

E/MJ.

Jan 11, 1902

Feb. 15, 1902 p254

INYO COUNTY.

(From Our Special Correspondent.)

No Sabo.—This mine, 12 miles northeast of Bishop is being opened by John and Louis Leidy. The ore piled for shipment in the spring.

KERN COUNTY.

(From Our Special Correspondent.)

Phoenix.—G. W. Lloyd who is building a 5-stamp mill on this mine at Johannesburg, has purchased water system of the Eagle Company.

Yellow Aster.—The 2 mills at Randsburg crushing 450 tons a day and improvements are being made to increase the capacity. John Single is manager.

SAN BERNARDINO COUNTY.

(From an Occasional Correspondent.)

Columbia Mining and Milling Company.—This mine, besides putting in 15 more stamps, intend to install a cyanide plant for treating its oxidized ore and tailings, and recently ordered a compressed air drill. The company now has in operation 5 stamps with power sufficient to run 20 stamps. Lack of water has prevented full operation of the plant up to present, but increased supply has been obtained by sinking the main shaft. The ore in sight above the 100 ft. level is estimated at over 200,000 tons. The company's offices are at Los Angeles. Jas. D. Evans president; W. A. Boeck, secretary and treasurer, R. J. Dyas, vice-president and manager.

Supply and Jean.—J. R. Cheatham is putting in a 60-ton cyanide plant for these mines at Dale.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

California King Company.—This company, at Pichaco, F. Guerra, superintendent, has a number of men opening its claims.

Jan. 25, 1902 p148

LOS ANGELES COUNTY.

(From Our Special Correspondent.)

Vulcan Smelting and Refining Company.—Plans are being made for the erection of a 30-ton smelter at Los Angeles by this San Francisco company which promises to have the plant running in February.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

American Girl.—This mine at Ogilby has installed 8 new Standard concentrators. The mine is sinking to the 500 ft. level. The company brings its water from the Colorado River by a 12-mile pipe line. Ex-Governor H. H. Markham, of Pasadena, is president, G. H. Coffin, secretary, and Thos. Johnson, superintendent. The mine is among the best producers of Southern California.

California King Mining Company.—The mill for working the 16 claims of this company at Pichaco is under construction. Four and one-half miles of railroad track are being laid.

Feb. 1, 1902

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

Gold Dollar.—Evan Davis, superintendent of the Associated Mines Developing Company, owning the Gold Dollar, Glen Ray and other mines near Victor states that as soon as the properties are further opened a 10-stamp mill will be erected.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

California King.—The railroad connecting the mines at Pichaco, with Yuma, is in course of construction. A dry crushing roller mill is to be used at the mines.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

Copper World.—This mine, now owned by the Ivanpah Consolidated Smelting Company, at Rosalie is yielding about 50 tons of smelting ore daily. A new hoist has been put in.

Feb. 22, p286

KERN COUNTY.

(From Our Special Correspondent.)

Butte Mining Company.—This company, at Randsburg, P. H. McMahon, superintendent, is working 22 men and taking out considerable ore.

Florence.—A Bakersfield company has been organized to re-open and work this gold mine near the Long Tom on Upper Poso Creek.

Old Keys.—It is understood that this mine, near Isabella, is to be sold.

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

Pinon.—W. F. Sherwood, of Los Angeles, has purchased from Dr. Mary S. Erth, of the same place, a 2-3 interest in this and the Golden Calla mines in the Pinon District.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

American Borax Company.—This company has been organized in San Francisco to develop borax deposits in the desert country near Daggett.

Bayard.—At this group, near Ludlow, 3 gas engine engines are used. Two In-kee electric drills are being put in. The company, when it finds enough water, will move the 60-stamp mill and plant from Bayard to the mine. The general manager is Mr. Stage and C. Grant is mine superintendent.

Dale District.—The miners of the old Virginia and Mining District have abandoned the name and formed the Dale District, with the same boundaries. The Capitol, a new mine recently located by C. B. Eaton is attracting attention.

Mar. 8, p360

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

Anthony.—This old mine is being put in order and operations will be resumed in the spring.

Millsbaugh.—A mill to crush 20 tons of ore per day.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

Capital.—Very rich rock is coming out of the Capital Mine at Dale. Some gold is saved by running through a dry-washer and some is pounded up and washed in pans. The ore streak is very high. The mine is owned by C. B. Eaton, of Los Angeles and has created quite an excitement at Dale.

Davis Mining and Smelting Company.—This company, at Oro Grande, is to have an 80-ton smelter. The ore is of a grade which will not bear shipment. The Los Angeles company owns 12 locations.

Plant.—This mine, in the Monumental 100 ft. level is about to be opened on a large scale. Two steam hoists are being installed.

E/MJ

Mar. 22, 1902 p424

**Millspaugh Iron and Mining Company.**—This company, at Ballarat, A. N. Millspaugh superintendent, has been doing development work for some time with 15 men at work. The new milling plant is completed.

KERN COUNTY.

(From Our Special Correspondent.)

**Alladin Group.**—These mines, at Mohave, owned by Dr. W. J. Nelson, of Los Angeles, have a shaft 100 ft. deep, which is being sunk 100 ft. deeper. Ore will be shipped to Barstow for treatment.

**Bobtail.**—This mine, near Mohave, has been purchased from G. Ropper and D. Craighton by San Francisco men.

**Exposed Treasure.**—The 13 claims of this company, near Mohave, W. J. Nelson manager, are being developed and some are producing. Twenty stamps have recently been added to the mill. Eighteen miles of pipe line have been laid for water, and a cyanide plant has been installed. J. H. McDermott is manager, W. J. Nelson having resigned. The property and plant, owned largely by New York men, cost upward of \$400,000. The deepest shaft is 600 ft., and the total amount of underground work is about 6,000 ft.

LOS ANGELES COUNTY.

**Red Rover.**—At this mine, at Acton, a fine 4-ft. ledge of good ore has recently been struck. The mine has been unproductive for some time, though formerly it paid well. The recent strike was made near the old workings. The mine is owned by Governor Henry T. Gage, H. O. Collins, George J. Denis and others, of Los Angeles. There is a mill on the property. There are a number of other mines at Acton, but little has been done at the camp for several years.

SAN DIEGO COUNTY.

**Picacho.**—The excavations for the great dry-crushing cyanide plant are completed. The Colorado Iron Works Company is getting together the material for the building. Work on the railroad to the mill site is progressing well.

Mar. 29,

KERN COUNTY.

(From Our Special Correspondent.)

**Exposed Treasure.**—This mine, near Mohave, largely owned by W. J. Nelson, of Los Angeles, has started up with additional 20 stamps with new Corliss engine, bearings, etc.

**Oshkosh Gold Mining Company.**—This company, at Randumb, R. E. Doan superintendent, and G. P. Drew, of Los Angeles, president, is erecting a plant consisting of a 4-stamp mill, new Standard concentrator, overhead water tank, etc. Development work is prosecuted by 8 men, and the stamps will drop early in April.

**Phoenix.**—At this mine, at Johannsburg, G. W. Lloyd, owner, a 5-stamp mill has been put up with provision for 5 stamps more. There is also a cyanide plant.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Dale Camp.**—This camp needs a large custom mill. Sabbath & Killian have been working a 2-stamp mill several years, the Monahan is another 2-stamp mill and the Brooklyn Mill has 3 stamps. Water costs 9c. a gallon.

**Easton Camp.**—This new mining camp, near Dale is named in honor of C. B. Easton, of Los Angeles, who recently made a rich strike in the Capitol Mine.

**Malachite Copper-Gold Company.**—From the mines of this company, 14 miles from Daggett, at Ord Mountain, a lot of ore has been tested with results reported satisfactory. Development is in progress.

**Providence Gold and Copper Company.**—Superintendent Gen. L. Berg has taken men, supplies and freight to the new camp about 25 miles from Blake, south of Fishy Pass, where he is to start work on the Gold Stone group belonging to this company. Ground is to be prepared for a mill site, houses erected, etc. A 20-stamp mill is projected.

**Stabueno.**—Mr. G. A. Bryant intends making important improvements on this quartz mine on the Mohave Desert about 30 miles from Mohave. His men are taking out high grade quartz.

**Vulcania.**—In this mine, at Danby, a strike of rich ore is reported. The Jackson group has recently been sold.

Apr. 5, 1902 p 494

INYO COUNTY.

(From Our Special Correspondent.)

**Utah Bench.**—This mine, 4 miles from B. Grant, C. Archer superintendent is to build a trackway for hauling out ore.

**Radeliff.**—This company, at Ballarat, W. W. Goodwin, manager, is again at work with 10 stamps developing.

**St. George Group.**—This group of claims, near Modoc, has been purchased by Spokane, Wash., and Los Angeles men, through H. L. Peres, of Los Angeles, and will be reopened. The claims have not been worked for 30 years.

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Cannon Group.**—This group, in the Providence Mountains, recently purchased by E. Frank Campbell, has been examined by A. T. Stewart, of Los Angeles. As the ore carries considerable sulphurets a mill with concentrators will be erected.

**Desert Queen.**—This mine, near Banning, at one time a large producer, but idle for a long period, has started again.

**Red Cloud.**—This mine, near Salton, E. H. Gould superintendent, is ready for work on a large scale. P. Creasinger, of Los Angeles, is president of the company and W. L. Elder secretary.

**Silver Wave.**—On this property, in Old Woman's Mountains, D. Jackson, representing A. P. Morrison, of New York, has, since taking the bond, spent \$12,000 in development work and claims to have found an ore body which will pay handsomely.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**California King.**—The excavation for the 1,000-ton reduction works at this company's mine at Picacho, is completed, and 5 large boilers are in place.

**Golden Cross.**—A company capitalized at \$2,750,000 has been organized in London to purchase this mine, at Hedges. While the mine is a large producer it is in debt and its affairs are managed by a receiver. It is the largest quartz mill in California. The ore is low grade, but in large bodies.

**Picacho District.**—The dry-washer men in this district, numbering about 50, got out over \$25,000 last year.

**Stonewall.**—This quartz mine at Cuyamaca, 8 miles from Julian, which was at one time a very heavy gold producer, has been sold to New York men by the San Francisco National Bank, which held a mortgage upon it. The mine was located in 1870, was worked some years by A. P. Frary, but became the property of the owners of the Cuyamaca grant. It was afterward purchased and developed by the late Governor Waterman. Since his death it has laid idle for 9 years.

EMJ

Apr. 12, 1902 p530

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Chukawala Mining Company.**—At this mine near Salton, Charles P. Wyatt, superintendent, a cyanide plant is being erected to treat the ore directly. The company's office is at 112 North Los Angeles street, Los Angeles.

**Desert Queen.**—This mine, at Banning, owned by S. P. Zambro, of San Bernardino, has not been worked for some time, but development work is now being done.

**Los Hueso Mining and Milling Company.**—This property at Banning is now owned by this company, 906 Main street, Kansas City, Mo., with S. M. Felsky, superintendent. The property has been idle since last May on account of scarcity of water.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Bon Ton.** This placer, at Dale, is being worked.

**Brooklyn Company.**—This company, at Dale, has finished its well and has a good water supply. The company, which now has a 3-stamp mill, is to erect a larger one. Ames & Yeager are the principal owners.

**Paradise Valley.**—W. J. Beaver and H. Galeron, of San Bernardino, are putting up a mill on claims in Paradise Valley, about 20 miles from Daguerre.

**Vulcano.**—A strike of gold ore and of water has been made in this mine at Danby.

Apr. 19. p562

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Providence Gold and Copper Company.**—The mines are at Goldstone, 25 miles from Blake, in the Providence Mountains. Superintendent Berg is erecting bunk houses, etc., and extending the shafts on several of the claims. There is no mill at the mines as yet.

Apr. 26. p. 594

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Red Cloud Mining Company.**—The mines are near Salton. S. P. Cressinger, of Los Angeles, is president and E. N. Gould, of Salton, is superintendent. C. W. Bennett is at present acting superintendent. Work is starting, the machinery not being all up yet. Some experimental runs have been made on ore to find the best way to work it. Twenty-five men are employed in development.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Antimony Discovery.**—John T. Reed, S. S. Thomas, and E. Swarthout have struck a 12-ft. ledge of antimony ore 12 miles north of Randsburg.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Stonewall.**—This old mine at Cuyamaca is to be reopened, after some years idleness, by Col. S. H. Lucas representing Eastern purchasers. The property is equipped with a fine mill and other machinery and once was a large producer.

May 10.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

C. E. Shuey, C. A. Weaver, R. D. Warnock and the estate of T. H. Henchry have sold a gold property at Ballarat to a Los Angeles company, which has been organized to work it.

**Buckeye.**—From this mine, at Ballarat, F. L. Howard, owner, good shipping ore is being taken.

**Dean & Jones.**—On this mine, at Slate Range, 50 men are at work, and ore is steadily crushed.

**Imperial Ranch.**—On this mine, at Ballarat, recently sold by Charles Anthony to Los Angeles men, a new plant is being put in and 25 stamps are running.

**Rudeliff.**—Fifteen stamps are working on ore from this mine at Ballarat. W. W. Godsmark, manager.

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**National Paint and Color Company.**—Near Colton has been found a deposit of ochre, which is being opened by Wm. Dyer and J. H. Dixon, who have organized this company.

**Red Cloud Mining Company.**—The mines of this company are some distance from Salton, and E. N. Gould, of Salton, is superintendent. The owner and president is S. P. Cressinger, of Los Angeles. Some bullion is produced. Reservoir lines are being built.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**American Girl.**—This mine, at Ogilby, has been sold to the American Consolidated Mining Company, composed of Denver and Chicago men. Thomas J. Collins has been superintendent of the mine and J. H. Coffin, of Pasadena, secretary. There is a 100-ton cyanide plant. The new owners will rebuild the mill and build a 10-mile pipe line to the Colorado River to obtain water. The manager for this company is Colin Timmons.

**California King.**—The mines of this company at Pichacho, are being connected with the Colorado River by a 4½-mile narrow gauge road. The road will be used for crushing the ore, which is to be treated by cyanide.

**Golden Cross.**—Active work on this large mine, at Hedges, has been stopped for the present by Receiver A. W. Pauly, though the cyanide works will keep at work on tailings. The property is involved in litigation. Debts left by the former receiver, Isaac Trumbo, of San Francisco, have not been settled and Mr. Pauly has shut the mine down pending a court decision.

**Volde.**—These mines, near Julian, comprising a number of claims, have been bonded to English people, represented by J. H. Thring.

May 17.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Bagdad Mining Company.**—Surveys are being made for a narrow gauge railroad, to run 7 miles from the mines to Ludlow on the line of the Santa Fe Railroad. From there the ore will be shipped to the smelter at Borstow. Thirty-seven men are employed. These mines are owned mainly by parties connected with the New York Central Railroad Company.

**Holcomb Valley Coal Mining Company.**—About \$25,000 worth of machinery belonging to this company at Holcomb Valley is to be sold at public auction by the sheriff to satisfy judgment.

E/MJ

May 24, 1902

KERN COUNTY.

(From Our Special Correspondent.)

**Baltic.**—This mine at Randsburg has a new 10-stamp mill, built at Los Angeles by the Llewellyn Iron Works.

**Josephine T. G.**—This mine, near Randsburg, has been bought by J. P. Howe, Andrew Kane and R. T. Brackney, who have been working it under bond for the past year. An interest has been bonded to D. & E. Culbert.

**Mojave Copper Company.**—This company has purchased 30 copper locations near Mojave, and active development is to start shortly.

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Pinon.**—This gold mine, 15 miles from Indio, has been bought by W. P. Sherwood, and is worked under contract by F. Reichert and Wm. Hansen. New machinery is to be put in.

**Red Cloud.**—This coal mine, 10 miles from Salton, E. S. P. Creasinger, of San Diego, and directors have decided to move the mill, and concentrators.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**California King Mine.**—It is reported that ex-Senator John D. Dole, of Dakota, has purchased the Dorsey in these mines near the Colorado River.

May 31

INYO COUNTY.

(From Our Special Correspondent.)

**Inyo Gold Company.**—This company, owning claims in the Panamint Mountains, 8 miles from Ballarat, will install a cyanide plant, and will also have electric lights. J. P. Flint, W. S. James and others are interested.

**Reward Mining Company.**—On the mine of this company, at Reward, H. C. Steele, manager, a 14-ft. ledge of good ore has been found, showing free gold. This mine has been a producer for some time. The long tunnel is still being driven ahead.

KERN COUNTY.

(From Our Special Correspondent.)

**Borax.**—Ten miles from Caliente Messrs. B. B. and H. Philips, of Bakersfield, have found a vein of borax which they are about to open.

**Keyes.**—This old mine, at Keyes, owned by Col. James Spellacy and the State Bank at Sacramento, is employing 20 men and milling high grade ore.

**Lady Belle.**—This mine, at Kernville, is one of the oldest in the county, but it has been in litigation for some years. It is now about to be reopened, and a boiler and pumping machinery have been shipped. The deepest shaft is 350 ft. This shaft and the other shafts are at present full of water. The mine is one of the Big Blue group.

**Keyesville.**—The placer claims in Mammoth and Keyesville which were worked in early days are now to be worked, this time higher up, as a new dam at a greater elevation brings the water on to the claims.

**Coal and Power Company.**—This company is

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Black Buttes District.**—In this hitherto unprospected region over 50 new mining locations have been made, but little development work has as yet been done.

**California Portland Cement Company.**—At this company's quarries at Colton, Chas. Albright is superintendent, F. H. Jackson, of Los Angeles, is agent, and W. Smith, of Los Angeles, has recently been elected president. New machinery is being installed with a capacity of 12,000 tons of cement per month. Lately the works have been turning out between 9,000 and 10,000 tons monthly. A new rock-crushing plant for road ballast has been ordered. Oil burners are being attached to the new lime kilns, and about 100 tons of fuel oil will be used daily.

**Victor.**—These marble quarries are shipping marble to Colton to be polished.

June 7, 1902 p807

KERN COUNTY.

(From Our Special Correspondent.)

O. H. T. Hansen, of Glenville, has sold his claim in Granite, to an Oregon Company, which is to put up a mill.

**Tom Mitchell.**—This old mine at Kernville, owned by Thomas Kerner and W. B. Walker, is turning out a little rock. At one time the mine produced very rich ore, but caved and filled in 1863, lying idle until 1901, when Kerner & Hylen started work in the old tunnel. Hylen got discouraged and sold out for 75c. Kerner then got through rich ore, but did not recognize it, and so quit. W. B. Walker recognized the value of the ore he found and bought a half interest for \$25. The first clean-up of 18 tons of rock is reported to have yielded 14 lbs. of gold, and rock now coming out runs as high as \$150 per ton.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Bayland Mining Company.**—From the mines of this company at Ludlow, C. Grant superintendent, a good deal of ore is being shipped to the railroad by team. Forty-seven men are said to be taking out 125 tons of ore per day.

**Barstow Mill.**—This mill is temporarily closed while extensive repairs are being made.

**New Gold Strike.**—E. W. Spaulding, C. F. Blackburn and Messrs. Cole & Wright have found new gold claims on the north slope of the San Bernardino Mountains, 25 miles from Victor. The ore is free milling. Numbers of miners have gone to the new district.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

Three oil companies—the Mesquite, Cactus and Yuba—have been drilling in the Carrizo Creek Region on the Colorado Desert. It is reported that strong seepages of oil have been struck at depths of from 300 to 500 ft. There are no productive wells in the district.

**California Gold King.**—On these mines at Fichtelbo, about 400 men are at work, mainly on the railroad which is to connect the mines with the Colorado River. It is expected that the new reduction works will be completed about July 1.

June 28, 1902

INYO COUNTY.

(From Our Special Correspondent.)

*Emily Knox.*—W. C. Pidge, acting for San Francisco and Eastern men, has bonded this and 2 other claims near Bishop, and also the Enloe and Leidy mines, near Laws. Prospecting is to start at once.

KERN COUNTY.

(From Our Special Correspondent.)

M. J. Curren, L. M. Underwood, George Letts and A. B. McNitt, of Bakersfield, have located some promising claims in the Rademacher District, near Randsburg.

*Havilah District.*—The old camp of Havilah, that for many years has done little, is now again active, mainly because the cyanide process has worked well on ores of the district. Among the properties now worked are the Big Four Company's tunnel, the Golden Eagle tunnel, the McKidney Mine, the Warrington Company's plant, the Friday and King<sup>2</sup> mon mines. A cheap power supply is expected shortly through the construction of a canal.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

*California King Gold Mining Company.*—Engines and cars for the 6-mill narrow-gauge road are at hand. J. E. Ridgeway has been appointed assistant manager, and Andrew Trumbo is foreman of the cyanide department at Pochacho. Senator John P. Jones is president of the company.

*Golden Cross.*—Charles W. Pauly, the receiver of this mine, at Hedges, owned by the Free Gold Mining Company, reports receipts for May as \$13,487, of which \$11,693 was derived from the cyanide plant. The mine is closed pending legal settlement of the accounts of Isaac Trumbo, of San Francisco, the former receiver.

*High Peak.*—The Helvetia Mill has been crushing ore from this mine, at Julian. Water supply is scant.

*Palagonite.*—What is represented to be a deposit of this material has been discovered in the Aliso District, 3 miles from Escondido on the way to the Encinitas station of the Santa Fe Railroad. Palagonite is a basaltic tufa chiefly consisting of glass lapilli and the products of their alteration, and is known to exist in Italy, Iceland and the Cape Verde Islands.

It is supposed that this San Diego County deposit is the only one in this country. There is claimed to be an immense mass easily accessible. The powdered product is suitable for paints, polishing powders, kalsomining, filler for mineral paints, etc. Some of the material is pure white and other portions show lavender and ochre colors. J. E. Delgado, of San Diego, owns the deposit, and has brought to the State Mining Bureau, San Francisco, various samples. Little development has been done, but steps are being taken to put the material on the market.

*Ranchita.*—F. E. Jones has closed down this mine at Banner for a time, but will soon erect a mill for the Elevation Mining Company at the same place.

July 5, 1902 p. 23

Allen G. Campbell, a widely known and popular Utah mining man, died recently at his home in Riverside, Cal., from pneumonia. Mr. Campbell was about 77 years of age, and was a native of Missouri. After following mining in various parts of the coast and mountain States with indifferent success, he went to Utah in the early '70s. When the great Horn Silver Mine was but little more than a mere prospect, it passed into the hands of himself, Matthew Cullen and Pat and Dennis Ryan. The mine proved a bonanza, and in 1879 it was sold for \$5,000,000, each of the partners owning an equal interest. With his fortune made, Mr. Campbell continued to invest in mining properties, chiefly in Beaver and Iron counties, and later in Nevada and southern California. Recently he parted with large blocks of ground near Milford and Frisco, Utah, but his holdings there and in the iron belt further south were still considerable.

Mr. Campbell leaves a widow, 2 little sons and a daughter, besides an elder son, Charles, by a former marriage, who lives in Kansas. Mr. Campbell's disposition was kindly, and his manner genial. In former years he paid out thousands of dollars for the education of poor children.

July 5, 1902 p. 25

KERN COUNTY.

(From Our Special Correspondent.)

*Echo.*—The new mill at this mine, near Mohave, is about completed; 25 men are at work.

