by narrow belts of very highly metamorphosed and crystalline, micaceous, and hornblende slates and schists, which usually have a northwesterly trend; and various qualities of limestone and marble occur at some localities. Moreover, the western foot of the range along the coast, is much of the way flanked to a greater or less extent by almost unaltered accumulations of comparatively recent origin. But the aggregate quantity of all these formations compared with that of the granitic rocks which constitute the great mass of the range, is as stated above extremely small.

The detailed topography of this broad mountain region is very complex, the different ridges trending in many different directions, and inclosing amongst and between them many small valleys at various altitudes above the sea, some of which contain considerable good farming land, though none of them are very large.

As we go inland, the mountains gradually increase in height till at an air line distance of about fifty miles from the coast we find the highest crests of the range at altitudes of between six thousand and seven thousand feet above the sea.

Going still further east, the descent of some five thousand feet from these culminating crests to the western edge of the Colorado Desert is very steep and rapid, thus showing a strong resemblance in the general form and outline of the range, though on a considerably smaller scale, to the shape assumed by the Sierra Nevada itself through the more central regions of the State.

These remarks hold good in a general way of the whole range, until we reach the northern portion of the county, where a more decided easterly and westerly trend of some of the heavier mountain ridges begins to make itself felt, and where, close to the San Bernardino County line, the grand peak of San Jacinto towers to an altitude, as stated by Lieutenant Wheeler, of ten thousand nine hundred and eighty-seven feet above the sea.

For a detailed description of this broad region, a beginning will be made by the present writer at the monument on the Mexican boundary line, some fifteen miles southeasterly from the City of San Diego. This monument is of marble, and consists of a square pedestal capped with a pyramid, the top of which is some twelve or fifteen feet high above the ground. The magnetic course of the boundary line from the monument towards the east on April 24, 1872, was north 71 degrees east.

The monument itself is within about two hundred yards of the shore of the ocean, and is between fifty and seventy-five feet above tide, on the mesa.

For two or three miles, at least, to the east from the monument, the boundary line runs along the northern edge of a mesa whose bluffs, fronting towards the north along the southern edge of the Tia Juana Valley, are some of them at least five hundred feet high.

At an estimated distance of ten or twelve miles southwest from the monument are Los Coronados Islands. These are a little group of three or four small rocky islets in the ocean, which belong to Mexico, the largest