*King Solomon.*—This company, near Havilah, intends putting up mills this year. The Morning Glory group of mines is worked.

*Kinyon and Wedge.*—Connection has been made between these Randsburg mines at the 155-ft. level.

SAN BERNARDINO COUNTY.

(From an Occasional Correspondent.)

*Colorado River Gold and Copper Company.*—This company, in Monumental District, expects to erect a small smelter this year.

*Wright.*—From the claim of D. P. Wright, near San Bernardino, some very rich specimen rock is being taken. The mine is about a mile and a half from the Green Lead claim.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

*California Salt Company.*—This company, which recently acquired leases on the Carlsbad, La Costa and Kelly sloughs, and put up salt evaporating works near Carlsbad, has been sued by M. Lewis, who asks for a receiver and an injunction preventing the company from collecting an assessment. The vats and works cover 25 acres.

*Free Gold Mining Company.*—The mines of this company, at Hedges, better known as the Golden Cross property, will resume work, a compromise on the accounts of Isaac Trumbo, the former receiver, having been reached. Mr. Trumbo will assume notes on the First National Bank of San Francisco, aggregating \$10,000, which the court ruled Trumbo had no right to draw. Trumbo also agrees to pay to the present receiver \$500. His agreement to take care of the notes and the payment of \$500 wipes out the alleged deficit of \$8,600. The merchandise claims, amounting to \$49,000, are adjudged to be a lien on the property, and must be paid from the funds of the company or from future operation. The settlement also provides for the payment of a balance due creditors of \$44,000 on claims dating as far back as 1895. These creditors are to receive \$20,000 at once and half of the net earnings of the mines until the obligations are canceled, while the merchandise creditors are to get \$10,000 down and the other half of the net earnings. There is an agreement that neither party shall appeal. It is declared that in due time all creditors will be paid. The mines have lately been closed, pending this settlement, but the cyanide works have been operated. The property is one of the large producers of California.

*Julian District.*—The Owens, Helvetia, Julian Consolidated and other quartz properties at Julian have been recently examined by A. F. Judson, of Los Angeles, in the interest of Eastern men, with a view to purchase. This is an old camp worked since 1870, but no very great depth has been attained.

KERN COUNTY.

(From Our Special Correspondent.)

*Consolidated Mining Company.*—This company has been incorporated at Los Angeles to work the Wedge, Kinyon and 18 other claims at Randsburg. The officers are Los Angeles men. W. E. De Groot, president; E. T. Simpson, vice-president; T. S. Fuller, secretary; J. W. Off, treasurer. These with L. G. Parker, W. A. Barker and Mrs. E. A. Summers form the directorate. Development will be superintended by Percy H. McMahon, of Randsburg, already superintendent of several mines there.

*Lightning Gravel Mining Company.*—This corporation, organized at Bakersfield, is to use the Lightning gravel process, by which, it is claimed, cemented gravel and coated gold may be worked at a profit. H. L. Norton, of Bakersfield, represents the company.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

*San Bernardino Iron Mines.*—There is to be litigation over these iron ore claims at Daggett. E. E. Lake, who owned them, transferred his title, and now brings suit, alleging that he sold for much less than value, owing to misrepresentations. Lake asks the court to declare the deed of transfer null and void. It is understood that the group of 8 claims was sold for \$200 and that the mines have since been bonded to a Los Angeles company for \$30,000.

SAN DIEGO COUNTY.

*California King Gold Mines Company.*—The suit of William A. Farish against this company, Stephen W.

Dorsey, John P. Jones and the Wells Fargo Company has been discontinued without cost to either party as against the other. Stephen W. Dorsey settled the claim out of court.

July 26 p. 124

KERN COUNTY.

(From Our Special Correspondent.)

Randsburg is to be supplied shortly with electric power for the mills and mines.

*Bakersfield Smelter.*—Work has started on a smelter at Bakersfield by a recently organized company. There will also be facilities for cyaniding ores.

*Butte Lode.*—This mine at Randsburg has cleaned up \$36,194 for the first 6 months of the year.

*Gold Peak.*—This mine at Amalie has 12 men at work, mainly on development.

*Randolph Mining Company.*—This company owns 8 claims near Randsburg and has begun development.

*Ratcliffe.*—This mine at Ballarat is keeping a 20-stamp mill and cyanide plant busy. Fifty men are at work.

*Yellow Aster.*—At this famous mine at Randsburg, John Singleton, manager, a new pump is installed and the mine force is to be increased.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

*Silver Wave.*—On this mine near Danby, the tunnel is now in 650 ft. The mill is working on some high grade ore.

*Vulcania.*—A contract has been let by this company near Danby, for a 100 ft. shaft and 100 ft. of drifting

SAN DIEGO COUNTY.

**California King Gold Mines Company.**—Deputy Sheriff Campbell, of New York, has received an attachment for \$36,518 against this company from J. Adriance Bush, in favor of Hewlett Bush, on an assigned claim from the Colorado Iron Works Company for balance due for machinery for a mill near Yuma, Ariz. The attachment was granted on the ground that it is an Arizona corporation.

(From Our Special Correspondent.)

**Bullion Bar Dredging Company.**—This company controlling by lease the properties and dredger of the Advance Gold Dredging Company at Potholes 14 miles above Yuma is to start the dredge in the river for a test. The dredge has been idle owing to litigation among the owners.

**Schaffer Salt Works.**—These old works near the head of San Diego Bay have been purchased by the Western Salt company, G. E. Babcock, president, and a new refining plant has been put in. Increased facilities are being provided.

Aug. 16 p. 225

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Alohc.**—This group, at Dale, will shortly start work again.

**Baldy.**—These mines, on Mount Baldy, have small streaks of rich ore. A roller mill has been hauled in.

**Brooklyn.**—This company, at Dale, owning the Brooklyn and Los Angeles mines, has a 3-stamp mill,

and will add 5 stamps. The cyanide plant is nearly finished.

**Capitola Group.**—This group of quartz mines at Dale, C. B. Eaton superintendent, is working steadily.

**Carlisle.**—This group, at Dale, owned by Meltae & Hallsworth, will shortly have a mill and pumping plant. The workings are the deepest at Dale—450 ft.

**Dale.**—The town and post-office of Dale have been moved to near the O. K. Mine, 8 miles southeast of the old town of Dale. The stages run from Palm Springs, 73 miles, once a week.

**Providence Gold and Copper Company.**—These mines are at Goldstone, in the Providence Mountains, Geo. L. Berg, late of Los Angeles, being superintendent. The camp is at an altitude of 6,000 ft. Shafts are being sunk, and a good water supply has been developed.

**Silver Creek Canyon.**—A new gold mine is being opened in this canyon near Hesperia. Over 150 ft. of tunnel have been run. The ore found is called high grade. The directors are James Kennedy, H. B. Wilson, W. Keyzer, T. E. Parke and J. O. Henderson, all of Ontario.

**Vandorbill District.**—The mines in this district, near Manvel, which have long been idle, are to be reopened. The St. George and Boomerang claims belonging to the estate of A. G. Campbell have been sold to Eastern men. The Gold Bronze, owned by J. M. Hale, of San Francisco, will shortly resume work. The old mill is being overhauled.

**Welcome.**—These copper claims, near Manvel, have been sold to G. M. Hamstadt, of that place.

Aug. 30

KERN COUNTY.

(From Our Special Correspondent.)

**Amalie District.**—H. Phillips, in this district, has found a vein of molybdenum which is to be developed. There is considerable activity in the gold mines, but the ore has to be shipped to smelters. There is some talk of H. H. Blood and others putting up a local smelter.

**Butte.**—The last clean-up of this mine, at Randsburg, netted \$63 per ton.

**Contract.**—This mine, owned by T. J. Harris and his brother, of Griffin, Ventura County, is near the Kern-Ventura line, and is under bond for 30 days at \$20,000. They are down 180 ft., and at that point ore was mined which yielded \$8,000 at the last clean-up.

**Keyes.**—This mine, at Isabella, has been closed down by Mr. Thornton and returned to the original owners, the Walker Brothers. The difficulty was cost of fuel to do the pumping.

**Lady Belle.**—This mine, near Kernville, is putting in steam hoisting and pumping machinery and timbering the shaft.

**Stringer.**—In the Stringer District, near Randsburg, H. Hough, J. Robb, J. Balschweid and Fritz Utecht have uncovered a 5-in. ledge of \$100 rock in a fraction adjoining the Merced Mine. They are also working the Pearl Wedge claim in the same district.

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Arica Group.**—These mines are about 60 miles south of Danby, San Bernardino County, and are being actively worked. Mr. C. H. Gray is the superintendent. The shaft at the mine is 120 ft. deep. The old Cooley Mine, owned by J. T. Brown, is in the same region.

Sept. 6

INYO COUNTY.

(From Our Special Correspondent.)

**Golden Argus Mining Company.**—This company is erecting a 5-stamp mill on its property in the Argus Range.

**Leidy-Vanfleet.**—At these mines, W. C. Pidge manager, 14 men are now at work. A Merrill mill and concentrators are to be put in. These mines are near Bishop and are under bond to Mr. Pidge, who also has the Yancy Enloe mines under bond.

**Molybdenum.**—O. H. Hill and M. C. Hall, of Bishop, have a deposit of molybdenum near the Hillside dam, south of Bishop Lake. The deposit is said to be quite large, but is unworked.

**Ratcliff Consolidated Gold Mining Company.**—This company, at Ballarat, W. W. Godsmark manager, has leased the water plant of the South Park Mining Company, including the gasoline engine, pump, etc., and will pump water to the Ratcliff Mine.

LOS ANGELES COUNTY.

(From Our Special Correspondent.)

**Iron Ore Smelter.**—Near Newhall an experimental furnace to smelt iron ore with oil fuel has been constructed. The ore is mined a short distance from the smelter. The result of the practical test now being made will determine the future plans of the company.

KERN COUNTY.

(From Our Special Correspondent.)

**Friday.**—This mine, at Havilah, belongs to S. L. Ferguson, who is about to sell to a Los Angeles company with sufficient means to properly develop it. The deepest works are not lower than 125 ft. at present.

**Gold Peak Group.**—This group, near Bakersfield, has been acquired by W. F. Snyder for the Western Exploration Company.

**Homer.**—Mr. Sanbery, superintendent of this mine at Havilah, has struck a good seam in the country rock while running a tunnel to the main ledge.

**King Solomon.**—In this mine at Havilah, John Hayes superintendent; the force of miners has been increased.

**Little Butte.**—Operations on this mine, at Randsburg, have been resumed under superintendency of P. H. McMahon.

**McKinley.**—It is stated that work will shortly resume at this mine at Havilah, Duncan Ferguson, superintendent.

**Oil Tanks.**—The Standard Oil Company has ordered 20 more 35,000-bbl. tanks for the Kern River field. The Southern Pacific Railroad Company is placing 72 of these tanks along its lines at various points.

**Oil-Well Drillers' Union.**—In this county a union of this name has been formed to make uniform wages. Last year the drillers were getting \$7 to \$8 per day, while now wages are \$4 to \$5 per day.

**Standard Mining and Reduction Company.**—F. V. Layton has acquired by purchase the interests of C. Kuffel and A. Nixon in this company's holdings, including the Stanford and Gold Coin mines and the Red Dog mill at Randsburg.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Campbell.**—Capt. Thompson and L. C. Gilliam, representing Idaho men, have bonded this group of mines at Manvel. This mine was once owned by Mackay, Flood, Fair and O'Brien, but the property did not pay. A. G. Campbell then worked the ore as a free milling proposition. There is a mill, concentrators, 3 shafts equipped with steam hoists, etc., but the machinery is out of date and the new owners contemplate putting up a smelter.

**Keystone.**—Two Huntington mills and a cyanide plant have been put on this old mine between Sandy and Fenner. The mine is owned by the Schrader-Johnson-Doak Company.

**Roosevelt.**—In these mines at Ludlow, some 600 ft. of development work has been done and a gasoline hoist erected. It is stated that a 50-ton cyanide plant will be put up.

Sept. 20

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

J. Irving Crowell has sued Col. Thomas Ewing, president of the Southwest Miners' Association, for breach of contract in the purchase of a group of copper claims in Morrow District. Crowell avers that Col. Ewing was to pay him the sum of \$118,500 that the deeds were placed in escrow until payment of purchase price, and that Col. Ewing failed to fulfill the contract. Col. Ewing says he never agreed to buy the properties, but to pay a certain sum if he found a purchaser. The claims are copper properties at present undeveloped.

**Eckes & Wilson.**—These men have been some months working a 2-stamp mill on a claim on Old Baldy Mountains at a point over Ice House Canyon. The Huntington mill was packed in on burros.

**Federal Mining Company.**—This company will develop the Manvel Mine, at Manvel, from the estate of A. G. Campbell. A large mill is contemplated. Capt. C. H. Thompson, of Spokane, Wash., represented the Spokane purchasers.

**Virginia Dale.**—This mine, at Dale, has been bonded to Louis Wright, of Pomona.

INYO COUNTY.

(From Our Special Correspondent.)

**Cecil R. Mining Company.**—Los Angeles men are developing mines in Park District, north of Johannesburg. A 2-stamp mill is doing test work. Seven claims are worked. The following Los Angeles men are interested: W. T. Carter, A. W. Graybill, C. R. Faulstick, F. K. Rule and U. S. Todd.

**Dunphy.**—On this mine, at Keeler, the Troeger Brothers will shortly erect a hoist.

**Eva Belle.**—J. C. McMillan and F. K. Andrews are shipping high-grade ore from this mine just across the summit of the White Mountains from Laws. Work has been going on all summer with encouraging results.

**Golden Argus Mining Company.**—A 5-stamp mill is being put up at this mine at Snow's Canyon about 20 miles from Ballarat, and concentrators and a cyanide plant are to be added.

**Ibex Springs.**—Judge L. Bethune and Arthur Holf, of San Bernardino, have bonded 3 claims at Ibex Springs in the Funeral Range in the Death Valley region to Eastern men for \$12,000. The ore runs high in lead and carries some silver.

KERN COUNTY.

(From Our Special Correspondent.)

A company composed largely of Santa Fe Railroad officials is opening a 14-ft. vein of gold ore about 10 miles from Bagdad. The ore is teamed to Bagdad, and then shipped to the mill at Barstow.

**Bagdad Mining and Milling Company.**—This company's mines, near Ludlow, are now employing 60 men and turning out 100 tons ore daily, about 30 tons of which are sent to the Barstow Mill, the balance being piled up to await the completion of the railroad from Ludlow to the mines. The ore runs from \$8 to \$40 per ton.

**Lida.**—E. M. Hamilton, owner of this mine, at Rosamond, has bought Willow Springs, and will pipe water to his 5-stamp mill at the Lida. He intends also to erect a 10-stamp mill at Willow Springs for custom work.

**Yellow Aster Mining Company.**—At this mine, at Randsburg, John Singleton manager, Mrs. R. L. Burcham secretary, the 100-stamp mill is now running. At the Goler wells the new well will be connected with the old one by a 270-ft. tunnel below water level. Both mills will soon be running.

LOS ANGELES COUNTY.

(From Our Special Correspondent.)

**After Gold Mining Company.**—This Los Angeles company owns 30 full claims in Horse Canyon, a branch of San Gabriel Canyon, 16 miles from Azusa, and is working 3 claims.

**American Iron Company.**—This company, with offices in the Bryson Block, Los Angeles, has started working iron ore at Russ Station on the railroad not far from Surrey. Oil and charcoal are used for firing the experimental smelter. The lime stone comes from Techapai. The first run has been made.

Sept. 20, 1902

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Bullion Bar Dredging Company.**—The dredger of this company, at Potholes, 14 miles above Yuma, will shortly start up after a year's idleness.

**Gold Rock.**—It is understood that these mines, at Hedges, will resume operations about October 1, and preparations are under way to start the mill.

**High Peak.**—Ore is being hauled from this mine, at Julian, to the Helvetia Mill.

(From Our Special Correspondent.)

**Iron King.**—Work is suspended in this mine at Julian. A shaft will be sunk.

**Oro Fino.**—Mrs. Florence A. Stough has begun suit against Samuel M. Green, of Milwaukee, Wis., and others to recover certain money alleged to be due as payment on these mines at Escondido.

**Poor Man's.**—On this claim at Boulder Creek near Julian, E. Feeler and Geo. Moore are taking out some good rock.

**Nobles Group.**—Work has started on this group, near Julian, under W. E. McEwen superintendent.

Sept. 27

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Bagdad Mining Company.**—This company, at Ludlow, C. Grant superintendent, has purchased the Rochester and Syracuse claims entire and a 2-3 interest in the Siberia, Bagdad, Ash Hill, Ludlow and Klondike claims in Bullion and Old Dad mining districts.

**Southwest Ore Reduction and Investment Company.**—This company, organized in Los Angeles, is to exploit mines in Virginia Dale District and erect cyanide and concentrating plants. The incorporators are: J. E. Schwenf, J. W. White, M. V. Parks, F. M. Sterling, H. Kuhl, H. D. Stablein and R. L. Stablein, of Los Angeles. The latter is president, H. Kuhl is secretary and E. J. Young business manager.

Oct. 4

INYO COUNTY.

(From Our Special Correspondent.)

**Inyo Gold Company.**—This company has been incorporated to work this group, near Panamint. The incorporators are W. S. James, F. P. Flint, O. P. Widaman, G. W. Lasher and J. O. Scannel, of Los Angeles. The company has a 12-stamp mill.

**Reward.**—Superintendent H. C. Steele, of this mine, at Reward, has contracted with the Union Iron Works, of San Francisco, for a 20-stamp mill. An electric power plant is to be put in.

**Sweetwater.**—At this group of 9 claims, near Bodie, A. P. Sayre, superintendent and J. A. Brown general manager, the new 10-stamp mill and 50-ton cyanide plant are busy. Several veins are worked through tunnels. Twenty men are employed.

Oct. 4

KERN COUNTY.

(From Our Special Correspondent.)

**Miners' Strike.**—The miners' unions at Randsburg and Mohave decided to order a strike on October 1, and to demand re-instatement of certain men recently discharged. Car men and shovelers want an increase from \$2.50 to \$3 per day. There has been friction between mine owners and miners for some time. About 1,000 miners are involved.

**Consolidated Mines Company.**—This company is driving a cross-cut tunnel through Rand Hill, at Randsburg, in the hope of striking several ledges.

**Iron Ore Deposits.**—Deposits of iron ore have been found on the line of survey of the Midland Pacific Railroad from Bakersfield to tidewater.

**Keys.**—In this mine, at Keyesville, development continues. A deep drainage tunnel is contemplated.

**Mohave Mining District.**—Thompson & Boyle have purchased from N. Crow 3 claims in this district. C. C. Calkins and C. E. Potter have opened good ore in the Accident and Revenue claims, and are preparing to bring in water. The Exposed Treasure has piped water 15 miles. The Echo Mining and Milling Company has installed a 40-ton Elspass mill, and has bought the Gray Eagle, Gipsy and Evening Star claims.

Oct. 11

INYO COUNTY.

(From Our Special Correspondent.)

**Death Valley Borax Beds.**—F. M. Smith, of San Francisco, is sending several expeditions into Death Valley to explore for borax and niter. Altogether 70 men will be kept prospecting for about 8 months. Other private expeditions have also started.

**Inyo Gold Company of Los Angeles.**—This company, owning mines at Tuba Canyon, near Panamint, is shipping in a cyanide plant to work tailings. J. P. Flint, of Los Angeles, is president.

**Mineral Hill.**—This mine, near Ballarat, D. H. Chaplin, superintendent, has started work again.

KERN COUNTY.

(From Our Special Correspondent.)

**Big Four.**—This company, at Havilah, has increased the force on the tunnel. W. Wood is superintendent.

**Buena Piedra.**—This mine, at Granite Station, 25 miles from Elmer, has developed a fine gold ore shoot at the 200-ft. level. A. W. McCrae is superintendent.

**Friday Gulch Mining Company.**—In this mine, at Havilah, the hoist is ready and the pump soon will be. The mine will be unwatered.

**King Solomon Mining Company.**—This company, at Havilah, John Hayes, superintendent, has let a contract to continue the shaft and drive the 600-ft. tunnel and another 100-ft.

LOS ANGELES COUNTY.

(From Our Special Correspondent.)

**Pico Canyon.**—The bed of the creek in this canyon, near Newhall, is to be worked on a better scale than formerly. A Los Angeles company is to bond the Newhall ranch. Much dry washing has been done in that locality in past years.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Bagdad.**—A railway is to be constructed to these mines, at Ludlow, from the main line of the Santa Fe. About 30 tons of ore daily are shipped to the mill at Barstow, the remainder being stacked.

**Iron Chief.**—This property is reported sold to J. F. Collins, of Pittsburg, Pa., for \$20,000. The new owner proposes to develop the property on a good scale.

Engineering and Mining Journal  
Oct. 18, 1902 p. 517

RECONNAISSANCE OF THE BORAX DEPOSITS  
OF DEATH VALLEY AND  
MOHAVE DESERT.\*

By MARIUS R. CAMPBELL.

All deposits of borax in the United States, so far as known, are limited in their occurrence to the States of California, Nevada and Oregon. The borax industry has passed through several stages of development since its inception in this country. Originally borax was obtained by evaporating the waters of Clear Lake, about 80 miles north of San Francisco, where it was first produced on a commercial scale in 1864. Subsequently the lake water was enriched by the addition of crystalline biborate of soda, which was collected from the alkaline marsh surrounding the lake. The industry flourished at this and other lakes in California, until in the early seventies borax in large quantity and in a very pure condition was discovered on many of the alkaline marshes of western Nevada and eastern California. Refining plants were established in the vicinity of Columbus, Nev., and at several points in California, the most important of the latter being Searl's Marsh, west of the Slate Range, in the Amargosa Valley, near Resting Spring, and at the mouth of Furnace Creek, in Death Valley. These plants flourished for a time, even though the finished product in many cases had to be transported by teams to the railroad, 100 miles distant. The increased production of borax in this country, together with the importation of large amounts from Italy, so reduced the price that in a few years most of these plants were abandoned.

About 1890 it was found that the borax crust on most of the marshes is a secondary deposit, being derived from the leaching of beds of borate of lime in the tertiary lake sediments that abound in the region. This discovery revolutionized the borax industry, for the bedded deposits are much more extensive, and they are more easily accessible and in a purer condition than the marsh crusts. The marshes were abandoned and a mine established on a bedded deposit at Borate, 12 miles northeast of Daggett, Cal. At the present time this plant, owned by the Pacific Coast Borax Company, is the chief producer of borax and boracic acid in this country.

The mineral found in this mine is colemanite, or borate of lime, which is refined in a large mill located on the western side of the mountain near the Old Calico Mining Camp, and it reaches the market in the form of borate of soda and boracic acid. Similar, though more extensive, deposits of colemanite were found in the Funeral Mountain, on the east side of Death Valley, but the region is so far removed from lines of transportation that the deposits have never been worked. They are held in reserve by this company for future operations.

Since the colemanite does not occur in veins but is bedded with the rest of the strata, which are lake sediments of tertiary age, it seems possible that care-

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(cont.)

ful search may reveal its presence in other localities. For the purpose of locating lake deposits and for studying their contents, the writer made a hasty reconnaissance through the Death Valley region in the spring of 1900. The route, as indicated on the map, extended from San Bernardino on the south, northeast to Pahrump Spring, then west to Owens Lake, and south to the starting point.

Lake sediments were found at a number of points in the Mohave Desert, in Death Valley, and about Owens Lake, but the country was not examined carefully enough to determine the limits of all of these deposits.

The material laid down in these lakes ranges from fine clay to extremely coarse gravel. It generally shows evidence of local derivation, and it was doubtless laid down in comparatively small bodies of water. The climate during the existence of these lakes must have been less arid than it is to-day, else the lakes could not have existed. But at times the supply of water seems to have been less than that carried off by evaporation, and the lakes became dry, and the mineral matter which they held in solution was precipitated, forming the various salts which now characterize these deposits. Since the lakes were presumably strongly alkaline, the waters were probably destitute of animal life, and hence few fossils occur in the beds then deposited. Plant fragments are more abundant, but only a few specimens have been found that are identifiable. From the evidence at present available, it seems probable that lakes existed in some parts of this territory from Eocene (early Tertiary), through the Miocene, and well into the Pliocene periods. The exact sequence cannot be determined, but it seems probable that the oldest lake sediments were laid down previous to the crustal movements that gave rise to so much of the present topography. It also seems probable that the borax beds occur most extensively, if not exclusively, in the oldest sediments.

Beds of this general character have been known for some time at various points along the south side of the Mohave Desert, especially near its western extremity. In these have been found a few marine fossils of Eocene age, consequently it is probable that the beds were laid down in an arm of the sea that extended into this region from the south, but its exact location has not been determined. These beds were seen by the writer in Cajon Pass, just north of San Bernardino. Their outcrop covers only a small area, and they are closely folded with the granite rocks with which they are associated. From the material of which they are composed it is evident that they were derived from the granite which now shows only on the north side of the range. They do not contain debris from the hornblende schists, which seem to make up the mass of the mountain west of Cajon Pass, therefore it seems probable that the beds are older than this mountain and that the original range was made up of the low granite knobs which to-day form the northern foothills of the range.

The beds about Daggett resemble those of Cajon Pass, but from their lack of fossil remains and from the large amounts of alkaline material which they contain it seems certain that they were deposited in an enclosed basin or lake. As indicated on the map, the mine is located in a small area of these deposits northeast of Daggett. The beds are composed of clay, sand, gravel and volcanic tuff, with here and there intercalated sheets of lava. The fine sediments contain a large amount of mineral matter, of which gypsum, soda and lime are the most abundant. The

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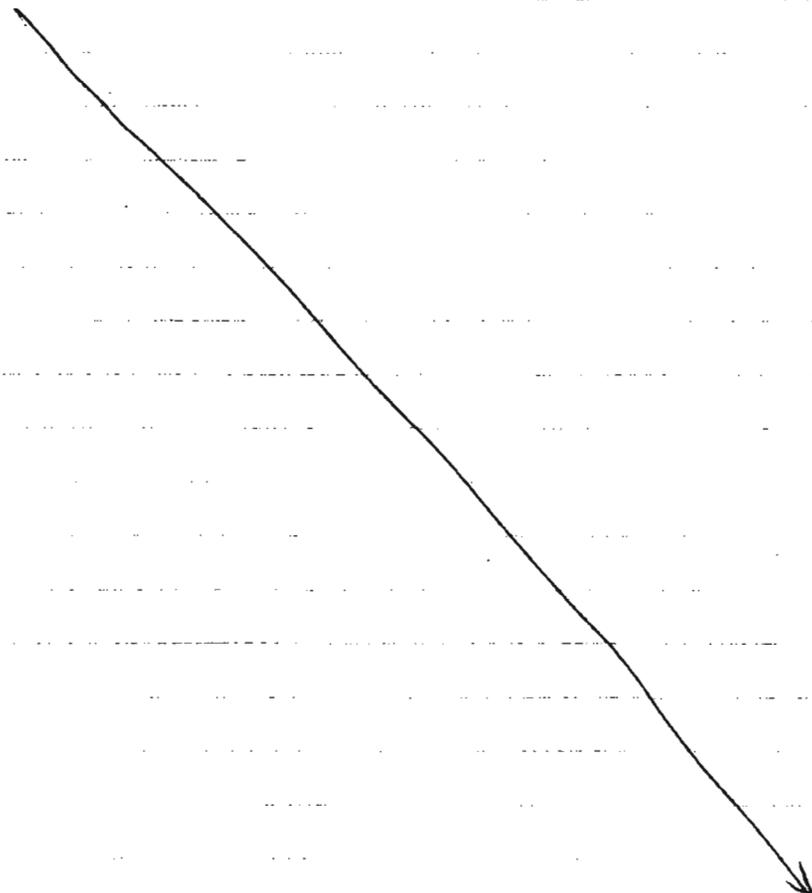
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beds are folded along east and west lines, and they extend across the mountain in the same direction for a distance of about 8 miles. Similar deposits are reported as occurring west of the Calico Valley, and the statement has been made that the two are probably continuous, but this cannot be the case, since the beds in the vicinity of Borate are replaced by crystalline rocks before they reach the western foot of the mountain, and hence they cannot be continuous under Calico Valley. The bed of colemanite, or borate of lime is not coextensive with the beds with which it is associated. It extends for a distance of perhaps a mile and a half, but it is of workable

thickness for only a part of this distance. At the mine it varies in thickness from 6 to 10 feet, and it is present in two parallel beds dipping strongly to the south. There is some doubt about these being separate beds, since the same effect may be produced by close folding. The colemanite rarely occurs in a solid, even bed, but it is made up of large masses which are more or less connected by stringers and bands of the mineral. Considerable lime is associated with the colemanite, and the whole is embedded in a rather soft clay which renders mining rather difficult.

It is probable that these beds antedate the forma-



cont.

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tion of Calico Mountain, since they apparently contain no material derived from that source. They are also metamorphosed to some extent along the contact of the Calico Mountain rocks. From these facts it seems as though the lake sediments were of considerable age; in fact, they may correspond with the Eocene sediments previously described as occurring in the Mohave Desert. They were each laid down during a period of volcanic activity, and they appear to have suffered about the same amount of deformation since they were deposited.

Similar rocks exist southwest of Daggett folded in the same general direction and containing considerable alkaline material. It seems possible that there are small beds of borax in this territory, but none were seen during this examination.

In comparison with these areas of folded sediments, it is interesting to note the level-bedded lake sediments along Mohave River from Oro Grand to Victor. In character these are much like the Daggett beds, except that they are practically horizontal and they contain none of the volcanic material that is so prominent in most of the older series. They have every appearance of being much younger than the beds just described, and it is possible that they correspond with the sediments of Miocene age which were described in the reports of the Fortieth Parallel

Survey, or with similar beds described by Mr. Walcott as occurring in the vicinity of Lone Pine, north of Owens Lake, in which fossils of Pliocene age were found. These beds are considerably tilted, evidently having been deposited previous to the elevation of Inyo Range. If lake-forming conditions prevailed until late Pliocene time, it is possible that the Victor beds may be of this age, but at present it is not safe to undertake definite correlations.

The most important, as well as probably the most extensive deposit of lake sediments extends across Funeral Mountain from northwest to southeast. The southern limit of these beds has not been determined, but from reports it seems probable that they have a

breadth of from 12 to 15 miles, and since they extend entirely across the mountain, their length is about 30 miles. These beds strike northwest and southeast, and they are tilted to the northeast at an angle of about 30 degrees. Their composition is much the same as the beds previously described, except that in the lower part of the series they contain immense beds of volcanic tuff and sheets of lava.

In the Amargosa Valley two lakes existed since the upheaval of Funeral Mountain, and therefore long after the deposition of the Funeral Mountain beds. One of these lakes occupied the valley in the vicinity of Resting Spring, and a shallow arm extended east and north along the foot of Kingston Mountain. The other lake was in the vicinity of Ash Meadows, but its sediments are not well exposed, and consequently its geographical extent is not known.

A small area of folded Tertiary rocks was seen on the south side of Death Valley, at its southern extremity. These beds do not extend east across the road from Cave Wells to Saratoga Spring, but to the west they appeared to spread out indefinitely, and it seems probable that much of the Owl's Head Mountain is composed of them. No borax was seen at this locality, and none has been reported, but the lake beds are said to contain a deposit of pure rock salt at least 60 feet in thickness.

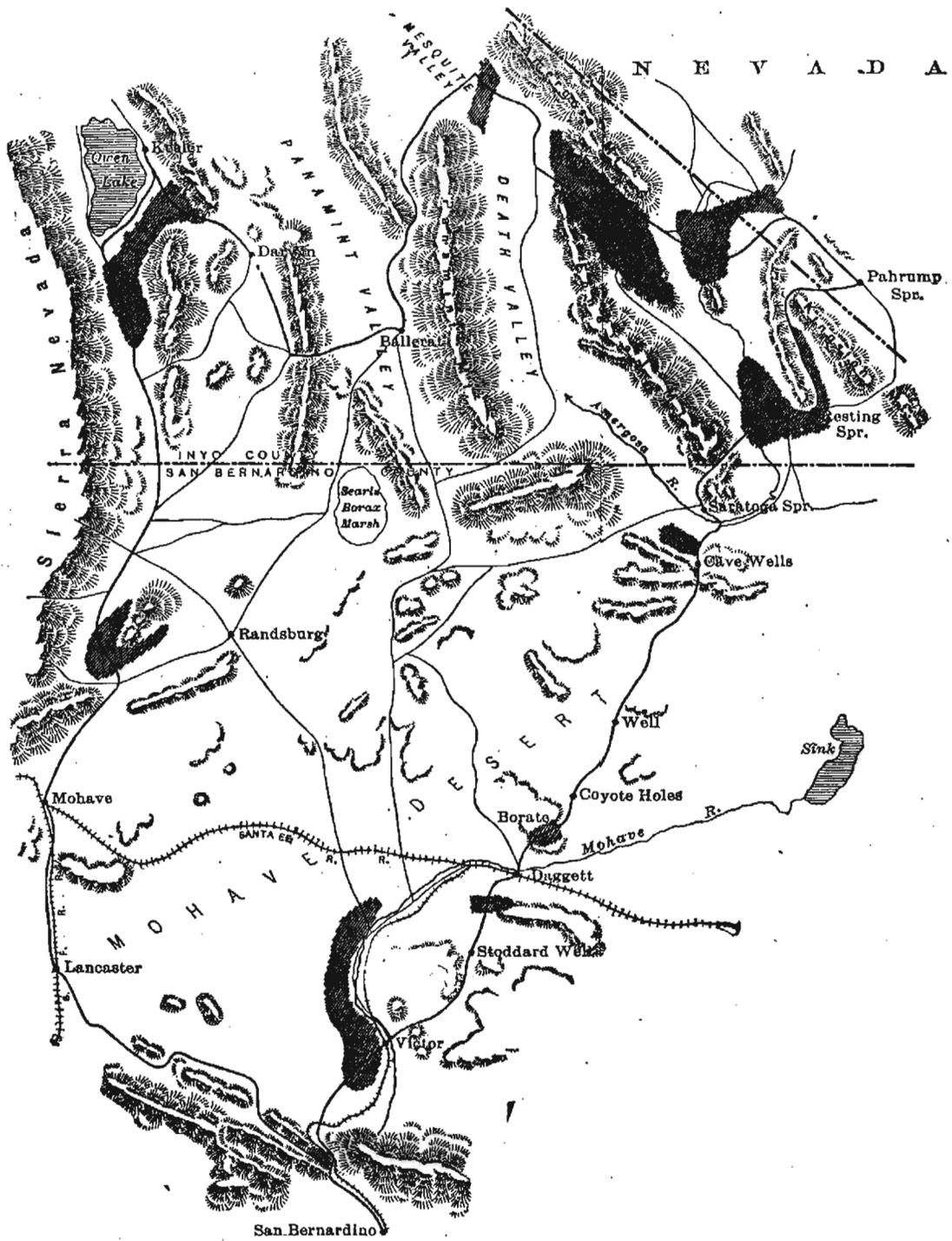
Death Valley is the lowest surface feature of the United States; its altitude has not been accurately determined, but it is thought to be 480 feet below sea level. It is largely occupied by a great salt field which has a length of about 30 miles and an average width of from 2 to 4 miles. The salt crust is not pure white, like the deposit in the Colorado Desert at Salton, but it is colored by sand and dust blown in from the surrounding region. The salt appears to expand or "heave" as it crystallizes, and consequently it is forced up in the form of pinnacles, which rise above the general surface to a height of about 3 feet, making an extremely rough surface that is crossed with difficulty. The thickness of the salt could not be ascertained, but it averages at least 1 foot of solid salt. A sample collected from the middle of the field shows that its composition is as follows:

Chloride of sodium.....	94.54%
Chloride of potassium.....	.31%
Sulphate of soda.....	3.53%
Sulphate of calcium, hydrous.....	.79%
Moisture.....	.14%
Undissolved residue, gypsum, etc.....	.50%

The northwestern arm of Death Valley, or Mesquite Valley, as it is sometimes called, also contains lake beds which, apparently, are the northwestward extension of the Funeral Mountain deposits. The clays are somewhat alkaline, but no borax deposits were seen. They are exposed for only a short distance being covered further west by sand dunes which occupy the south end of the valley. Only slight traces of lake sediments were seen in the Panamint Valley, but they are well developed in the vicinity of Owens Lake, where they contain much volcanic tuff, and lava flows are abundant. As shown on the map, they cover an extended area southeast of the lake and continue south along the foothills of the Sierra Nevada nearly to Little Owens Lake. Borax is reported as occurring in these beds, but the report could not be verified.

Lake sediments are extensively developed in the vicinity of Redrock Cañon. They are reported as having an extended outcrop in this region, especially in the vicinity of El Paso Peak. In the lower part of the series they are almost wholly composed of volcanic tuffs and intercalated lava flows. In this respect they resemble the Funeral Mountain beds and those which occur about Owens Lake. In El Paso Peak they are reported as carrying a thin bed of coal, in association with which fossil leaves have been found that are of Eocene age. It seems probable that these beds are of the same age as the sediments on the south edge of Mohave Desert, and that they were laid down in the same body of water.

The recent geological history of this region is exceedingly complex, and more work is needed before it can be unravelled and the origin of the borax and associated minerals fully determined.



BORAX REGIONS OF CALIFORNIA SHOWING DEATH VALLEY AND MOHAVE DESERT.

INYO COUNTY.

(From Our Special Correspondent.)

**Death Valley.**—Hundreds of prospectors are joining in a rush into this region, mainly to locate niter deposits, but also to search for gold ores. The region is a most desolate and difficult of access and almost impossible to live in. Water is very scarce and the heat in summer is excessive. Recent developments have attracted the prospectors.

KERN COUNTY.

(From Our Special Correspondent.)

**River Bed Mining.**—Frank, Frederick and Norman Sweet have located a number of continuous locations on Kern River between Bodfish Creek, near Havilah and the South Fork of the Kern River and will work the river bed and bars. The Huntington-Hellman Power Company will take about all the water from the river at this point and return it to the river below. Some of the bars prospect well.

**St. John.**—On this mine, 25 miles north of Mohave, W. F. Carpenter and F. E. Monaghan, of Santa Ana, have completed a 25-ton cyanide plant to work up about 20,000 tons of old tailings.

**Yellow Aster.**—A committee of miners and the superintendent of this mine at Randsburg have signed a statement that there is no trouble between the miners and that company, and that no strike is pending as reports have said. There is no dissatisfaction between the miners and the company either as to wages or treatment. Eugene H. Barton is superintendent and John Singleton is manager.

Oct. 25, 1902

KERN COUNTY.

(From Our Special Correspondent.)

**Goler District.**—Charles A. Bland, of Garlock, reports thousands of tons of ore blocked out in this district ready to be milled. The Mammoth Coal Company has temporarily shut down.

**Rayo Mining Company.**—This company, which owns claims near Keyesville and Vaughn, and has been advertising extensively in Eastern magazines, announcing millions in sight, has been investigated by State Mineralogist Aubury as a result of letters received by him from Eastern men. The existing conditions were found to vary greatly from the statements in the advertisements. The stock is offered for sale through a Chicago investment company.

**Standard Oil Pipe Line.**—The pipe line from the Kern oil fields to Point Richmond is about half laid. Five hundred men are working on it.

**Yellow Aster.**—The plant at this mine at Randsburg, John A. Singleton manager, recently shut down for four days because of the breakage of a pump.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Bagdad.**—These mines at Ludlow, C. R. Grant superintendent, are shipping ore to the Barstow Mills. Grading progresses on the railroad from Ludlow station to the mines. Neither mines nor mill run on Sundays.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Western Salt Company.**—This company has recently spent about \$150,000 improving the old La Punta works at the head of San Diego Bay. The new refinery cost about \$50,000, and is nearly completed, with a capacity of 70 tons daily. A warehouse to hold 3,000 tons of table salt has been built. There are 70 vats and 6 salt houses. The summer clean-up will be 7,000 tons. Graham E. Babcock, of San Diego, is president, and C. M. Bose foreman. The plant is located for both sea and rail transportation, and the company does not belong to the "salt trust."

Nov. 1, 1902

INYO COUNTY.

(From Our Special Correspondent.)

**Inyo Gold Company.**—This company, which owns the Tuber Mine at Ballarat, is installing a 50-ton cyanide plant to work the tailings and also ore from the mine. J. P. Flint is president.

**Reward Gold Mining Company.**—Twenty-five men are grading a millsite for this mine at Reward. Superintendent H. C. Steele has a small force working in the mine.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**John R. Gentry.**—These mines adjoining the Bagdad at Ludlow, have been acquired by L. E. Porter, superintendent of the Bagdad, and B. E. Chase, of Syracuse. Development will start at once. E. H. Stagg will be manager.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Mesa Grande Mining Company vs. San Diego Tourmaline Company.**—The application of plaintiff for an injunction has been denied and an order issued dissolving the temporary injunction.

**Ranchita.**—Cave Couts expects to start work shortly on this mine at Banner.

Nov. 8

INYO COUNTY.

(From Our Special Correspondent.)

**Golden Argus Mining Company.**—At the mines of this company, 20 miles from Ballarat, John C. Cress, superintendent, the 5-stamp mill has been started up.

**Radcliff Consolidated Mining Company.**—At this mine, Ballarat, W. W. Godsmark, manager, they have 25 men at work, and are running the 20-stamp mill steadily.

KERN COUNTY.

(From Our Special Correspondent.)

**Keyesville.**—Shaft sinking continues on the Lady Bell and Big Blue at Keyesville, and work is being done on the Mammoth and Capital. About 300 men, mostly Japanese and Indians, are working on the canal for the Electric Power and Development Company.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Smelter.**—New management has taken hold of the smelter recently built at Oro Grande, and more money is to be raised to put the plant in condition for custom work. Ore from the Copper Mountain Mine is to be worked.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Iron Ore.**—Samples of the iron ore found near Campo on the line of the survey of the San Diego Eastern Railroad, have been sent East for careful examination.

Engineering and Mining Journal  
Nov. 15, 1902

INYO COUNTY.

(From Our Special Correspondent.)

**Dunphy.**—Work has been resumed on this mine at Keeler by Troeger Brothers, who recently brought in new machinery.

KERN COUNTY.

(From Our Special Correspondent.)

**Baltic Mining Company.**—At this mine, at Randsburg, C. H. Wynne superintendent, the new 10-stamp mill is running.

**Butte.**—The Stanford Company working on this mine's tailings has made a satisfactory clean-up.

**Mattie.**—This claim in the Stringer District has been leased and bonded by Wilkinson Brothers to Los Angeles men.

**Vedder.**—The claims of G. D. Vedder at Garlock are to be developed.

LOS ANGELES COUNTY.

(From Our Special Correspondent.)

**San Pedro Smelter.**—For years there has been talk of a smelter near Los Angeles. Now Mr. Eichelberger, of the San Pedro Ice and Cold Storage Company, an-

nounces that he, with others, will build at or near San Pedro, the port of Los Angeles, a smelter to treat, at first, 50 tons of ore daily.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Brick Consolidated Mining Company.**—The Federal Gold Mining Company is arranging to take over these mines near Manvel.

**Copper World.**—This copper company, operating at Rosalie, near Manvel, is in debt to a Los Angeles bank. George H. Sisson is president and E. M.

Clark superintendent. There is some copper bullion on hand. A sheriff's sale is set for December 15.

**Chrysoprase.**—A deposit of this mineral has been discovered on the desert near Sugar Loaf. The only other deposits of chrysoprase found in California are in Tulare County, where considerable gem material has been taken out.

**Federal Gold Mining Company.**—This company is cleaning out the workings of the St. George and Boomerang Mines at Vanderbilt, near Manvel. It is intended to sink a double compartment shaft on the St. George and erect a concentrating plant at the Needles. L. C. Gilliam is superintendent.

**Roosevelt.**—Pasadena men are doing considerable work on this mine at Ludlow, and have put in a new hoist.

Nov. 22

KERN COUNTY.

**Butte.**—From this mine at Randsburg, P. H. McMahon superintendent, the last clean-up of 80 tons of ore showed a yield of \$72 gold per ton. Another shaft is being sunk.

**Mammoth Coal Company.**—This company, opening the mines near Garlock, has machinery, dynamos and poles on the ground, and intends furnishing electric power to the mines in that region.

**McKittrick Oil Wells.**—Many wells in the McKittrick District have had recently much water coming in. The McKittrick Oil Company has, it is reported, succeeded in casing off the water.

**Mesquite Springs Gold Company.**—This company is to open 3 claims at Mesquite Springs, about 9 miles from Randsburg, owned by A. P. Bland, of Los Angeles. A tunnel is being driven to tap the ledge on the 200 level.

**Winnie.**—At this mine, in the Stringer District, near Randsburg, recently purchased by Mr. Fudiker, of Los Angeles, men are doing development.

LOS ANGELES COUNTY.

(From Our Special Correspondent.)

**American Iron Company.**—This company is operating an experimental plant at Russ Station near Surrey. Both oil and charcoal are used for fuel. The limestone comes from Tehachapi. Some pig iron is produced.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Greene-Campbell.**—Capt. C. H. Thompson, who recently bought these claims near Manvel is to build a concentrating plant for the ores at Needles, on the Colorado River. The ores will be shipped over the California Eastern & Santa Fe road.

**Mountain Jewel.**—A 5-stamp mill for this mine has been shipped to Ibex, near Needles, by Mrs. Rose Howard and John Flynn. There is a 2-stamp mill at the mine.

INYO COUNTY.

(From Our Special Correspondent.)

**Borax Deposits.**—Several parties of prospectors are at work in the Death Valley region in search of borax deposits. It is reported that F. M. Smith, the "borax king," is searching a route for a railroad into the valley.

**Dean & Jones.**—At this mine at Arondo, between Ballarat and Johannesburg, a large deposit of low-grade ore is worked. The ore is passed through Cornish rolls and treated by cyanide. Twelve tanks are in use, and the number is to be increased. A tramway is projected. A gasoline engine furnishes power.

**Inyo Development Company.**—This company, which is manufacturing soda, has bored an artesian well near Keeler, from which a very fine flow of water has been obtained. The water rises 35 ft. above the top of the well. Noah Wrinkle is superintendent.

Nov. 29.

INYO COUNTY.

(From Our Special Correspondent.)

**Arondo Mining Company.**—This mine is between Ballarat and Johannesburg in the new Arondo District; and is owned by Dean & Jones, of Los Angeles. Mr. Dean is now in Los Angeles to secure more machinery. The ore is reported to average about \$5 per ton. It is run through Cornish rolls and then cyanided.

**Reward Mining Company.**—At the property of this Pasadena company at Reward, H. C. Steele manager, work is progressing on the new 30-stamp mill, which is to be run by electric power.

KERN COUNTY.

(From Our Special Correspondent.)

**Napoleon Consolidated Mining Company.**—From the Santa Ana, one of the mines belonging to this company in the Stringer District of Randsburg, a good clean-up has been made, 27 tons yielding \$132 per ton. F. V. Layton is superintendent.

**St. John District.**—Some prospecting is going on in this old district, about 30 miles west of Randsburg. The tailings and old dumps of the St. John Mine are

being cyanided. The Oshkosh Mining Company is doing development and has erected a 4-stamp mill.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**O. K.**—This mine, at Dale, owned by Ingersoll & Easler, of San Bernardino, has been sold to a Boston syndicate represented by A. M. Hinckley, of Middleboro. The amount mentioned is \$75,000.

**Southwest Ore Reduction Company.**—This company, now putting up a 20-ton cyanide plant at Dale, has contracted for ore with 20 companies in that district. The contracts are also made so that the Reduction Company may acquire the mines within from 3 to 5 years. It is expected that the mines can deliver about 1,000 tons of ore monthly.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Redman.**—Work has begun in this mine at Banner. This was the first claim located at Banner, as far back as 1871.

Dec. 6

INYO COUNTY.

(From Our Special Correspondent.)

**Golden Argus.**—In this mine, 22 miles from Ballarat, J. J. Crees superintendent, there are 15 men at work and the 5-stamp mill is running.

**Inyo Gold Company.**—At this mine in Tuba Canyon, J. P. Flint is putting in a cyanide plant.

**King Consolidated.**—These mines at Ballarat, near the Redlands Mill, has been bonded to New York men through W. W. Godsmark, of the Radcliff.

**Panamint Cyanide Plant.**—At Ballarat, T. N. Stebbins is putting in a cyanide plant to work over the many old dumps.

**Radcliffe Consolidated.**—At this mine at Ballarat, W. W. Goosmark manager, 30 stamps are dropping regularly. There are 6 levels on the vein, and all the ore is handled by a gravity wire tram. There are 30 men employed.

**Reward Mining Company.**—This company, at Reward, H. C. Steele superintendent, is examining different watercourses with a view of establishing a station for electric power. It is reported that Philadelphia, Pa., men are negotiating for the mine.

**Tuba.**—At this mine at Ballarat contract has been let for a 50-ton cyanide plant to work the tailings.

KERN COUNTY.

(From Our Special Correspondent.)

**Lady Butte.**—In the shaft of this mine at Kernville good ore is reported. The drifts are now being cleaned out.

**Mammoth Coal Company.**—This company at Garlock has, at a depth of 145 ft., a 12-ft. vein of coal. The quality is said to be improving.

**Pacific Smelting Company.**—This company has been organized to build custom smelting works at Bakersfield to use oil fuel. The incorporators are A. W. McCrae, B. L. Brundage, A. Weill, H. P. Bender, G. W. Lupton, J. W. Scott, C. I. Clafin, G. T. Nugbert, C. Bickeroyke and C. W. Wickersham, all residents of Bakersfield. Mr. McCrae is the chief promoter. The plant is to start with a capacity of 100 tons per day.

**Woody District.**—A number of mines are being opened up near Woody. The claims around Rag Gulch paid high in early days.

RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Wright-Lawrence Mining Company.**—This company intends erecting a smelter on its property 70 miles south of Needles, near the Colorado River.

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Federal Mining Company.**—This company, near Manvel, now employs 24 men opening and developing the old Brick Consolidated mines. The mines have been idle several years. C. H. Thompson is manager.

**Mountain Jewel Mining Company.**—This company, at Danby, is planning a 10-stamp mill. The company's headquarters are at Long Beach, and J. P. Hays is president.

**Orange Blossom.**—Work has been resumed on these mines near Bagdad, Peter Klinefelter, superintendent. The property is owned by Denair, Eagman & Rich, of Needles.

**Silver Wave.**—This company at Danby is running its 10-stamp mill steadily.

Dec. 13

SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

**Mountain Jewel Mining Company.**—This company, of which J. P. Hays is president, is planning a 10-stamp mill in the Old Woman Mountains, near Danby.

**Vanderbilt District.**—In this district around Manvel, considerable work is being done. The Santa Fe Railroad Company is about to build a 12-mile branch from Dry Lake to Vanderbilt. There are between 150 and 200 men at the camp at present. The St. George and Gold Bronze claims, under bond to the Federal Mining Company, L. C. Gillian superintendent, are worked, with 30 men, and shipments of ore have recently been made.

SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**Boulder Creek Mining Company.**—At the mine, near Julian, the tunnel has been driven 160 ft., and the ore is stated to average \$12 per ton. Drifting from the tunnel is in progress.

**Julian Reduction Company.**—This company, with M. Jacoby as manager, intends to put up reduction works at Julian, including a 100-ton furnace.

Dec 13

INYO COUNTY.

(From Our Special Correspondent.)

**Argus Range.**—Several properties are now being worked in this range, near Ballarat. The Morton group in Snows' Canyon, and adjoining the Golden Argus property, has been sold to S. R. Phail and Mr. Thurman, who intend developing. On J. C. Cress' claim a 5-stamp mill is at work. At Arondo, in the same range, the Cornish rolls have been started up, and a water supply of good quantity has been developed. The Arondo Mining Company employs 20 men. The cyanide plant capacity is 50 tons daily. The average extraction from several thousand tons is \$5.77. G. L. Dean is president.

# Engineering and Mining Journal

Dec. 20, 1902

## INYO COUNTY.

(From Our Special Correspondent.)

*Cecil R.*—This company, owning mines in South Park District, 68 miles south from Johannesburg, has made a \$600 clean-up from 5 days' run with its 2-stamp mill. A 20-stamp mill will shortly be completed. U. S. G. Todd is manager.

## KERN COUNTY.

(From Our Special Correspondent.)

*Big Blue.*—This company, at Isabella, has hoisted the pumps from the Clara Belle shaft. Some ore is about to be crushed at the Hooper Mill.

*Caliente District.*—Only superficial work has been done thus far at the mines near Caliente, but the ore is of high grade. Lack of capital has prevented any great developments.

## SAN BERNARDINO COUNTY.

(From Our Special Correspondent.)

*New York.*—These mines consist of 8 claims, about 5 miles southeast of Manvel. A side track has been put in. Prospecting, is being done.

*Orange Blossom Group.*—Work has been resumed on this group 8 miles from Bagdad. The ore carries copper and silver.

*Roosevelt.*—S. Washburn, of Pasadena, is perfecting plans to put a lot of machinery on this mine near Ludlow.

*Waterloo Mining Company.*—D. D. Connell is working a lease on the properties of this company at Ludlow. A 15-stamp mill is in operation.

## SAN DIEGO COUNTY.

(From Our Special Correspondent.)

*Glade Mining Company.*—This company, an English corporation, has recently come into possession of the Noble mines, near Descanso. J. H. Thring, representing the stockholders, is looking over the mines. There has recently been installed a stamp mill, with concentrators, etc., all run by gasoline engine. Development is going on.

## RIVERSIDE COUNTY.

(From Our Special Correspondent.)

*Tip-Top and Iron Chief.*—At these mines, near Walters, owned by Pittsburg, Pa., men, the miners recently drove the superintendent, J. E. Collins, away from the mines. A sheriff has gone out to settle the trouble.

*Wright-Lawrence Mining Company.*—This company now owns mining property opposite Parker on the Colorado River, about 75 miles from Needles. J. W. Peebler, of Chicago, Ill., who is interested, says that a proposed smelting plant at Needles will be built by this company. The ores carry copper and gold.

Engineering and Mining Journal  
July 4, 1903 p. 25

SPECIAL CORRESPONDENCE

San Francisco. June 24.

(From Our Special Correspondent.)

Four smelters are planned for different places in Southern California. Two for San Pedro, the seaport of Los Angeles, one for San Diego and one for Newport. All are to be at tidewater and none are within 150 or 200 miles of any mine. It is difficult to see how there will be business enough for all, though none is planned on a large scale. The Ivanpah Smelter at Manvel, San Bernardino County, and the Needles Smelter at Needles, in the same county, were idle all of last year, and they are much nearer the desert mines than smelters on the seacoast. As for Arizona and New Mexico the big smelter at El Paso, Texas, can handle ores cheaper than those on the coast. If promoters would concentrate their efforts and establish one good, big smelter it would seem more to the purpose. On the bay shores of San Francisco one big smelter does all the work for all of northern California, Nevada, etc. A small custom smelter is idle and another one is only doing a small business for a few mines.

July 4, 1903 p. 27

INYO COUNTY.

In the Lower Tonopah mines, at Lone Pine, two cross-cuts are being run to demonstrate the width of the main vein. If the development work proves satisfactory Judge G. W. Cottrell, one of the owners, states that adequate milling facilities will be provided at once.

The ledges of copper in the northern portion of the county and those along the southern end and the Funeral range are to be examined by Frank Westinghouse for Los Angeles and Arizona men, with a view to development.

KERN COUNTY.

The miners' strike, at Randsburg, has not yet been settled, and many people are daily leaving the camp. The Napoleon Consolidated has shut down and discharged its men, and the Yellow Aster and other prominent mines continue idle. The manager of the Yellow Aster states that the mine will not be reopened until the men return to work on the old rate of wages. The mills are being cleaned up and the shafts will be covered and the tunnels bulkheaded.

*Keyes.*—In this mine, at Isabella, good rock has been found below the former workings at 350 ft. depth.

Two lime kilns are to be built by J. W. Jameson on his lime deposit, near Tehachapi, where several other lime deposits are being worked.

Several oil prospecting rigs are operating on the Carissa side of the coast range, some miles west of McKittrick.

*Fulton Oil Company.*—This company, at Sunset, Mr. Thorn superintendent, has succeeded in landing the casing in well No. 2, going through 92 ft. of oil sand to a clay foundation.

*Tekla Mining Company.*—Los Angeles men are considering the proposition of erecting a mill, near Caliente, on the property of this company, to treat the ores from mines in Amalie District.

July 11, 1903 p. 64

There is no sign as yet of any improvement in the strike conditions at Randsburg, Kern County, where many mines have been closed down, including the larger ones employing many hundreds of men. The Yellow Aster people declare they will continue closed down indefinitely until the miners listen to reason. In the meantime, the miners have taken up prospecting in that region, both in the mountains and desert, an occupation not at all desirable during the exceedingly hot summer months.

The two mining exchanges of Los Angeles have finally made a merger and come together under the name of the Los Angeles Stock Exchange, indicating that all classes of securities will be called. While the agreement has not been ratified at this writing it is understood that the membership will be limited to 100 persons. The governing boards of both bodies have indorsed the plan of amalgamation, which is shortly to be ratified by all interested.

July 11, 1903 p. 65-66

KERN COUNTY.

*Amalie District.*—This district is to be reorganized, to embrace all the territory between a line 3 miles south of Indian Creek at its intersection with Stevenson's Canyon, and a line 9 miles north of Indian Creek. The district to extend about 6 miles in each direction, east and west, from the intersection of Indian Creek and Stevenson's Canyon.

*Morton Mining Company.*—This company, at Randsburg, has closed down its property, owing to the miners' strike. The Mattie has also closed down.

SAN BERNARDINO COUNTY.

A Ludlow prospector has found at Amboy, near Bagdad, a heavy ledge carrying gold, silver and some copper. The ledge is reported to be 14 ft. wide. Few prospectors will go to that region at this season, as the great heat prevents much work in that part of the desert. Los Angeles men will develop the vein later in the year.

July 18, 1903 p. 99

On June 15 last over a million acres of land were thrown open to settlement along the line of the Santa Fe Pacific road, between Needles and Mohave, being sections 3, 7, 11, 15, 19, 23, 27, 31 and 35 in each township. The numbered sections have been open heretofore, but no settlers have taken up any land, as it is a desert country.

It is expected that large traction engines will shortly displace the picturesque 24-mule teams for hauling borax from the borax mines of the Pacific Coast Borax Company in San Bernardino County. A new ledge of Colemanite on the eastern side of Death Valley is to be opened. The ore will have to be hauled about 100 miles to Ivanpah, where there is a spur from the Santa Fe main line. It is expected that the traction engines will make better time and take heavier loads than the mule teams. The mines already being worked are very productive and profitable, and the company owns a vast amount of ground yet untouched. The summer temperature in that desert region is excessive, sometimes going above 120° in shade.

Engineering and Mining Journal  
July 18, 1903 p. 102

INYO COUNTY.

W. M. Russell has bonded a number of claims at Fish Springs, including the Commetti Mine, with the intention of consolidating them into one company.

The locations recently made a few miles from Haiwee and between that place and Coso Hot Springs seem to be of some importance. The claims are southwest of Bishop. The ore is said to run about \$25 per ton. There is no water near-by.

*Arondo Mining Company.*—While sinking the shaft at this property, near Ballarat, they found a 2-ft. ledge of higher grade ore than that which they have lately been working. It is expected that new machinery will be put on the mine, which is mainly owned by G. L. Dean and J. P. Jones, Bullard Block, Los Angeles.

*Cecil R.*—On this property, at Argus, the wood supply was recently burned, and they are about to install a 50-h.p. gasoline engine to run the mill. Ten stamps may be added to the eight now in the mill.

KERN COUNTY.

The gravel claims at St. Elmo are attracting some of the striking miners from Randsburg. Dry washing machines have to be used.

*Lucky Four.*—Men have gone to open up this new prospect, on upper Kern River. A tunnel is to be driven. It is owned by Drs. Sylvester and Schaffer J. Elwood, and J. Bennett, all of Bakersfield.

*Morton Mining Company.*—This mine, at Randsburg, Charles Adams superintendent, has closed down on account of the miners' strike. The Mattie and the Yellow Aster remain idle.

*Tekla Mining Company.*—The property is on Indian Creek, near Caliente, in which Los Angeles men are about to become interested.

July 25, 1903 p. 137

INYO COUNTY.

*Oreed Mining Company.*—This company, in the Ballarat region, is preparing to put up a mill.

*Indian Queen.*—The Western Ore Purchasing Company has bought 1,500 tons of ore from this mine.

Aug. 1, 1903 p. 151

A NEW CALIFORNIA ASSOCIATION.

THE DESERT Mine Operators' Association has been formed in Los Angeles to include mine owners in Southern California, Southern Nevada and Arizona. The object stated is "to foster and develop the mining industry in all its branches in the district covered by the Association." The officers include John Singleton, president and manager of the Yellow Aster mine at Randsburg, Kern County, president; J. Hammond, of Searchlight district, Nev., vice-president, and F. S. Hicks, of Los Angeles, but interested in the Stringer district at Randsburg, secretary and treasurer. The executive committee is to consist of representative men from different prominent districts. The platform of the new association is to the effect that, "We thoroughly believe in the principle of equal rights to all and special privileges to none, and therefore be it resolved that we, the

Covt...

Desert Mine Operators' Association, declare that in the employment of labor we shall not discriminate against non-union men."

Judging from this expression it would seem that the prime object of the association was to band together the employers and operators to resist strikes among the miners. The president, Mr. Singleton, is a large owner in the Yellow Aster mine, now closed owing to strikes, and the vice-president is from a camp where they recently had a strike. An organization similar to this was formed in San Francisco recently by operators in the Mother Lode counties, but it has thus far effected very little, because its members settled affairs with their men about as they pleased and without much reference to the rules of the association. In fact, in the first contest, the miners rather got the better of it, and other strikes have since occurred, where the men got the raise of wages asked. The new association in Los Angeles covers a very wide territory, and it will be hard to get operators to "pull together" when camps are so isolated and far apart, and where the interests of various sections are so different. It will be interesting to note whether the Southern California mine operators make more of a success of their association than did their northern brethren.

Aug. 1, 1903 p. 174

KERN COUNTY.

The mines in the vicinity of Mohave are employing about 200 men. The Exposed Treasure is getting good returns. The Echo has just enlarged its shaft and the Karma and Queen Esther are both enlarging their reduction facilities. Other mines are doing development work. The water pipe line from Camp 18 miles distant, is not completed.

SAN BERNARDINO COUNTY.

*Ludlow.*—This company expects to begin shipping ore over the new branch railroad shortly.

*Woodstock Mining Company.*—Walter A. L. superintendent, states that developments warranted building of a mill near Bagdad.

SAN DIEGO COUNTY.

*National Smelting and Refining Company.*—This company is about to build a 100 by 30 ft. structure over a smelter already set up for installing other furnaces. An assay office building is also to be erected.

25m

Hart

Gold was discovered at Hart in the end of December 1907 by James Hart and partners. By January 10, 1908 a district was organized, and hundreds of men began to flock in most of them from Goldfield, Nevada. The entire country within a radius of several miles was thoroughly searched by over a thousand miners and prospectors. A pipe line was immediately started to Malapai Springs, but in the mean time water had to be hauled 10 miles to camp.

By the beginning of February 1908 some 200 men started work on leases, and a contract was let for the daily delivery of 8000 gallons of water at the camp. Thirty-five leases were let and the lease of the Ore, the Lee and Foster and Goldfield Big Chief started shipping ore. The Ted hunter and Aldrich lease struck pay ore right away. And Hart and Hill were sacking ore on the original strike. A newspaper called the Hart Enterprise was also established.

By February 26 the young town had seen considerable excitement, with gunplay and litigation over the townsite and some of the original locations. There were about 600 to 700 people in the camp. And plans were under way already to erect a 20-stamp mill.

The much awaited water line to springs four miles away was completed by the beginning of March, and from 800 to 100 people began to crowd the new camp. Several mines of very high grade ore were dug. The McGuire & Mahana lease on the Ore Belle No. 1 and the Hill and Hart tunnel of the same mine all being very rich. The Big Chief produced some ore of several thousands of dollars an ton.

May 16, 1908 The Big Chief mine has received its mill which is now being installed. A new hoist has been put up at the Quartette shaft of the Jumbo. Tunnels are to be driven on the Fairview and Providence groups of the Hart Consolidated Mining company. The Swarise, J. D. Goodwin has made a promising strike. A number of companies are preparing to do extensive development work.

May 30 Ore No. 1 in the Thunder lease of Block no. 2 in the mine at Hart a strike has been made which is considered the most important in the brief history of the camp. The ore body is wide and of high grade.

June 20 The Hart Gold Mining Co. has been organized to develop the Red Mills and Gray Horse tramps. The Swan lease is still holding the lead as the best one so far. The Ore Belle Mining Company is about to start a tunnel and deep shaft, the tunnel being driven by Hart and Hill on Ore Belle No. 1 has run into rich springers of high-grade ore.

Jan 1908 War Wagle This company has purchased from L. J. Carter of L.A. the Lead Queen group in the Highgate district. The rich ore vein is of apparently the same size and value for the last 30 feet down. The rich ore vein is of apparently the same size and value for the last 30 feet down.

Feb 1 C.O. Johnson ---Opal Mountain.

Feb 22. In the Palm District of San Bernardino county a large rotary rock crusher is being installed and a number of claims are being worked. At twenty-nine Palms a custom mill is being installed. The former of these mines the Orange Blossom Extension is down 550 ft. The two companies now jointly own Budweiser springs seven miles from the mines and a 4-in. pipe line is being laid to supply to camps the flow being by gravity.

Feb. 29 Long Horn 50 Miles east of Victorville the property is owned by L.A. people a 10-stamp mill is being put up.

March '08 Fremont some very high-grade ore has been found and preparations are being made to put in machinery.

Mar. '08 Kessler Spring The miners of this locality are about to organize a mining district. Fifteen properties are in operation there two of which the King Theobald and Arcalvada are shipping ore to Salt Lake. The former of these two is to be incorporated.

April Arrastra Canyon. Joseph Wheeler has found a ledge of gold-bearing ore ...numerous prospectors are watching.

April 25 Charles Strong and H.J. Robinson of ...acquired ... On the ...intention to erect a ... The plant will be equipped with crushers power, etc.

A 14-in. streak of very high-grade gold ore has been found in Atlantic claim no.2 of the Gold Peak Consolidated Mining Company at twenty nine Palms district. On the Boss chain of the same company an 11-in streak running very high in gold has also been found. The ore has been sacked for hauling to the custom mill at the Palms. This custom mill has now been leased to the company and a pipe line will be constructed to connect the wells at the Palms with the mines/ A new teen site had been projected an

July 4

Dry Lake The hoist at this mine near Victorville is now in operation and a small stamp mill will be installed at once

Slean G. F. Slean has shipped two carloads of \$50 ore from his lease on the Junco at Hart

July 2

The Standard mine near Lima idle for the past year owing to litigation is being reopened. The ore carries both gold and copper. The deepest shaft of the property is 256 ft and some 4000 ft of crosscuts and drifts have been cut.

The Tecopa silver-lead mines at Tecopa in Inyo county on the border of S.B. County will be shortly started up again under superintendence of J.H. Lester the former manager the mine last year shipped all its ore to Salt Lake smelters this ore carrying both lead and silver. The miner ceased shipping a few months ago while a concentrator is being erected. The two mines operated are the Gunsight and Monday, which are about a mile apart. Extensive development work is about to be undertaken and some 50 men will be set at work. Mines were worked in this section in the early seventies and some highgrade ore hauled out by team. When the Tonopah and Tidewater railroads was built within a few miles of the properties much lower grade ore could be shipped to good profit. The ore is of a desirable fluming character and is desired at the smelters. Lesors of the Alexandria claim of the company have recently shipped considerable high-grade ore. The properties are 5 miles south of Greentown.

Orange Blossom -- a rich strike has been made.

Ore Belle Mines this company formed of Duluth, Minn capitalists has made final payment to Hart & Hitt for the Ore Belle Belle and Ore Belle Fraction mines at Hart, and active operations have been started.

The Old Waterloo silver mill for 20 years a familiar landmark of the desert at Daggett has passed into history. The Borax Properties Ltd. a company which is erecting a borax plant at Otis has bought the mill and is moving it to the building site in Otis. All the machinery was sold to Robert Newell a junk dealer and he will commence blasting it up for shipment.

Keweenaw.. There are now six companies in the camp taking out ore; among them are the Keweenaw Gold, the Keweenaw Gold Extension The Meadowville, The Sunnyside and the Chiche mining companies. The ores run from \$20 to \$80 a ton it is said and some of the stringers in the veins are of very high grade.

G.F.H. G. F. Hale has bonded this group as claims 8 miles north of Ludlow ...work has begun.

Paradise mountains mining company the mill is now steadily at work on satisfactory ore  
H. Galeron is superintendent. Five stamps are to be added to the mill.

Aug. 1

The Italic Company at Twenty-nine palms is experimenting with dry washers. The  
westerfield separators recently set at work are reported satisfactory but larger  
ones will be built.

Aug 8

Bert Hitt and James Hart the original discoverers of the new camp of Hart get into  
a controversy with Peters, Johnson and O'Keef over a lease in the Bih Chief mine  
one of the big properties of the district. It was finally agreed by all parties  
concerned to submit the matter to arbitration three well known mining men of the  
district being selected to act as arbitrators. Two out of the three settled of  
a stated amount as due the lessee ~~of a stated amount as due the lessor~~ Hill and Hart appealed  
from this award and went to the courts. Now Judge Orter revokes the order staying  
judgment for the plaintiffs and said that as all parties had agreed to abide by the decision  
of their friends and neighbors, a just decision had probably been made.

Hart at local capital is to erect a 10 stamp mill so that owners and lessees may  
realize of the ore already mined. Water is somewhat scarce.

Aug 15

Alverd K.E. ASH has leased this mine and has set men at work developing.

Orange Blossom.. The new mill of this co. started up and plans for an enlargement have  
already been made. *see 9/16/10*

Aug. 22 It is supposed that Eastern capital will shortly lend its aid to enlarge the  
smelting plant at Needles. The present smelter is the only one in southern California  
and the only one accessible to southern Nevada nearer than San Francisco or Salt Lake.  
Three years ago Manager Godshall aided by Pennsylvania capital bought the old plant  
of the Fletcher smelting Company enlarged it and rebuilt it to handle both lead and  
copper ore and lately a new furnace has been added to meet the growing business from  
southern California, Nevada and northern Arizona.

Aug. 20

Harbor group at this property on the east end of the Avawatz range the 175-ft. shaft  
is to be sunk to 500 ft and a new hoist has been purchased.

Long Range Dist. 20 miles from Barstow Ferand and Rusehr have a Curtis dry washing  
at work and report it as being satisfactory.

Sept. 12 This Mountains a large amount of mineral land has been taken up as the  
result of copper and gold strikes made this spring as soon as cool weather comes  
considerable development work will start.

The Pacific Smelting Company is about to put up a smelting plant near Bakersfield, and announces that there will be two 50-ton furnaces. It expects to get much of its ore supply from Kern County camps, and have the miners save freight charges to San Francisco Bay.

In Southern California, where numbers of people have lately gone into mining for the first time, wonderful (?) discoveries continue. Thus Los Angeles papers announce from Whitewater Canyon, San Bernardino County, that five prospectors, who noticed a mountain of peculiar color, on investigating, with the aid of an assayer, found it to be "a mountain of nitric acid, sulphuric acid, lime, potassium, gypsum and silica." Nothing is said of putting on a faucet to tap it. The prospectors were hunting for gold, but think, after the assayer's report, they have something better. The item keeps on the rounds of the southern press, as indicating the natural resources of the region.

At the first meeting of the Desert Mine Operators' Association, in Los Angeles, 40 odd companies sent in applications for membership, indicating considerable interest. Among those which have joined are the Yellow Aster, of Randsburg; Stanford and St. Elmo, of Johannesburg; Bagdad and Chase mines, in Bagdad District, San Bernardino County; Exposed Treasure, and others of Mohave District, Kern County; the mines of Virginia Dale District and other Southern California properties. From Arizona, the Arizona Wallapi Mining Company of Chloride and Gold Road and Leland of Mohave. From Nevada the Nevada Keystone and Nevada, of Yellow Pine, and all the companies of Searchlight District. The Executive Committee consists of John Singleton, of the Yellow Aster (president); F. J. Harrington, of the Quartette Company at Searchlight (vice-president); Frank J. Hicks (secretary); G. H. Hooper, John Seward, E. H. Stagg and Julian P. Jones. Since the Randsburg strike miners in other desert regions have threatened to tie up properties from "sympathy," and the association will endeavor to prevent the spread of labor troubles.

Travel this season in Kern, San Bernardino, Riverside and some other southern counties is unusually heavy. As a consequence many of the water places are taxed to their limit and something will soon have to be done to provide water for miners, prospectors and travelers. The Chamber of Commerce of Los Angeles recently recommended the supervisors of the different southern counties to look after the water holes, springs, etc., in their respective districts so as to conserve and increase the water supply. A more complete system of sign posts is also needed.

INYO COUNTY.

**Bishop Park Region.**—In this district near the upper waters of Bishop Creek, south and west of Bishop, there is considerable excitement and numbers of miners have gone there. The ledges are quite large. The Rocky Point, discovered by Chas. Coyle and H. N. Stovall, is the principal claim thus far. Many locations have been made recently. In earlier years there was some surface mining done in the vicinity.

KERN COUNTY.

**Miners' Strike.**—The Randsburg Miners' Union has sent out the following notice: "A strike has been declared against all mines under the jurisdiction of the Randsburg Miners' Union No. 44, Western Federation of Miners. The issue involved is a 50c. per day advance in wages. Our union has voted unanimously to uphold this principle." The strikers are orderly and there has been no overt act.

**Butte Lode.**—This mine remains idle.

**Consolidated Butte Mines Company.**—The new hoisting plant of this property at Randsburg, is completed, but the mines remain closed.

**Iron Ore.**—Kern County people developing an iron ore property near San Emedia expect to dispose of it

to Eastern men. There is a very extensive deposit, according to W. H. Hill, of Bakersfield.

**Pyramid.**—At this mine, at Randsburg, Charles Wores is sinking a double compartment shaft.

**Yellow Aster.**—No attempt is being made by the management to open the property at Randsburg. The machinery is in shape for a long shut-down.

SAN BERNARDINO COUNTY.

**Bagdad.**—These mines at Stagg have just obtained a number of skilled miners from Grass Valley. The foreman, J. A. Brockington, is a Grass Valley man.

KERN COUNTY.

**Butte Company.**—This company, at Randsburg, has put up a new gallows frame, new engine house and a Fairbanks & Morse gasoline hoist.

**Carbonate Queen.**—This mine on Indian Creek, near Amalie, owned by C. E. Ramy, will probably be bonded by Bakersfield men, who are now examining it.

**Minnehaha.**—Eight men are running a tunnel on this mine at Randsburg.

**Pacific Smelting Company.**—This company, A. W. McRae, manager, expects soon to have two 50-ton furnaces working on the site of the McKittrick branch line.

RIVERSIDE COUNTY.

Clay, lime, gypsum and glass sand are found near Corona. Leo Krooner and others are about to start a factory for firebrick, tile, etc., at this place.

SAN DIEGO COUNTY.

**Lepidolite Mines.**—The company owning the lepidolite mine near Mesa Grande, A. L. Ross, manager, is driving a tunnel to cut the ledge 150 ft. below surface. Many crystals of tourmaline are sent to San Diego to be ground. The company is producing 500 to 350 carats monthly of gem material.

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Aug. 22, 1903 p. 289

SAN BERNARDINO COUNTY.

**Giant Ledge Mining Company.**—This company, operating in the New York Mountains, west of Manvel, has 20 men at work. A railroad will be built from the mines to the trunk line.

**Pacific Coast Borax Company.**—This company, F. M. Smith, president, is building a traction engine road from Ivanpah station to its new borax beds at Ash Meadows, where the deposits are said to be very large.

KERN COUNTY.

**Copper Basin.**—James Worham and A. E. Redstone are running a tunnel on this claim, in the Mohave desert.

**Mohave District.**—The water is flowing through the pipe for the Karma, Echo and Thompson & Boyle claims. The new dry process roller mill of the latter company has been proven satisfactory by test. The grading for the new 20-stamp mill of the Karma is nearly done.

Aug. 29, 1903 p. 325

The failure of the New York men who held the bond on the Owens and Washington mines at Julian, San Diego county, is rather a setback to that camp, the best mines of which were discovered as far back as 1870. It was hoped that the deal would go through, that other men might be induced to invest. The camp is rather inactive and few of the mines have attained any great depth; they paid well near the surface, and then struck a barren zone. The miners are confident that the claims will show up well at greater depths, but have not the money for deep sinking. There is some activity at the lepidolite mines near Pala and at the mines near Escondido. A smelter is being constructed at San Diego to treat ores from Julian and Banner districts, but more capital should be put into those districts to develop the mines to furnish an adequate supply of ore.

Sept. 5, 1903 p. 365

The conference at Los Angeles between the Desert Mine Operators' Association and the president of the Randsburg Miners' Union, came to nothing. The mine operators refused to pay more than the old scale of \$3.50 per day for shaft sinking, and \$3 for stoping and drifting. The Miners' Union asked for \$3.50 per day for all miners, and \$3 for shovelers. The principal place affected is the Randsburg region, but all other "desert" districts are interested. Most of the mines at Randsburg and Johannesburg have been closed for some time owing to the strike. It is apparent that the new Mine Operators' Association intends to force an issue with the miners. The Yellow Aster Mining Company, at Randsburg, the largest employer of labor in the region, is idle still. It has now, however, 60 non-union miners on the way to Randsburg from Missouri and will have 200 before long. The result of this move remains to be seen, but some trouble will doubtless grow out of it. If this is to be the policy of the Desert Mine Operators' Association, labor troubles may be expected in several camps in southern California and southwestern Nevada, where this association has jurisdiction.

The numerous mines owned by the estate of the late Patrick Reddy in Inyo and Mono counties are to be disposed of by order of the probate court. The principal mines are those of the Darwin group at Darwin, Inyo county, valued at about \$100,000, but there are numerous other mines in that and Mono county which may be purchased. They have all been idle since Mr. Reddy's death.

Sept. 5, 1903 p. 368

INYO COUNTY.

J. S. Statler and P. Blume are opening four claims of silver-lead ore near Furnace canyon, 6 miles from Queen station, at an altitude of 8,000 ft. The main ledge is 4 ft. wide.

**Poleta.**—This mine, near Bishop, has been sold to Wallace McGregor and others, and will be re-opened.

SAN BERNARDINO COUNTY.

**Gold Peak.**—Good progress is made in opening this mine, near Victorville. The ore is 20 in. wide, and assays nearly \$40 per ton.

Sept. 12, 1903 p. 402

At Randsburg, Kern county, the strike condition is quiet, notwithstanding the importation of non-union miners from Missouri. It is now proposed to make the entire camp non-union. As it takes about 300 miners to work the various properties made from laborers, teamsters, mill men, surface borers, etc., the Desert Mine Operators' Association has quite a job on its hands to carry out this project. The pay rate is to be \$3 per 9-hour day for miners and \$2.50 for muckers, the same as before the strike, two months ago.

It is stated that the owners of the Yellow Aster declare they will not again employ union miners, but will rather shut down indefinitely. The non-union men are now at the Yellow Aster. So far the sheriff has had nothing to do, and the town is quiet.

Sept. 12, 1903 p. 404

KERN COUNTY.

Dooley Bros. & Freese are opening an iron mine in San Emedio district, and now have their tunnel in 125 ft. This deposit is the largest in the district.

**Alameda Gold Mining Company.**—This company at Randsburg has recently had a crushing of 38 tons of ore, which milled \$33 per ton.

**Franklin.**—In this mine on Indian creek rich rock has been struck by C. Ramey, A. Beatty and H. Williams.

**Randsburg District.**—There were 300 miners at work in the camp in June, and now about 35. Trains run three times a week instead of every day as formerly.

SAN BERNARDINO COUNTY.

**Gold Park.**—At this district, a few miles south of Twenty-nine Palms, a stamp mill and cyanide plant will be put up.

**Sacramento Wash.**—In this region, not far from Needles, gold nuggets have been found a short distance from the ground of the Kleinfelter Company. The latter company found gold while sinking a well some months since.

Sept. 19, 1903 p. 443

KERN COUNTY.

**Lida Mining Company.**—This company at Rosamond, E. M. Hamilton, superintendent, has 16 ft. of ore in the cross-cut at a depth of 325 ft. The mine is a producer.

**Yellow Aster Mining Company.**—The mine at Randsburg, which has been closed some time, has started with non-union miners. Superintendent E. H. Barton says no discrimination will be made between union and non-union miners.

Aug 19 A new mining camp has been established on the desert 14 miles SE of Lima it is called Gold Valley and a tent city has sprung up there within a few weeks. A number of veins have been located and work commenced on them. The (size?) is small but the ore is high grade. This new camp is located on the south slope of the Providence mountains. It is reported that the camp has an abundance of water and wood.

Sundry group of 7 claims 12 miles north of Lima have been sold to ? and Parrett? of Pasadena Sep 26 Rich places have been struck on the N E slope of Mount S.B. have excited the mining communities at Victorville and Hesperia

Fremont a rich ore body has been struck Oct 3 The ? Coolgardie dry washing places are being worked this time by the Coolgardie mining company which has a claim of (a) thousand acres of the channel ground. The ground is shallow it being only about 3 1/2 feet to the bedrock. Considerable Gold was taken out in this district years ago but none of the dry washers had sufficient capacity to make the workings profitable. After considerable, rather extensive experiments the Company devised and patented a dry washer which

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SAN BERNARDINO COUNTY.

*Ivanhoe.*—This mine at Dale, J. J. Ellerman, superintendent, has been sold. A road is being built to haul in machinery and a pumping plant is to be installed at Ferguson's well to furnish water.

*O. K. Mining Company.*—In this mine at Dale, Jos. Ingersoll, superintendent, an 18-in. vein has been struck on the 100-ft. level north. There is also ore on the 300-ft. levels north and south.

Sept. 26, 1903 p. 481

KERN COUNTY.

Most of the dry-washing claims at Goler are now deserted.

*Pearl Wedge.*—Ore from this mine at Randsburg, has yielded returns of \$91 per ton.

*Yellow Aster.*—This mine at Randsburg is working with a small force of non-union men. Some of the union miners have gone back to work, but not many. There has been no outbreak, and the miner's union men disclaim any intention of doing any harm to the company's property.

SAN BERNARDINO COUNTY.

The ore find recently near Bagdad is said to show croppings running a long distance, but all the ground has been located.

At Sacramento Wash in Klinefelter canyon the Colorado Hydraulic Company reached bedrock at 20 ft., and has good paying gravel. A water plant will be installed, and oil fuel used for the boilers of the pumping plant.

Oct. 3, 1903 p. 519

Calvin Baker, of San Bernardino, has built an automobile driven by a 10-h.p. gas engine with which to go prospecting on the desert. The engine is also to operate certain ore-crushing appliances carried on a trailer. He takes provisions, etc., for a three months' trip.

Oct. 3, 1903 p. 520

KERN COUNTY.

*Friday Gulch Gold Mining Company.*—This company at Havilah has recently paid for its property, and machinery has been bought to deepen the shaft.

*Rand.*—This mine at Havilah has been purchased by August Thish and C. F. Bennett. It was largely developed about 40 years ago, but has been idle many years owing to clouded title.

*Yellow Aster Mining Company.*—This company has succeeded in getting a number of miners at work again and started its mill. Miners have been brought from Missouri to take the places of strikers.

SAN DIEGO COUNTY.

Machinery is to be placed on the copper mine, 8 miles from Encinitas. The shaft is now down 300 ft. Gold and silver are found with the copper.

*California Gold King.*—Superintendent R. K. Humphreys of this mine, at Picacho, reports the finding of a rich ledge a few feet beyond the abandoned drift made before the present owners took charge.

*Little Giant.*—This mine, owned by Joseph Alford, is the principal one at Boulder creek, 12 miles from Julian. The vein is from 12 to 18 in. wide, and the ore so far taken out averages close to \$50 per ton.

Oct. 17, 1903 p. 596

INYO COUNTY.

*Sanger & Mairs.*—M. Jacoby, of Los Angeles, who has a bond on these copper claims, in Saline valley, has been visiting the mines, with a view to operating them. The copper deposits are said to be large, but some distance from the railroad.

Oct. 24, 1903 p. 634

SAN BERNARDINO COUNTY.

Theodore Phillips and Gustave Rauschapt report having found good placer ground in Holcomb valley. The strike is not far from the Green Lead mine. Little will be done until the coming of the winter rains.

*Anglo-American Consolidated Mining Company.*—The American Girl Gold Mining Company has decided to this company several claims held by the former in Muchacho mining district.

*Helvetia.*—The new shaft in this mine at Julian admits of development being carried on faster.

Oct. 31, 1903 p. 672

KERN COUNTY.

*Exposed Treasure Mining Co.*—This company, near Mohave, intends adding 30 stamps to the 20-stamp mill.

*Flamiofume Mining Co.*—This company, operating 16 miles from Mohave, in Jawbone cañon, has 15 men at work and has finished the foundations for a mill.

*Karma Mining Co.*—This company at Mohave, J. R. Gerner, superintendent, has a 10-stamp mill and will add 10 more stamps.

*Mammoth Coal Co.*—This company, of Garlock, is preparing to prospect its claims with diamond drills.

SAN BERNARDINO COUNTY.

*Bagdad Mining Co.*—This company at Ludlow is shipping its selected ore to the smelter on San Francisco bay and the free milling ore is being sent to the mills at Barstow. About three carloads a day are milled.

Nov. 7, 1903 p. 687

Copper continues steady, the market being influenced to a degree by the Montana mines controversy, which the volunteer committee on arbitration has failed to settle amicably. Consumers of the metal are still anxious inquirers, but their excitement appears to be less keen, though there is a good deal of confusion as regards the possibility of a final adjustment of the Heinze-Amalgamated dispute. The exports of copper from this country so far this year show a marked falling off, especially to Great Britain, as compared with 1902; but imports, particularly from Mexico, are considerably more than they have been for two years past.

#### THE DISAPPEARANCE OF THE PROSPECTOR.

In the general advancement of mining the prospector appears to have lost his former importance; it is as though the army of those who develop the mineral resources of the country had marched forward so fast as to overtake the advance guard of pioneers, then absorb them, and finally leave them behind. This apparent disappearance of the prospector of the old days has been the theme of retrospective comment among those who direct mining explorations.

It is a fact to regret. In part it was inevitable, in part it is due to the decadence of a type. The tracts formerly unexplored are becoming well trodden and the once inaccessible places of the earth are now easily attainable. The glamor of the dawn has faded from off the mountain tops, the never-never lands have been made commonplace by travel, and "that nameless grace the charm of the unknown" has been stripped off the regions which were, not long ago, the goal of the adventurous. In other words, the attractiveness of prospecting has waned. The young men find in it no more of allurements, and the only prospectors worth mention are the old fellows who no longer seek for the hidden ore, but are content to sit by camp-fires and talk of the days when they struck it rich on Bullion Hill, or washed the first pan of dirt in Colchis Valley. The prospector's calling has fallen upon evil days. If you ask him why, he will tell you that he cannot get any "backing," no one will "grub-stake" him, the moneyed men who formerly provided the wherewithal have ceased to "put up." For this there are various reasons forthcoming. Twenty years ago the merchants and bankers of a mining center like San Francisco, Denver or Salt Lake were in the habit of giving a prospector a "grub-stake;" that is, they found him food, supplies and a horse or mule, and, thus provided, they sent him out to seek for gold, silver or copper, on the understanding that any discovery should be shared equally between the miner and his patron. Such agreements rested upon good faith, and it is a fact that they were kept in a manner highly creditable to all concerned. As the frontier came into closer touch with the more complex civilization of the cities, the simple codes of honor, strong amid border life, became weakened by the interposition of the letter of the law. As soon as it became necessary to draw up legal contracts, as soon as good faith needed stiffening by attorneys, the whole system of grub-staking broke down. The merchants who formerly had men constantly in the field ceased to support them when, time after time, it was found that discoveries would be made only to be hidden for subsequent location by the prospector on his own account. Bad faith will undermine any form of business. The prospector il-

lustrates the law of organic life: he does not survive because he is not fitted to the new conditions; he is threatened with the extinction of the Dodo.

Another factor has proved inimical to the prospector—and that is the labor-union. When a certain rate per diem is to be the one and final recompense for all men, irrespective of ability and experience, it is obvious that the prospector, who typifies the co-operative aspect in its most adventurous mood, must succumb to the walking delegate. The bitter antagonism of the ignorant leaders of the labor-unions is not the sentiment likely to foster the

relations of mutual trust and good-will which characterized the days of the pioneers.

It is a pity, but it is the price of progress. Simplicity yields to complexity in all the avenues of life. Time was when we shared some of our salary with the prospector, when we sent him into the hills in search of lost mines and of mines that were never found. We loved the young and fearless, we respected the old and experienced prospector. We ate his bacon and beans, we drank his coffee, and at night we slept under the same blankets by his side. We swapped yarns, and philosophized over the hidden things of the earth. He was a man and a brother; above all, he was free to come and go among the hills, no one hindering him. Other times, other men. May the sunlight linger on the old cabin upon the hillside, may the breeze sing like the voice of the sea among the pines where once the prospector dwelt, and may the snow fall soft upon the far divide across which he took his lonely way, never to return.

Nov. 7, 1903 p. 710

The opening session of the annual convention of the California Miners' Association will be on November 16, the sessions to continue three days. During that time, in addition to the usual business and election of officers, a number of technical papers are to be read by members.

The National Smelting & Refining Co., which has been erecting a plant at National City, San Diego county, has indefinitely put off starting active work. The cause given is the death of one of the directors. All sorts of things seem to happen to smelting plants in southern California. They are constantly being "planned," but fires are not started very promptly.

Nov. 7, 1903 p. 712

#### KERN COUNTY.

*Arando.*—Dean and Jones, owners, are installing a cyanide plant at this mine.

*Golden.*—A 600-ft. tunnel is to be driven in this mine in Amalie district, J. B. Ferris, owner.

*Rayo Mining Co.*—This company in Pioneer district reports uncovering a 3-ft. vein of No. 40 rock, and will have its new mill crushing ore within six weeks.

*Zoda.*—At this mine, in Amalie district, 40 men are now employed.

*Zenda.*—T. W. Cummings, owner of this mine at Amalie, has commenced the erection of a mill.

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SAN BERNARDINO COUNTY.

*Bagdad Mining and Milling Co.*—This company, at Bagdad, is shipping 100 tons of ore daily to its 50-stamp mill at Barston. There are also 4 Huntington mills in the plant and ore shipments are being increased. E. H. Stagg is the general manager.

*Benjamin E. Chase Mining Co.*—This company, at Bagdad, is to have a 10-stamp mill and cyanide plant. The water to be hauled in tanks costs 40c. per ton of ore crushed.

*Roosevelt Mining Co.*—This company, Sherman Washburn, president, owns properties at Bagdad and is planning for a quartz mill. The incline shaft is 400 ft. deep. There is considerable copper in the ore.

SAN DIEGO COUNTY.

*California Gold King.*—A new gasoline double-drum hoist is being put in this mine at Picacho. R. K. Humphrey is superintendent. The ore body in the mine is being prospected by diamond drills.

*Giant.*—This mine at Boulder creek is producing good rock and the prospects of the Waterloo are encouraging. Mr. Morgan is arranging for a 10-stamp mill at Boulder.

*Julian Consolidated Mining Co.*—A suit is being tried against this company in which the plaintiff charges that the management allowed the mine to be flooded to prevent his selling the property at Julian, while he was holding an option upon it.

*National Smelting and Refining Co.*—L. W. Morgan, manager of this partly completed plant at National City, announces the opening is indefinitely deferred. The cause is the contemplated reorganization of the company following the death of one of the directors.

*Stonewall.*—This mine at Cuyamaca will shortly begin milling ore under the superintendence of Col. Lucas, the organizer of the company owning the property.

Nov. 14, 1903 p. 749

The business men of Randsburg, Kern county, where a miners' strike has been going on for some months, have issued a statement to the effect that the Yellow Aster Mining Co. has been running steadily 130-stamps for the past three weeks, with about 200 men at work. The statement also says that men looking for work should disregard sensational articles which are published contrary to these facts. The union men are not in any way interfering with work, but the town is being held back by reports that the mines are not running.

Nov. 14, 1903 p. 750

INYO COUNTY.

*Ballarat.*—Several outfits are starting up in this camp. At Tuba cañon J. P. Flint has a force of men at work, and will soon be running his 12-stamp mill. The Cecil R. Co. keeps its 8-stamp mill running. At the property formerly belonging to the Ballarat Mining Co. a new mill is going up. At the Mineral Hill mine the cross-cut to the tramway is about finished, and the mill will soon start. At Millspaugh they are rebuilding the mill destroyed by fire.

(Cont.)

KERN COUNTY.

*Angelus.*—For this mine, at Fremont's Peak, drilling machinery has been shipped and drilling for water will soon commence.

*Barbarossa.*—Mr. Parlow, of Placerville, bought a half interest in this mine, near Amalie, and a gang of men are at work.

*Echo.*—This company intends adding a roller mill to its 10-stamp crushing capacity.

*Exposed Treasure.*—Manager DeKalb intends adding 30 stamps to the 20 at this mine, near Mohave.

*Gold Peak.*—This company, near Amalie, employs 30 men, and is shipping from 10 to 15 tons of ore daily to the Selby Smelting Co.

*Pinmore.*—This mill, at Johannesburg, owned by the Croesus Mining Co. and leased to Earnestness & Nelson, was burned last week.

RIVERSIDE COUNTY.

*Bowler Free Gold Mining Co.*—This company owns several claims in the Chuckawalla mountains, about 23 miles east of Salton. Fred. Bowler, of Los Angeles, is one of the principal owners. A test shipment netted \$500 on 35 tons of ore. A tunnel is to be run to tap the ledge at 900 ft.

*Kunzite.*—A mine of this gem material has been found in the Cahuilla mountain and sold to eastern men for \$10,000. Two men patrol the mountain day and night to keep off trespassers.

Nov. 21, 1903 p. 788

KERN COUNTY.

*Zada.*—Final payment of the \$22,000 purchase price of this mine at Caliente has been made by H. H. Blood and associates. The company is now working the mine.

RIVERSIDE COUNTY.

*Orocopia.*—The mines are 16 miles from Salton, and a survey is being made for a pipe line to convey water from Palm Springs. It is understood that a mill and cyanide plant are to be put up.

SAN BERNARDINO COUNTY.

*San Bernardino Mining Association.*—A temporary organization of this association has been made with Geo. M. Cooley as president, and J. F. Campbell secretary, at San Bernardino. The first purpose is to prepare a mineral exhibit for the St. Louis fair. However, it is intended to make the organization permanent to act on matters connected with the development of the desert section, such as good roads, water supply, etc.

Nov. 28, 1903 p. 827

RIVERSIDE COUNTY.

*Granite.*—This mine, in Chuckawalla district, near Salton, owned by White, Masters & Hall, is now under development.

*Ora Copia.*—On this, the old Fish property, 16 miles from Salton, considerable development is being done. A large cyanide plant is to be put in.

*Red Cloud.*—This company is putting up a small prospecting mill near Salton.

SAN BERNARDINO COUNTY.

*Bagdad Mining & Milling Co.*—Eastern capitalists, interested in the Bagdad Mining Co., have effected a consolidation between that property at Ludlow and the Chase mines under the name of the Bagdad Mining & Milling Co. The Bagdad company owns a 50-stamp mill at Barstow, and a 10-stamp mill is being built on the Chase group.

*Ledge.*—Lawrence Harris, of Vanderbilt, has made a rich quartz strike about a mile northwest of that place.

KERN COUNTY.

H. E. Huntington, Wm. Kerchoff, I. W. Hellman and E. Randolph have located a number of placer claims along Kern river, near where the electric power plant is being erected. The development of the claims will shortly begin.

*White River District.*—In this district there is more activity than for some time past. Several claims have been bonded to San Francisco men, and work is in progress to determine values. A new hoist has been put on the Eclipse, and work is to be resumed on the Bald Mountain.

Dec. 5, 1903 p. 864

The owners of the great borax mines at Death valley, in the desert region, are about to give up the picturesque 24-mule teams used in hauling the borax out to the railroad, and are constructing an automobile train and macadamizing a 100-mile road. The automobile is expected to haul seven loaded wagons or trucks, specially constructed for the purpose.

Dec. 5, 1903 p. 867

INYO COUNTY.

*Tuba.*—This mine, in the Panamint mountains, owned by W. S. James and J. P. Flint, is running a 6-stamp mill on \$30 rock. The tailings from a previous run were recently cyanided and netted over \$10 per ton.

KERN COUNTY.

*Angelus Mining & Milling Co.*—At this company's property, 16 miles southeast of Johannesburg, a good flow of water was struck in a well 240 ft. deep. The company is developing a large body of gold-bearing gravel.

*Queen Esther.*—This mine, near Mohave, known as the Thompson & Boyle claim, is to be opened. It is a tunnel proposition and has a large mill and cyanide plant.

LOS ANGELES COUNTY.

*San Gabriel Cañon.*—Only one mine in this cañon is now producing gold, though assessment work is being done on a number of claims scattered along the cañon for 30 miles.

RIVERSIDE COUNTY.

*Bowler Free Gold Mining Co.*—This group, in Pacific district, Chuckawalla mountains, has been shipping high-grade ore to the smelter on San Francisco bay. The company owns 23 claims about 23 miles east of Salton.

The coal mines at Garlock are to be prospected by diamond drills.

*Confidence.*—This mine, adjoining the Rand, shows up a body of good grade ore on the 100-ft. level.

*Friday Gulch Mining Co.*—This company, at Havi-lah, H. L. Meacham superintendent, has its machinery almost ready for work. Final payment on the property was recently made.

*St. John.*—This old mine, at Sageland, at the foot of Piute mountain, is having a cyanide plant put in.

RIVERSIDE COUNTY.

*Pano-Kunzite-Tourmaline Mining Co.*—This company, operating on Coahuila mountain, is about to drift into the mountain in search of lithia, kunzite and tourmaline. The Little Blue claim appears thus far to have the best variety of gems. There is wood and water at the claims.

SAN BERNARDINO COUNTY.

*Brooklyn.*—This company, at Dale, has put in a 30-ton leaching plant, copper in the ore making this necessary.

*Ivanhoe.*—This company, J. J. Ellertman superintendent, at Dale, has 25 men at work building a new road, and a 30-ton cyanide plant will be put up.

*John Suter Gold Mining Co.*—This company has been organized to work a group of 10 claims near the Bagdad mines, Bagdad. The directors are John Suter, president; A. L. Selig, vice-president; E. E. Selph, secretary; T. L. Martin, D. C. Sullivan and Andrew and J. A. Henderson.

*O. K. Mining Co.*—This company, at Dale, Joseph Ingersoll superintendent, has started up its new 30-ton cyanide plant.

*Supply Mining Co.*—The new cyanide plant at this mine, Dale, has been completed. Two new ore shoots have been found in the mines.

*Virginia Dale.*—This property, at Dale, has been sold to a Mr. Sigafuss for \$25,000 cash.

Dec. 17, 1903 p. 941

The Bagdad and Chase properties, near Ludlow, San Bernardino, both productive, have been consolidated as the Bagdad-Chase Gold Mining Co. The directors are Benjamin E. Chase, John N. Beckley and John E. H. Stedman, of Rochester, N. Y.; Edgar Van Etten, of Boston, and Chauncey M. Depew, of New York.

The Golden Cross mines, at Hedges, San Diego county, owned by the Free Gold Mining Co., have been in the hands of a receiver some years. He has succeeded in wiping out all the indebtedness, and about the first of the year the property will be turned over again to the company. One of the largest mills in the State is at these mines, and there is also an extensive cyanide plant. The ore is of low grade, but there are large bodies of it.

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INYO COUNTY.

*Millspaugh Mining Co.*—The new cyanide plant of this company is practically completed and the new mill is ready to run. The mill company has promised to do certain custom milling for men developing claims in the district.

KERN COUNTY.

A 3-stamp, quadruple-discharge mill, 1,000-lb. stamps has just been completed at Piute under the supervision of W. L. Cobb, and is now in operation.

*Consolidated Mines Co.*—This company, of Los Angeles, has brought suit against O. A. Strassfort and M. E. Edwards to quiet title to the Twin Brothers claim at Goler, and the Lillian V. and Nos. 1 and 2 in the same district. The company claims the defendants have located claims overlapping theirs.

*Johannesburg Gold Mining Co.*—The properties of this company at St. Elmo are reported sold to a Chicago company, headed by A. F. and E. Norison. It is expected that a 10-stamp mill will be erected.

SAN BERNARDINO COUNTY.

*Golden Seal.*—This company at Dale, owning the O. K. and Lulu mines, is to have a new hoisting plant, and 50 ton crushers and rolls will be put up.

*Ivanhoe Mining Co.*—This company at Dale has bought the Ivanhoe mine, and as soon as the wagon road is finished a crushing plant will be put in.

*Supply.*—At this property, Dale, a cyanide plant is being put in. There are 30 men at work in the mine.

SAN DIEGO COUNTY.

*Free Gold Mining Co.*—No mining has been done on this property for some months, but the cyanide plant has been operated on ore already mined. Mining operations will be resumed on the first of the year by the company, instead of the receiver.

*San Diego.*—L. W. Morgan has returned from the East, and states that this smelter will shortly be in operation again.

Dec. 24, 1903 p. 980

KERN COUNTY.

Stockwell & Holliday have shipped an engine to their mine at Slaterange.

*Amalie District.*—W. H. Williams states that this district is about nine miles square and the veins are strong and wide. There is plenty of ore but the district needs capital to develop it. Most of the claims are at present still prospects.

*Pacific Smelting Co.*—Ore bins and buildings for this smelter have been put up on the McKittrick branch railroad line and excavating for the oil reservoir is nearly completed.

Dec. 31, 1903 p. 1016

INYO COUNTY.

*Fish Springs.*—The Buckeye Mining Co., of Mansfield, O., J. A. Casler superintendent, has been developing this group for two years and opened up some good ore. The Ophir is the principal mine of the group.

*Reward.*—This property, at Reward, H. C. Steele manager, has been closed. The power facilities are inadequate.

(Cont..)

KERN COUNTY.

*Butte.*—This mine, at Randsburg, cleaned up \$6,400 from 85 tons of ore recently.

*Confidence Mining Co.*—This Los Angeles company, with mines near Havilah, is now mining rock of high grade.

*Josephine.*—A. Borette will put in a hoist and other machinery on this mine, at White river.

*Pine Tree.*—The first clean-up from this mine is satisfactory. The mill is being repaired.

*Santa Bueno Mining Co.*—A gasoline hoist is being shipped to the property of this company at Mohave.

RIVERSIDE COUNTY.

*Gem Mining.*—Considerable prospecting is going on for gems in the San Jacinto reservation and adjoining region. The kunzite mine found in the Coahuilla mountains is being worked. The gems are found mainly in the crevices of granite ridges.

SAN BERNARDINO COUNTY.

*Lead Mountain Mining & Smelting Co.*—At this property, near Bagdad, J. L. Carder superintendent, the shaft is down 500 ft., and 35 men are doing the development work. It is the intention to sink to 1,000 ft. The ore is all shipped to a smelter.

*Roosevelt.*—This mine at Bagdad is producing about 100 tons of gold-bearing ore daily.

SAN DIEGO COUNTY.

A. McDonald, of Lamanda Park, Los Angeles county, has bought a group of mines in Iron Springs district, near Warner's ranch, from E. H. Harding. The purchase includes half interest in 14 claims and certain mill sites and water rights.

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## KERN COUNTY

**Golden Jackrabbit**—George W. Hull, of Jerome, Ariz., J. B. Ferris and others have purchased a 70-ton mill for the Ocher mine, 8 miles east of Caliente, and are also installing electric drills; other improvements are being made toward the property on an extensive scale.

Sept. 3, 1910 p. 475

## INYO COUNTY

**Southern Belle**—This company, with its mill four miles from Laws, has decided to do custom work, treating 10-ton lots at \$4 per ton.

July 9, 1910 p. 88

## INYO COUNTY

**Poverty Hill**—A test run is being made at this mine and the new plant will soon be steadily operating.

## KERN COUNTY

A rich strike has been made in the Lucky Star, of the Bremmer group, operated by A. McClure, A. F. Dedrick and T. R. Petersen, in the Stringer district. The high-grade ore was found at 80 feet.

Sept. 10, 1910 p. 528

## INYO COUNTY

At Oasis camp the Copper Queen mine is showing up some high-grade copper ore, and free milling gold ore overlooked by the old prospectors has also been found. The Schwab properties south of this group contain wide veins of good copper ore and are being developed.

**Silver Bell**—C. B. Burr has taken charge of this mine in Ubehebe district for the Monterey Gold Company and a long tunnel has been commenced.

**Monster**—A wagon road is being built to this mine from Citrus, and the mine will be worked again.

**Lost Frenchman**—Joseph Ward of Big

Pine claims that he has found this much sought for mine in the southwest end of Deep Spring valley and is taking out high-grade ore.

Aug. 20, 1910 p. 380

## INYO COUNTY

**Tecopa**—A five-years' contract with the American Smelting and Refining Company has been made for the shipment of a minimum of 300 tons daily and a maximum of 1000 tons. Most of the present output is from the Gunsight claim, but sinking is going on in the Noonday. There are 150 men on the payroll. This is the largest lead-ore producer in the State.

Sept. 17, 1910 p. 574

## KERN COUNTY

**Ramey**—The 12 claims located some years ago by J. E. Ramey, in Hamilton district 20 miles east of Caliente, have been sold to a Duluth company which has commenced operations and will soon put up a 10-stamp mill. Mr. Ramey will represent the company.

**Black Hawk**—This group, three miles southeast of Randsburg, is now being operated by Byrne, Kuffel & Noyser, and a 5-stamp mill is being run steadily.

## SAN BERNARDINO COUNTY

**Gold Park Consolidated**—This company is operating 52 claims in three groups about 70 miles east of Banning. The Warrior shaft is now 200 ft. deep. C. W. Roach, superintendent, reports that three sets of leasers have started work on the middle group of claims. The group is already developed by six shafts and about 4000 ft. of work, the deepest working being 320 feet.

Aug. 27, 1910 p. 429

## INYO COUNTY

More activity is predicted for the Bishop district through the efforts of C. P. Watson. A diamond drill will be used in prospecting that section.

## Nitrate Deposits of Southern California

By F. W. GRAEFF\*

The nitrate beds owned by the California Nitrate Company are situated in the extreme eastern part of San Bernardino county, between Needles and Parker in the Chemehuevis valley, 32.6 miles south from Needles, and contain 12,160 acres.

The road from Needles to the nitrate beds is in excellent condition. Leaving Needles the road penetrates the desert proper, passes a number of sterile mountains and hills varying in height, and which are creamy yellow. This color is the main characteristic of the California nitrate beds, according to statements of the State Mining Bureau. The surface consists mainly of clay, covered with gravel, spreading like a mantle over the whole country, covering and completely hiding the underlying strata. There are many of these exposed hills to the right and left of the washes.

Atmospheric action, rains and floods, have cut into the hills and eroded the original beds rounding and shaping them into their present peculiar form. It is only where erosive forces of nature have washed away the top cover of this alluvium that the clay beds appear below. How far they may extend underneath the gravel is not known. Only the exposed parts of the nitrate-bearing clay hills can be observed at this time. These hills are from 100 to 300 ft. high and it is thought that large quantities of nitrate are obtainable from them and it is likely nitrate-bearing strata will extend far below the base of the hills.

The clays in their dry state are hard and compact, but when water is applied they disintegrate quickly, due, of course, to the great amount of soluble saline matter they contain. The samples which I took from various parts of these clay beds contain nitrate in various quantities as the analyses below will show. The samples taken at the hills indicate that the nitrate-bearing clay covers the hill from apex to base in varying thickness, covered with about 6 to 12 in. of loose decomposed "slum," the residue of leached-out clay.

### ANALYSES OF SAMPLES

I give herewith analyses of four samples:

	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Nitrate of sodium.	7.2	8.2	17.2	22.6
Chloride of sodium.	5.8	6.3	11.8	13.1
Sulphate of sodium.	1.1	0.9	2.4	1.8
Sulphate of calcium	0.9	3.1	2.9	2.2
Moisture.	2.8	3.8	4.6	2.3
Insoluble.	79.9	77.5	60.6	57.7

\*Los Angeles, Cal.

The analyses of samples obtained from various strata at a number of hills indicate that the main bulk of nitrate in the hills is contained in the clay strata.

The "insoluble" contains mainly alumina, iron and silica. One to two per cent. nitrate is found on top of the hills, and samples of a rocky material, most likely of a volcanic nature, show also small traces of nitrate in them.

Among other minerals found in the nitrate beds are strata of transparent gypsum or selenite. Another variety of gypsum called satin spar, pure and white and decidedly fibrous, is also met with in nearly all the beds in small quantities. I also found traces of iodine in two samples. All samples analyzed by me were surface samples, as it was impossible at that time to penetrate the interior of the hills or obtain samples from strata under their base. The relative high percentage of nitrate found in the surface samples allows me to draw the conclusion that most likely in the interior of the hills are large deposits of nitrate. I have observed on the hills where I took samples that a sample taken near the top contained 8.2 per cent. of nitrate, while another sample taken 14 ft. below on the same hill contained 22.4 per cent. of nitrate. The property contains many hills of the same character, and may be assumed that the same or better results will be found in all the clay hills.

### MINING

The extraction of the crude material for reduction is as simple as the work of borax or other solubles found above ground. Pick and shovel will almost do the loosening of the nitrate-bearing material, while horse scrapers and plows can be used to advantage. The loose clay on top bearing only 1 to 2 per cent. of niter may be removed easily by a scraper and discarded, and little blasting, if any at all, will be necessary for opening the nitrate-bearing ground, which when scraped down to the slope may be loaded in wagons or cars and carted to the reduction works near by. The dry water courses afford natural roads, which with but little work to improve them, will answer all purposes.

The difficult question in Chile is to obtain enough water for the solution of the nitrate. The Colorado river, bordering the property on the east, will furnish all the water necessary for the extraction of the nitrate.

### SIMILARITY OF THE CALIFORNIA AND CHILE DEPOSITS

The California State Mining Bureau, in *Bulletin 24*, describes the similarity of the deposits along the Colorado river and those in Chile. They are summarized as follows: Both occur only in the hot, rainless desert portions and the nitrate is associated with gypsum, common salt, glauber salt and sulphate of magnesia.

Both are found on the margins of dried up sea bottoms or in the residuum of evaporated oceans. The deposits of niter in both countries are interrupted by deposits of salt, borax, borate of lime, soda, etc. In both Chile and California, the *caliche* varies widely in depth, even in spots close to each other, running from a few inches to several feet. Spots are found that are almost pure.

In Chile the beds are covered with a hard crust called *costra*. This *costra* is covered with the debris of earthy matter cemented together into a conglomerate that contains sand, salt, gypsum, etc. In California the *costra* is composed of the same substances, but unlike Chilean *costra* is soft. In Chile the *costra* has to be blasted, while in California it can be worked with a scraper. No nitrate strata are found below the *caliche* in Chile, while in California, nitrates are found in more than one of the alternating strata of the terraces. In Chile the only nitrate found in commercial quantities is in the *caliche* or nitrate of sodium. In the California beds, other nitrates are present as well as nitrate of sodium which promise to be of commercial importance.

### Early Iron Making on the Pacific Coast

According to the *Bulletin* of the American Iron and Steel Association, the first pig iron manufactured on the Pacific coast was produced in the Oswego furnace, Oregon, on Aug. 27, 1867. The first stack at Oswego was built in 1866 by the Oregon Iron Company, which had been incorporated Feb. 23, 1865, with a capitalization of \$200,000. It was originally 32x9 ft., but was afterward twice enlarged. The furnace was in blast almost continuously for 10 years. The first iron was melted with charcoal made from fir wood burned in charcoal kilns erected at the works. The blast was furnished by blowers driven by water power. The cylinders and pistons of the blowing equipment were built of wood. In 1878 the plant was bought by the Oswego Iron Company, which removed the wooden appliances and operated the furnace intermittently until Oct. 26, 1882, producing in four years 18,500 gross tons of pig iron. The Oregon Iron and Steel Company, the present owner, took over the plant in 1882 and produced 14,663 tons of pig iron in the two succeeding years. Some of the iron made during this period sold as high as \$40 a ton. Between 1885 and 1889 the company was reorganized with a capital of \$1,500,000 and a new furnace was built in 1888, the old furnace being abandoned. The new furnace was operated until 1894, but has not been in blast since that year. The ore used was a brown hematite, mined near Oswego.

## Gold Park District, California

### LOS ANGELES CORRESPONDENCE

Gold Park lies a few miles south of Twenty-nine Palms, near the county line separating San Bernardino and Riverside counties, California. The elevation varies from 3500 to 4200 ft. above sea level. The camp of the Gold Park Consolidated Mines, the chief operator in the district, is accessible by desert wagon roads from various directions; from Palm Springs on the Southern Pacific, or Bagdad on the Santa Fe railroad, the distance is 45 miles. From Indio on the Southern Pacific the distance is about 35 miles.

### GEOLOGY

The principal country rocks of the district are of igneous origin and consist chiefly of granites of varying composition and texture. Syenite, apatite, diorite and porphyritic rocks are plentiful. Some quartzite, evidently metamorphosed from a coarse-grained sandstone, appears in places. The country is mountainous and is cut by many cañons. The surface is largely covered by wash and boulders of granite and kindred rocks. Hornblende predominates in the granitic rocks. As far as development has progressed the ore is in the form of free gold carried in a quartz gangue, impregnated in places by iron oxide. Sulphide, consisting chiefly of iron pyrites, is beginning to show at 190 ft. in the Black Warrior shaft. With the exception of the Black Warrior, the veins vary from 1 to 5 ft. wide, averaging a little more than 2 feet.

### GOLD PARK CONSOLIDATED OPERATIONS

The Gold Park company owns 52 claims, divided into the Warrior, No. 2 and Main groups. Work at present is being confined to the Black and White Warrior, although leases have been let recently on the Main group. On the Warrior group a quartz vein varying from 40 to 60 ft. in width has been exposed by surface cuts for a distance of seven claim lengths. On the Black Warrior a shaft has been sunk to a depth of 200 ft. and two shifts are working to put it down to the 500 level. The shaft is on the vein and about 1400 tons of ore are now on the dump. Some drifting has been done and the company has decided, on the strength of the ore

showing here and in the leased claims, to erect a mill of moderate capacity. The ore from this shaft goes about \$30 per ton in gold, the bulk of the rock hoisted being ore. This shaft is equipped with a small air compressor and hoist, both operated by gasolene engine.

On the Main group leases have been let on the Boss and No. 6 claim. The Boss is developed by three shafts, the deepest being 100 ft. deep. Underground work here has proved the ore to occur in shoots of varying size and tenor. Some rich ore has been encountered, the average being about \$30 per ton. The vein branches on this claim and a shaft has been sunk on each branch and at the fork. Leasers are working in the last-mentioned shaft.

The vein on claim No. 6, Main group, has a north-south strike and dips westerly. A shaft has been sunk 136 ft. on the vein, and is in 2 ft. of ore averaging \$50 per ton for practically its whole

### ANACONDA MINE AND MILL

With the exception of the Anaconda, situated 1½ miles west of group No. 2 of the Gold Park company, and possibly a few prospectors, there are at present no other operations in the district. The Anaconda, operated by Edward MacDermott and associates, of Los Angeles, is developed by a shaft 100 ft. deep. Two crews are drifting on the 100 and the ore mined is being sent to the small mill at Twenty-nine Palms. The ore here varies in grade, but by sorting is kept up to about \$30 per ton in gold. About \$1000 per week is being obtained from ore milled.

The mill at Twenty-nine Palms, under the same management as the Anaconda mine, is of the Bryan type and is capable of treating about 20 tons of ore per day. It is planned to add a cyanide department as the tailings from some of the rich ore run comparatively high. The



CALIFORNIA BOY SHAFT, GOLD PARK CONSOLIDATED MINES, CALIFORNIA.

depth. Leasers are working here. Another shallow shaft on this claim shows ore of greater width but much lower gold tenor. For the present the leasers on the Boss and No. 6 expect to haul ore to the mill at Twenty-nine Palms, about 7 miles distant. Arrangements are under way to lease the Atlantic claim of the Main group. This claim is developed by four shafts, the deepest of which is 100 ft., two tunnels, 120 and 218 ft. respectively, and a 150-ft. open cut. No work is being done on group No. 2 at this time. The total development on the property of the Gold Park company consists of nine shafts varying from 65 to 320 ft. in depth, and about 4000 ft. of drifts. Also there are many shallow shafts and cuts. Work at this time is not being conducted on a large scale but future plans indicate a wider range of operations. As soon as more depth is gained in the Black Warrior shaft work will be pushed at this point.

improvement of this mill and the construction of an uptodate mill and cyanide plant by the Gold Park company should do much toward the development of the district.

# Occurrence of Tungsten in Rand District, Cal.

Occurs Commercially as Scheelite. Plate Amalgamation of Tungstengold Ores Difficult. Much Valuable Ore Lost through Ignorance

BY SAMUEL H. DOLBEAR\*

Except at Atolia, in the southeasterly portion of the Rand mining district, of California, where tungsten is being mined as an industry in itself, the occurrence of tungsten as scheelite in the ores of the Rand mining district has not been considered of commercial importance until recently. The distribution of tungsten in this district does not seem to be limited to any definite area, its existence having been noted in all parts of the district, associated with the gold ores, or independently. Scheelite ( $\text{CaWO}_4$ ) is the only ore of tungsten which has been found here in economic quantities although seams of wolframite have been recently reported.

It has been noted by writers on the subject, that where the tungsten ores are rich, gold values are poor. This is not necessarily the case in the Rand mining district, for in several of the mines, notably the Gold Coin, Baltic, Wickard, and Sydney group, ore of sufficient tungsten content to be considered valuable, has been found to carry as high as \$50 to \$60 per ton in gold.

## EARLY TUNGSTEN OPERATIONS

The chief operations for tungsten in the district are being conducted at Atolia, by the Atolia Mining Company. The presence of tungsten at this point first became known as early as 1904. The discovery was made and development operations carried on by W. A. Wickard, Thomas McCarty and Charles Churchill. The vein was on the Papoose claim, the original discovery was about three ft. in width, and was found in weathered granite. While the vein in the lateral workings from the main shaft on the Papoose is said to be continuous, the tungsten is unevenly distributed, occurring in lenses. In the barren parts, the vein is quartz, which is the main impurity in most of the tungsten ores.

## FIRST SHIPMENTS TO GERMANY

Working to a depth of between 150 and 200 ft. it is said that the ore at the Papoose mine was exhausted. Operations are now largely confined to the Churchill and Weatherbee veins, the latter recently acquired by the Atolia company.

During early operations hand picking of ore was employed, the better grade of material being determined by its weight. The principal demand for tungsten ores in 1905 was in the German manufacturing industries, and the first several cars

of picked ore were exported to that market. At present the ores are crushed with a Blake crusher, ground in a six-foot Huntington mill, and concentrated with Frue vanners. The recovery effected by this treatment is from 72 to 82 per cent. About 30 men are now employed in the mine and mill. The ore being treated is said to run from 6 to 8 per cent. tungstic acid, the concentrated material from 67 to 68 per cent. tungstic acid. The monthly production amounts to \$10,000, approximately.

## GEOLOGICAL FEATURES

At the northern end of the tungsten belt we find intrusive granites several miles in length, cutting the schists. Tungsten has been found north of this intrusion but sparingly, in the schists; the principal tungsten orebodies being found in an older granite mass in the southern part of the belt.

Over a large area in what is locally called the Stringer district, are found irregular fissures in the granites and schists which in many places contain gold ore, and sometimes tungsten. The veins may be valuable for both minerals, or may contain but one. This condition is noted on and near the Baltic mine, where both gold-tungsten, gold, and tungsten ores have been mined in various places. The first shipment of tungsten from the district was made from the Baltic mine.

## GOLD-TUNGSTEN ORES

The fact that gold ores of the district contained tungsten was first noted by the Yellow Aster Mining and Milling Company several years ago, and four Standard concentrators were installed to save this mineral. It was found after trial, however, that the percentage of tungsten in the ores of that mine was not sufficiently high to defray the cost of treatment, and the attempt was abandoned.

At the Sydney mine, six miles southerly from the Yellow Aster, the presence of tungsten in some of its gold ores, has been known for three or four years. A small amount of ore from this mine has been treated for tungsten over a Woodbury table.

Realizing the commercial possibility of the gold-tungsten ores of this district, the Stanford Mining and Reduction Company, operating the Red Dog custom amalgamation mill, at Johannesburg, has recently installed a New Standard concentrator, and is treating custom ores for gold and tungsten.

## OUTLINE OF CONCENTRATION METHOD NOW EMPLOYED

The ores are stamped to pass a 50-mesh slot screen, using 6-in. discharge and 5½-in. drop; are first plated and then concentrated. Much difficulty has been experienced in this method of treatment. On account of the extreme weight of the tungsten, the plates are badly scoured, and it is with great difficulty that amalgam is retained on the plates. Although particles of amalgam are frequently found on the table, it is impossible to employ an amalgam trap on account of the density of the concentrate collecting in the trap. Amalgam collecting on the battery plates is extremely hard and brittle. At the cleanup, the corners of the battery are found to be solidly caked with the ore. The loss of tungsten is from 20 to 30 per cent. A portion of this loss is on account of the employment of insufficient settling boxes, while the larger portion of the loss occurs in the tailings, and could probably be somewhat remedied by the employment of a second table in series for the richer ores; and by the use of a canvas table for the lower grade material.

## PLACER TUNGSTEN

Tungsten occurs in both the gulches of recent origin and the glacial channels of the Stringer district. The present gulches slope generally in a southeasterly direction, while the channels, which are now filled with débris, firmly cemented together, bear more in a southerly direction.

In 1898 over 100 men were employed in dry-washing parts of these gulches and channels, and much difficulty was experienced in these operations on account of the accumulation on the riffles of what was then mistaken for heavy spar, or barite. When the riffle board became filled with this material, it was carried to the camp of the digger, on the bank of the gulch, the gold removed by amalgamation, and the tungsten discarded as worthless. A considerable amount of tungsten accumulated on the banks of the gulches in this way. Later floods distributed these piles over the surface of the gulches. The material accumulated in this way was recently scraped up and milled.

## VALUE OF SCHEELITE UNKNOWN IN EARLY DAYS

During the early operations, the bottoms of many of the gulches were honey-combed with workings by these miners in

\*Mining engineer, Johannesburg, Cal.

their quest for gold, and it is stated that pieces of scheelite weighing several pounds were found in places. These pieces of ore were used in the construction of pillars for the retention of ground. It is also stated that seams of scheelite, in place, were found, but as they were not considered valuable, no record of their locality was preserved. Most of these old workings have caved in, and are now inaccessible.

An attempt is being made to operate unworked portions of the placer deposits, both for gold and tungsten. For experimental purposes, a small jig was built, having two compartments, in one of which is situated the jig box having a screen bottom with 3/32-in. apertures. In this way the coarse pieces of tungsten accumulate in the jig box, the placer gold and fine tungsten sinking to the bottom of the jig-box compartment. The gravel to be jigged passes through a 5/8-in. screen, while the oversize is hand sorted for large pieces of ore. The material settling in the jig-box compartment is hauled to the custom mill, stamped and amalgamated, the concentrates being saved as before described. The accumulation in the jig box itself, is comparatively pure, and requires no further treatment.

Placer tungsten occurs in pieces from a millimeter to several inches in diameter. In most cases these pieces are rounded and nodular in appearance indicating that they have either traveled a long distance, or that a considerable amount of material has been washed over them.

In the immediate vicinity of the Atolia mines, where bedrock was not over four or five ft. below the surface, the overburden has been removed, and large pieces of tungsten gathered by hand.

#### FIELD TESTS EMPLOYED

Tungsten ore of sufficient percentage to be valuable can usually be detected by its weight, being, in its pure state, about twice as heavy as quartz. The tests employed by prospectors in this district, while simple, are nevertheless, accurate.

A small amount of the ore is crushed, placed in a test tube or any other vessel of glass which may be available, and a small quantity of concentrated hydrochloric acid is added. This is heated to the boiling point, and should be boiled for a moment, when a scrap of metallic tin or zinc (preferably tin) is added. If tungsten be present the solution immediately becomes azure blue.

Another test which is fairly delicate is by fusion in a reducing flame with a salt of phosphorus. In the oxidizing flame no color is obtained, while in the reducing flame, the bead becomes a fine blue, which changes to blood red upon the addition of ferrous sulphate.

In making quantitative determinations, the method described by Prof. R. C. Ben-

ner, of the University of Arizona, is in common use and is found satisfactory for ordinary commercial purposes.

#### BENNER'S METHOD FOR TUNGSTEN

Fuse the ore with a mixture of sodium and potassium carbonate, and dissolve in hot water. The tungsten goes into a solution with sodium silicate, as sodium-potassium tungstate. Filter and wash with hot water, and if there is any residue which has not been disintegrated by the first fusion, it must be re-fused, as in the first case, and again treated with boiling water, filtered and washed with hot water. This alkaline tungstate is evaporated to dryness with nitric acid, moistened with nitric acid, and the evaporation repeated, when the silica is heated to about 120 deg., to dehydrate it. This dry mass is moistened with nitric acid, and allowed to stand several minutes. It is then taken up in a weak solution of some such salt as ammonium nitrate, which is added to the water to prevent the formation of a pseudo-solution of tungstic acid. Filter and wash with a slightly acid salt solution until free from alkaline salts. The precipitate is now transferred to a platinum crucible and ignited with free access to the air. This gives the impure tungstic oxide. This ignited residue may contain silica. The silica is removed by treating with hydrofluoric acid, evaporating to dryness, and igniting.

Engineering and Mining Journal  
Oct. 15, 1910

KERN COUNTY

*Kern-Piute*—This company at Piute has just put new boilers in the mill and the concentrating plant will shortly be completed. The mine, at an elevation of 8000 ft., will be operated all winter.

Oct. 22, 1910 p. 831

KERN COUNTY

The Houser Brothers and Frederick Williams have sold under bond and lease five claims in the Stringer district, near Randsburg, where there is more activity than there has been for years. Development also is being done in deep placer mining.

Nov. 5, 1910 p. 926

KERN COUNTY

*Butte*—About 200 ft. up the hill from the old workings in this mine at Randsburg, Patrick Fahey has discovered ore fully as good as that in the old vein at the surface.

Nov. 12, 1910 p. 980

INYO COUNTY

*Arondo*—It is expected that the Harrison Reeves Company will buy this property in the Argus range, 50 miles from Johannesburg. It is equipped with a roller mill and cyanide plant.

KERN COUNTY

At Randsburg, high-grade ore has been found on the 200 level of the Pearl Wedge. In the Santa Ana, Boison & Burke have found a good vein. Watchman Brothers and Cagle have taken a lease on the Santa Ana.

Nov. 26, 1910 p. 1076

INYO COUNTY

*Villareal*—In doing assessment on the property of this company, 15 miles south of Keeler, a 20-ft. vein of silver-lead ore has been found, thought to be on a continuation of the Cerro Gordo silver-lead belt.

Dec. 3, 1910 p. 1124

KERN COUNTY

C. J. Teagle, of Johannesburg, has bonded his placers at Summit, seven miles north of Randsburg, and H. E. Cunningham is sampling and testing the ground.

*Graham & Jones*—At this mine in the Argus range, a large body of low-grade ore is being opened up on several levels. The mine is equipped with a Sampson mill and a cyanide plant.

Dec. 24, 1910 p. 1274

INYO COUNTY

A movement is on foot for a smeltery at Keeler or Olancho to be erected jointly by the mine owners. The Argus Company is planning a cyanide mill.

*Villa Real*—At this mine near Darwin, D. F. Shively has found a body of silver-lead ore. Ore is being shipped to the railroad by team.

KERN COUNTY

*Windy*—From this mine near Randsburg, owned by John Singleton, Patrick and Charles Fahey are taking ore.

*Butte*—A recent mill run from this mine at Randsburg netted \$50 per ton.

Dec. 31, 1910 p. 1328

The recent find of a rich silver-lead vein not far from Darwin, Inyo county, has resulted in a general prospecting of the whole section. Most of the ground is open. Men familiar with the region say that the new finds are much more promising than were those at Modoc, or Cerro Gordo in times past.

# Crushing with Slow Chilean Mill

By Alexander McLaren \*

*At the Gold Belt mill a specially designed slow-moving chilean mill proved the most efficient crushing machine. The milling process described.*

Within the last two years, in the capacity of superintendent of the Great Gold Belt mines at Amboy, Cal., it became necessary for me to design and erect a plant suitable for the reduction of the ores of that mine. This was complicated by a number of perplexing problems, chief of which was an extreme shortage of water. Several samples were sent for laboratory test (amalgamation, concentration, etc.), from which the best results showed an extraction of less than 60 per cent. by amalgamation. Various reliable firms made the tests and all were unanimous in their verdict and advice, viz.; stamps and concentrators (cyanide being out of the question owing to prohibitive amount of copper present). The slow-speed chilean mill was then brought into the discussion, backed by recommendations as to high extraction of gold, small consumption of power and water, and low cost of installation and maintenance.

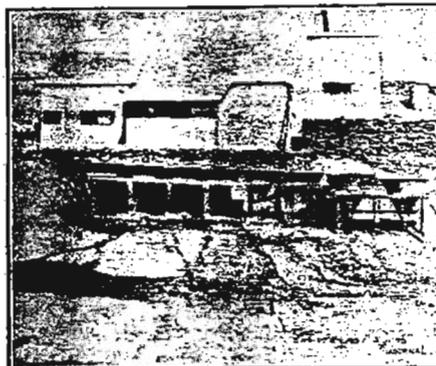
## SUSANNAH MILL, GOLDEN, UTAH

I thereupon paid a visit to the Susannah mine at Golden, Utah, where a 10-ft. slow-speed chilean mill was in operation. The ore was an exceedingly hard quartz, no sulphides apparent, the gold being contained in the oxidized spots and cavities in the quartz. Delivered to the grizzly, the coarse was crushed by a 7x10 Dodge breaker down to 1-in. and fed to the mill by a belt-driven plunger feeder. Owing to the low water supply at that season, the mill could be operated only 16 hours out of the 24, crushing 20 tons during that time, obtaining an extraction of 85 per cent. by amalgamation on plates and in the mill, and making a tailing, 75 per cent. of which would pass through a 100-mesh screen, with a loss of water amounting to 180 gal. per ton of ore. The source of water supply was a spring flowing 2½ gal. per min. A conserving plant, situated immediately below the mill, consisted of a series of tanks in which the solids settled permitting the water to be used again; the loss was occasioned only by flushing and drawing the various tanks when they had become filled with sands and slime. This plant was equipped with a 25-h.p. gasoline engine, which, although pulling a 7x10 Dodge crusher, 10-ft. Lane mill, and 1½-in. centrifugal pump working against a head of 24 ft., did not seem to be working anywhere near its rated capacity, although at an altitude of nearly 7000 feet.

## DESIGN OF GOLD BELT MILL

This investigation, as well as extensive inquiry among others operating similar mills, led to the erection of a plant, the

\*Superintendent, Great Gold Belt Mining Company, Amboy, San Bernardino county, Cal. principal unit in which is a 7-ft. Lane slow-speed mill. As this plant was to handle the output of four properties scattered over an area nearly three miles square, a centrally located mill site was selected. The most feasible method of transporting the ore from mines to mill was by team, and for this purpose an automatic dump wagon, of three tons capacity, such as is ordinarily used by street and railway contractors, proved to



GREAT GOLD BELT MILL, AMBOY, CAL.

be well adapted for that class of work. Loaded at bins at the mines from ¾ to 1½ miles from the mill, it was found that with one man and four animals 21 tons could be delivered to the mill in one day. This speed was due to good roads, rapid loading facilities from bins at the mines, and equally rapid unloading at the mill, where the dumping of a load containing from 2½ to 3 tons would not consume over three minutes; in fact, is often accomplished while the wagon is in motion, no stop being made and the readjustment of the dumping device taking place while the wagon is returning to the mine. The load is first driven on a scale where the weight is determined, thence to the rear of the mill where the load is dumped on to a flat grizzly over which the wagon is driven. This grizzly, 7x10 ft., is made of 12-lb. T-rail, with ball of rail down, spaced 1 in. apart and sustained by two I-beams and one channel embedded in concrete on each end; beneath the grizzly

is a hopper-bottomed bin of 12 tons capacity. The fines drop through and the coarse is fed into a 7x10 Dodge crusher the feed opening of which is set level with the grizzly floor. From this bin the ore is delivered to the main ore bin, having a capacity of 35 tons, by a double sprocket-chain elevator, 30-ft. centers, carrying 4x7-in. pressed-steel buckets spaced approximately 14 in. apart. Considerable trouble was experienced at first in feeding this from the chute and regulating the flow by a rack-and-pinion gate; a plunger feeder was then installed, driven by sprocket from the lower shaft on the elevator; this proved entirely satisfactory, feeding evenly and eliminating all choking and similar annoyances. From the main ore bin the material is fed by a belt-driven plunger feeder into the chilean mill, being introduced in the rear center of the pan and directly on the die, together with the required amount of wash water.

## CONSTRUCTION OF CHILEAN MILL

Chilean mills are fairly plentiful, but the fast-speed type, running about 35 r.p.m. is not so well adapted to amalgamation as the slow-speed type, running at 8 to 10 r.p.m. In the mill under discussion, four wheels, each weighing 1200 lb., equipped with tires 3 in. thick, 5 in. face and 42 in. diameter, made of Midvale steel, travel on a manganese-steel die 3 in. thick, 5 in. face, and 7 ft. outside diameter, each wheel covering this track 10 times per minute, or slightly over 219 ft.; this is apparently slow, but 4½ tons of rock in a tank above, sustained by the axles, gives additional crushing weight. At this rate of speed, the pulp is left on the die in the best possible manner to receive the impact of the wheel, while the finer particles rise in the slightly agitated body of water and discharge when sufficiently fine by an action somewhat similar to that of a hydraulic sizer. The pulp is subject to an abrasive action while in the pan, which has a tendency to brighten any particles of gold which may be rusty.

A groove 1 in. wide by 1 in. deep encircles the inside of the pan on the outer circumference of the die; mercury fed into the mill finds its way into this groove and the brightened gold particles also collect there. The outer pan, which is made of sheet steel with a batter of about 60 deg., is equipped on the inside with wooden baffles set about three feet apart and reaching from within one inch of the die to the top of pan. These baffles retard the flow of the current and catch a great deal of amalgam which is thrown up by the wheels.

Approximately one-third of the outer circumference of the mill pan is fitted for discharge of pulp. It was soon found that the fineness or coarseness of screen had absolutely nothing to do with the fineness of pulp, that being controlled altogether by the height of discharge and speed of mill; further experiment showed that the screen when fastened to the ordinary screen frame only had the effect of retarding the passage of pulp and materially decreased the mill output. A basket-shaped device made of common fly screen was then fastened to the outside of the discharge or chuck block, the overflow from the mill discharging into it; the basket caught chips fuse, etc., that would cause clogging if permitted to pass over the plates and through the discharge pipes. The degree of fineness of the pulp is regulated by the height of discharge, and in that respect the mill is a pulverizer and hydraulic sizer in one; the finer the particles the higher the point of suspension in the liquid body. The pulp on being examined under a microscope appears to be a mass of rounded particles with an almost total absence of the angular, sharp-pointed particles of stamp-battery tailing; hence a better product for such subsequent treatment as concentration. From the mill, the pulp passes over 5x8-ft. amalgamating plates, in two sections of 4 ft. each with a drop of  $\frac{3}{4}$  in. between, and it is found that 95 per cent. of the amalgam taken from these plates adheres within eight inches of the top of the upper plate. From the plates the pulp passes through a Pierce amalgamator which catches any loose quicksilver or amalgam detached from the plates during the process of brushing up.

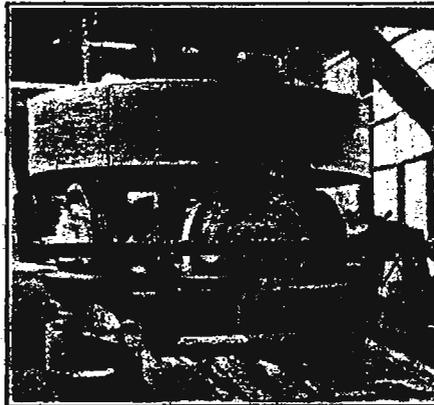
#### CLARIFYING WASH WATER

A Traylor concentrator was installed but, owing to shortage of water and the small amount and value of the concentrate, the use of the concentrator was abandoned as unprofitable. The tails and wash water are delivered to a series of settling tanks. These consist of six galvanized-iron tanks 5 ft. square on the top and 5½ ft. deep, tapering to a 5-in. opening at the bottom; the water flows in a thin sheet over a lip 4 ft. 10 in. long and perfectly level to the succeeding tank. The first two in the row, in which settle the coarsest tailings, are equipped with tapering square plugs, made from pieces of 6x6 square timber, which fit tightly into castings riveted to the bottom of the tank; they protrude above the top of the tanks and have a short piece of 1-in. pipe running through them at right angles, for a handle. When the tank requires emptying, the operator merely shakes the plug from side to side, thereby loosening it, and pulls it up through the body of pulp, permitting the tails to run through the opening at the bottom. When empty, the plug is

once more inserted. Only the first two of the tanks are thus equipped; the rest, including two 6x6-ft. conical tanks not heretofore mentioned, are equipped with short wooden plugs bored and fitted with 1½-in. Sargent molasses valves through which are drawn the slimes as occasion demands. The last four of the square tanks are fitted with wooden baffle boards, the width of tank and one foot deep, set at right angles to the line of flow, which aid materially in settling the slimes. From the last of these tanks the water is delivered in a comparatively clear state to a sump tank of 500 gal. capacity, from which it is raised by 1½-in. centrifugal pump to the supply tank at the rear of the mill. The deficit occasioned by evaporation and flushing out of settling tanks is made up from the clear-water tanks.

#### OPERATION OF THE PLANT

As this plant was built to handle ore from several different properties, all of different character, we will take for description that on which the laboratory



SLOW-SPEED CHILEAN MILL

tests were made, a hard, close-grained quartz, carrying hematite in its hardest form, the gold in the hematite being much in excess of that in the clear quartz and in a finely divided condition. The quartz and hematite occur in nodular form, nested in a brecciated mass between walls. Of this the nodules represent 30 per cent. of the whole, and, being broken in the mine, 65 per cent. will pass through the grizzly. Crushing at the rate of 20 tons per day of 24 hours, using a 4-in. discharge and common window screen to catch chips, an 88.1 per cent. extraction was made by amalgamation alone. Screen test from tails gave the following result:

	Per Cent.
Stayed on 20 mesh	0.10
Stayed on 30 mesh	0.27
Stayed on 40 mesh	0.37
Stayed on 60 mesh	1.50
Stayed on 80 mesh	3.87
Stayed on 100 mesh	8.10
Passed 100 mesh	85.79

Assays of the different sizes of pulp show higher values in the coarser material than in the slimes. In stamp mill-

ing the results would be the opposite as the splashing would throw the finer particles of gold into suspension and beyond the reach of anything but cyanide. With the Chilean mill it is different; the fine particles liberated from the gangue on the die are permitted to remain there and they readily unite with the mercury. This plant has crushed at the rate of 20 to 30 tons per 24 hours and is easily handled by one man on a shift. Gasolene power is used, consuming, under heaviest load, 2.17 gal. of distillate per hour. A conservative estimate based on tons crushed, labor, fuel, wear and tear on machinery, etc., shows a cost of \$1.50 per ton of ore milled, which, considering the size of plant and a 14-mile haul from the railroad, is a low cost of milling.

Engineering and Mining Journal  
Aug. 10, 1912 p. 278 V. 94 no. 6.

INYO COUNTY

*Skidoo Mines Co.*—During the month of June, in which ten days were lost, 1186 tons of ore were milled from which was produced; amalgamation bullion, \$11,349; cyanide bullion, \$5604, making total receipts of \$16,953. The costs were:—For development, \$1399; for operation \$7,819; a total of \$9218, leaving net profits for the month of \$7734.

*Loretta*—A contract has been made with the Nevada-California Power Co. for the construction of an electric power line from the Goldfield wires at Gilbert Hill to the mine which is on the west side of Eureka Valley, 18 miles from the summit of the White mountains. The foot wall has recently been cut in the vertical shaft at 865 ft. While awaiting the installation of a new hoist prospecting is being done. A crosscut has been driven 110 ft. without finding the hanging wall. It is the purpose to deepen deposits of solid sulphide ore will be encountered at that depth. The ore so far developed has shown some rich sulphides in small bunches carrying gold and copper. The mine was discovered by William Eva in 1879; was acquired by the Schwab interests and the Loretta company was organized in 1896. Should development warrant it is the intention to build a smeltery and construct a railroad from the mine to Coaldale, a distance of about 60 miles.

Engineering and Mining Journal

Aug. 1, 1914 p. 229

Imperial County

IMPERIAL VALLEY GYPSUM CO. (Holtville)—Preparation being made for installing plant to work gypsum deposit situated east of Holtville. Water being developed on premises.

Inyo County

WILSHIRE BISHOP CREEK (Bishop)—Mine unwatered in one week. Last year it required ten weeks. Difference in time due to improved methods. Development and ore extraction begun. Timbers being hauled for cyanide plant construction. All machinery is on ground, except tube mill at Bishop, ready for wagon haul.

LORETTA (Coaldale)—Main shaft down over 1600 ft., water encountered. Probable shaft will be sunk to 1700 ft. point before crosscutting. Schwab interests developing property and if operation follows development, 55-mile railroad to Coaldale will be necessary. If orebodies are proved and mine successfully operated this should make important copper-mining camp.

ST. IVES (Bishop)—Mark Matthews and others of Tonopah have secured two-year lease and purchase option on this mine in Chicago district. Stated 350 tons of ore on dump and 600 tons in sight underground. Shaft down 200 ft. and 5-ft. vein is said to carry medium-grade ore. Pipe line 1100 ft. long will be laid to bring water from spring; 7-ton Tetrault mill will be installed.

on the ores, these having been made under the direction of some of the most competent ferro-alloy and chemical analyses in the United States.

James H. Rowe, of Butte, is president of the newly formed company, Peter Geddes Grant, of New York, vice-president, Paul A. Gow, manager of North Butte-Tuolumne Merger, vice-president, and W. D. Kyle, attorney, of Butte, secretary-treasurer. The above named with Angus McLeod, of the Butte & Superior Mining Co., comprise the directors.

### Revival of Zinc Mining in Northern Arkansas

The mining industry at Zinc, Ark., has been practically dormant since 1916, but the camp is beginning to take on new life, and should be making a fair production again by the middle of the summer.

W. C. McCurry has closed a lease on the Rhodes mine. The property is equipped with a small concentrating

### Cuyuna Manganiferous Ores Being Studied by U. S. Bureau of Mines

The experimental blast furnace maintained by the U. S. Bureau of Mines at its Minneapolis station is being used to solve the problem of efficient utilization of manganiferous iron ores of the Cuyuna range and other deposits of the United States. The object of the experiments is to determine the grades of metals to be secured and what types of slag will give the highest recovery of manganese. Because of the fact that more alumina occurs in these ores than the regular Lake grades, these experiments will also answer questions concerning their smelting.

### Gold Discovered at Kramer, Calif.

The accompanying photograph shows the Herkelrath discovery at Kramer, Calif. It is too early to make any prediction as to the real value of the ore-

The St. Louis Smelting & Refining Co. is sinking a shaft on the Ballard lease, which adjoins that of the Eagle-Picher Co. A number of other companies also are drilling in this vicinity, with good results.

The Eagle-Picher Co. is planning to work the Lytle mine, which is on the east side of the Blue Mound, just north of the Oklahoma-Kansas state line. It had been planned to work this property over the Amalgamated mill, but this concentrator was destroyed by fire recently, and the company has not decided whether to rebuild this mill or to erect a new one for working the Lytle deposits.

### Tonopah District Produces 10,000 Tons of Ore Per Month

Bullion shipments from the Tonopah, Nev., district indicate unchanged operations, with gross value of approximately \$175,000 per month. Tonopah Belmont is the largest shipper,



Photo by Haverstock & Payne, Los Angeles, Calif.

Scene of gold strike, near Kramer, Calif.

plant, which will be put into operation as soon as enough ore can be opened up to insure steady operation.

L. L. Brown has a force of men at work on the Jack Pot property, which he recently leased, and is making a good production of hand-cobbed silicate of zinc.

B. H. Ragland and associates are strip-mining zinc carbonate at a mine on Hoosaw Creek, between Zinc and Bellefonte. They have shipped one car and have another one almost ready for shipment.

A new shaft is being sunk on the Coker Hollow property. This mine is equipped with a mill, which will be started up as soon as enough ore is available to insure its steady operation.

The Bald Hill Mining Co., operating the Bald Hill mine, on the head of Cave Creek, is making steady production, at its 100-ton mill at St. Joe, Ark. Four cars of carbonate concentrates have been shipped, and several cars are in the bins ready for loading.

### Virginian Mine and Mill to Start Soon

Virginian mine, 15 miles northwest of Hillsboro, N. M., has been taken over by Texas interests. Unusual rainy weather has delayed the completion of the flotation mill. It is hoped that mine and mill operations will be started some time in May. About 30,000 tons of ore averaging 18 oz. in silver is reported as blocked out. John Moffitt, of Kingston, N. M., is

body. Excellent pannings have been obtained from rock on the dump, the material being a highly ferruginous porphyry carrying native gold. Mr. Herkelrath has disposed of part of his holdings, and the new owners are installing hoisting equipment for deeper work.

About six miles west of this site and about three miles south of the depot at Kramer further exploration work is being carried on in an old field where quartz veins are exposed. Some high-grade silver ore has been found by the Hiawatha Mining Co.

### Joplin Production Curtailed—Prospecting and Development Continue

Individual curtailment of mining operations continues in the Joplin-Miami district, being particularly marked for the week ending April 24 by the closing of all the mines of the Barnsdall Zinc Co. District manager P. B. Butler announced the properties would be closed for at least a month. They produce approximately 2,500 tons of zinc concentrates per month, and were closed solely because the trend of activity has been toward overproduction.

Drill development of the new sheet-ground area near Baxter Springs, Kan., continues, with promising results. The Eagle-Picher Lead Co., after putting down many holes on its twenty-acre tract immediately southwest of the town, announces that at least fifteen of

with the Tonopah Mining Co., the West End Consolidated, and the Tonopah Extension following in the order given. Total district tonnage is about 10,000 tons of ore per month.

In the eastern part of the district Tonopah Belmont is successfully exploring known veins both by regular development and drills. By careful work holes have been drilled to a depth of 320 ft., using a Type S-80 drifter mounted on a 42-in. feed shell. This form of prospecting has proved quite adaptable in the Belmont property, and will undoubtedly soon be used in other mines of the district.

In the western part of the district Tonopah Extension is successfully battling its water problem on the deeper levels, now handling more than 2,000 gal. per minute. This company will start new work in the near future from its West Tonopah shaft on the 1,100 level. The West End Consolidated is producing good ore from the Tonopah "76" ground, held under lease, and is raising and sinking from the 800 level in the newly discovered orebody.

### Booth Mining Company Reorganized

The Reorganized Booth Mining Co. of Goldfield, Nev., controlled by George Wingfield, is reported to have purchased a large stock interest in the San Rafael company and in three other companies owning promising ground. This is regarded as an important event in Quartz Mountain history, as Mr. Wingfield is well advised by competent

## Recent Technical Publications

Reviews, Abstracts, and References

### Ore Deposition at Randsburg, California

Geology and Ore Deposits of the Randsburg Quadrangle, California. Bulletin No. 3, California State Mining Bureau, San Francisco. By Carlton D. Hulín.

A Review by J. E. Spurr

**T**HE GEOLOGY of a well-known and interesting mining area is skillfully described in this publication. Perhaps the best-known mine in this district is the Yellow Aster gold mine, but there are a number of others.

A variety of rocks occur in the quadrangle—igneous, sedimentary, and metamorphic—and in age they range from Archean to recent. The Archean rocks are gneisses and schists, overlain by Paleozoic sediments. A batholith, believed to be an offshoot phase of the Sierra Nevada granodiorite, and of late Jurassic age, has intruded these rocks. Varieties of this intruded magma in the Randsburg quadrangle are classified as granite, quartz monzonite, and quartz diorite. A variety of the last-named shows included angular schist fragments, whose alteration may be traced by transitional stages to rounded "orbicles" with granitic texture and the composition of a quartz diorite, to stages "where only the faintest concentration of dark minerals remains to suggest the former presence of an orbicle." Those geologists who construe replacement phenomena of included fragments in a mineral vein as evidence against the ore-magma theory may well ponder on this complete replacement of schist fragments by the rock magma. Indeed, Dr. Hulín believes that the batholithic invasion in general, was accomplished more by assimilation (that is to say, by replacement) than by forcible injection, although the latter process was important. Limestone has been far more resistant to assimilation and replacement than the other rocks. This batholith, it may be remarked, has no connection with the ore deposition of the region.

#### INTRUSIVE ROCKS AND ORE DEPOSITS OF TERTIARY AGE

Intrusive rocks of Tertiary age—probably Upper Miocene—also occur. These are: (1) Rhyolite-latite dikes, pipes, and sills, the later dikes of the series becoming more basic; (2) diabase and basalt dikes. Flows and dikes of andesite are later and of probable Early Pliocene age; and still later is Pliocene-Pleistocene basalt. Important faulting has occurred in the Quaternary.

The ore deposits are Tertiary, and divisible into three successive stages of a single epoch: (1) tungsten, (2) gold, and (3) silver.

The tungsten deposits are fissure veins. They were formed in the Miocene, close to the surface, by ascending solutions. Post-mineral faults cut the deposits; the earlier faults of this series were contemporaneous with the ore deposition.

The (later) gold ores occur along lines of pre-mineral faulting, and are cut by later faults; they are fissure veins and impregnations, and are free from silver. In the Yellow Aster mine, ore deposition has been directly controlled by structural conditions, which determined the upward movement of the auriferous solutions.

Still later, silver deposits occur, in veins of two systems, one striking north and the other northeast, following older fault lines. The ore minerals are miargyrite, stylopyrite, pyrrargyrite, and proustite, in a gangue of fine-grained quartz, with calcite and chalcedony. Deposition of the silver ore has been directly due to structural control in the California Rand silver mine, where the flat fault zone has stopped the upper movement of ore solutions.

A diabase dike cuts the tungsten deposits in one mine, while in another locality tungsten veinlets are reported to be later than the diabase dikes; but the gold veins and the silver veins are all later than the diabase intrusives, as well as the rhyolite-latite dikes.

#### TUNGSTEN DEPOSITED IN OPEN FISSURES

The tungsten veins have been deposited in open fissures, with little or no replacement. Unreplaced fragments of wall rock are imbedded in the ore. The chief vein materials are quartz, scheelite, calcite, and sporadically stibnite. Scheelite and quartz were the first minerals crystallized; afterward came stibnite and pyrite, and then calcite and other earthy carbonates. Dr. Hulín is inclined to believe that deposition took place from stagnant (not circulating) solutions.

The gold veins carry as principal minerals quartz, arsenopyrite, and subordinate pyrite. Small quantities of galena are of later deposition. Last of all was the gold. Some of the deposits show gold and sulphides without quartz. Replacement of rocks by ores was an important process. A close relation between the tungsten veins and the gold veins is indicated. Both the tungsten and the quartz veins were clearly formed close to the surface, whence the author concludes that they were deposited at low pressures and low temperatures, a conclusion to which I will refer later.

The silver veins, like the gold ores, but unlike the tungsten veins, have been deposited largely by replacement, with fissure filling. The chief minerals are quartz, chalcedony, miargyrite (Ag Sb S<sub>2</sub>), stylopyrite [3(Cu, Ag, Fe) S, Sb, S<sub>2</sub>]; pyrrargyrite (Ag, Sb S<sub>2</sub>), proustite (Ag, As S<sub>2</sub>), pyrite, and arsenopyrite. The association of silver and antimony is therefore noteworthy. The ore averaged 50 oz. in silver and \$3 in gold per ton. There is more arsenic than antimony in the ore. Angular schist fragments, without trace of replacement, occur in the fissure veins. The deposition of most of the quartz preceded that of the metallic

minerals. The early solutions were rich in silica, iron, sulphur, and arsenic; the later ones in silver, antimony, and sulphur.

From the data the author concludes that all the three stages—tungsten, gold, silver—occurred during a comparatively short period in early Upper Miocene time and all came from the same magmatic reservoir as the Tertiary rhyolitic and diabolic intrusives.

Summarizing this unusually keen and careful analysis of a mining district, I have but one objection to raise—the assumption that because the ores were formed near the surface they were therefore formed at a low temperature. This is a widespread and persistent conclusion, but is an unwarranted one, as I have shown; for rocks very near the surface during periods of volcanic injection may be far hotter than rocks at great depths under more ordinary conditions. That shallow depth has meant low temperature, during periods of ore deposition, (an assumption which has been especially emphasized by Lindgren in America, and has indeed been made one of the bases for his classification of ore deposits) is as fundamental an error as has been made in our more recent literature of ore deposition.

With this mental barrier removed, we perceive that the tungsten ores, followed by arsenical gold-quartz ores, represent the regular zones of ore deposition at relatively high temperatures and therefore in rocks heated by volcanic invasion. This conclusion finds local confirmation in the diabase dikes which are in part younger than some, at least, of the tungsten veins and older than all of the immediately succeeding gold veins. Surely the diabase dikes, even though demonstrably "deposited" so close to the surface, were not "low-temperature" deposits, compared with diabase dikes in depth! The well-established sequence, tungsten-gold, indicates a falling temperature, and the position of the basic dike invasion between these two, and partly contemporaneous with the tungsten, adds another bit of evidence to my published argument that basic magmas congeal at the same general temperatures as ore deposits at temperatures around 400 to 500 deg. C.

The silver stage represents evidently a still cooler period. Indeed, these partly chalcedonic quartz veins of the silver stage, characterized by combinations of silver and copper with arsenic and antimony, clearly belong to the upper silver zone, called the "principal silver zone"—zone G—by the reviewer.<sup>2</sup> Between this zone G and the zones A and B, represented by the tungsten and gold-quartz veins of the region, the copper, zinc, and lead zones are not represented.

A gap in mineralization, accompanying the general fall in temperature, is thereby indicated, separating two successive injection episodes of ore magma: the first, of tungsten passing over, with falling temperature, to gold; and an independent later one, when the temperature was still lower, and the silver ores were introduced.

The Early Miocene sequence of magmatic injection, which included the

<sup>2</sup>Transactions of the Geological Society of America, 1915, Vol. 16, pp. 545-582.  
<sup>3</sup>The Ore Magmas, Vol. II, p. 764.

various ores, may thus be diagrammatically summarized, adapting the arguments and diagram of the reviewer from an earlier article above cited<sup>2</sup>:

700 deg. C.	Rock Magmas	Ore Magmas
	Rhyolite Latites	
600 deg.		
	Diabase	Tungsten-Quartz Gold-Quartz
500 deg.		
400 deg.		
300 deg.		Silver-Quartz

For the rest, the evidence of sharply timed injections—not age-long upbuilding—of concentrated and stagnant solutions, fits in admirably, in my opinion, with the Ore Magma theory. Some of the ores are replacements, but some, as described, are true veindikes, including most of the tungsten ores and part of the silver and of the gold ores. Among many evidences of this is that shown at a point where a silver vein cuts a

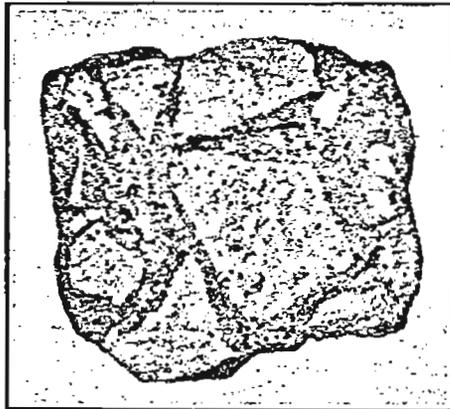


Fig. 1—Angular rock inclusions in silver ore

gold vein in the California Rand mine. Fragments from the gold vein, carrying \$5 to \$75 (per ton) in gold and only an ounce or two in silver, are cemented in the silver vein. And the accompanying figure (Fig. 1), copied from the frontispiece of the little book, showing angular inclusions, in the silver ore, of schist with the schistosity oriented at random, and the central spaces between the fragments occupied by drusy cavities, is a similar indication. And the fact that in both the gold and the silver ores, the metallic minerals tend to crystallize in the veins later than the quartz, or even to form veins and orebodies separated from the quartz, illustrates one of the basic phenomena of ore magma crystallization, as I have many times pointed out.<sup>4</sup>

The limited vertical extent of nearly all the orebodies, whether of tungsten, gold, or silver, compared with the horizontal extent, furnishes, moreover, evidence of the applicability of the Upper Pressure Limit, or Dumping Horizon explanation advanced by the reviewer.<sup>5</sup>

The tungsten ores usually extend in

depth only 100 or 200 ft. — the ore-shoots are generally roughly triangular in form, the apex being downward. Some of the ore-shoots do not reach the surface, although Dr. Hulin believes that the present surface lies only a few hundred feet below that of the time of the introduction of the tungsten veins. And the same is stated of the gold deposits, which, in no case, have persisted beyond a depth of a few hundred feet. The silver deposits were formed under similar very superficial conditions, and while in the single important silver mine the ore has been followed to the eleventh level, the amount of ore is contracting. In the case of the

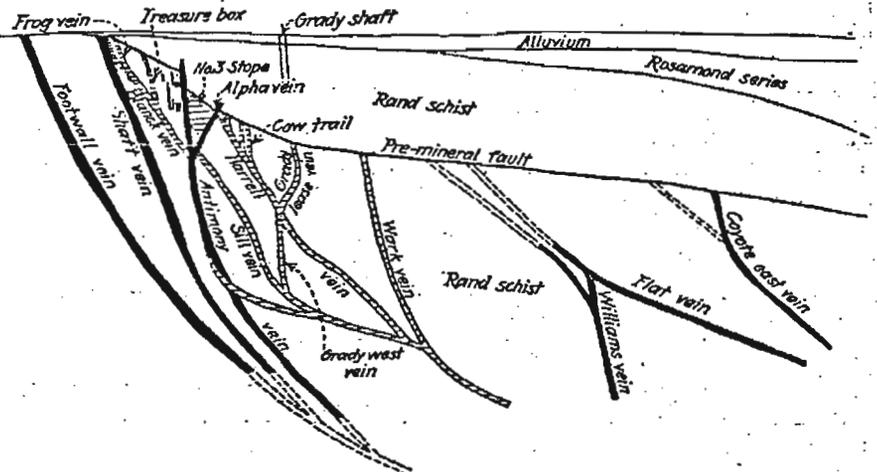


Fig. 2—Idealized section through silver deposits, Randsburg

silver ores, all the veins terminated above at a pre-mineral flat-lying fault or crushed zone which furnished the local relief of pressure (Fig. 2); and a similar upward termination of at least the most important group of gold veins—and impregnation gold ores as well—that of the Yellow Aster mine, was furnished by pre-mineral faults. "And in consequence," Dr. Hulin writes of the Yellow Aster mine, "we find orebodies developed which reach their maximum size and also terminate immediately below the low-dipping pre-mineral faults, and we find these orebodies gradually decreasing in size in depth, in some cases actually feathering out downward within the limit of the mining operations which have already been carried on."

Although the author explains the control of the upper limit of vein formation, both in the case of the gold ores and of the silver ores, by the damming back of the ore-solutions by fault-gouge, I am inclined to the explanation which I have indicated earlier in the paragraph—that is, that expansion of ore-magma gases on encountering the flat overlying faults brought about consolidation of the ore magma from that point downward. In either case, no prettier example of the hair-trigger conditions which determine consolidation close to the surface has been described.

Asphalt—The chapter on "Asphalt and Related Bitumens," a separate of "Mineral Resources, 1924," by K. W. Cottrell, nine pages, has been issued by the U. S. Bureau of Mines. Obtainable for 5c. from the Superintendent of Documents, Washington, D. C.

Chimneys—J. G. Mingle has had published in *Power* (Feb. 16, 23, and March 2) a series of three articles on chimney design. (New York; price 15c. each.) The first article discusses chimney draft; the second tells how to figure the capacity of a chimney; and the third is a study of the sizes of chimneys and the most economical ones to build. The same author has also recently had a book published (Combustion Publishing Corporation, New York; price \$3.50) on the "Design and Capacity of Chimneys."

German Publications—Recent German publications of interest to mining

engineers include: "Die oberschleische Zinkindustrie," in the Feb. 1 issue of *Metall und Erz* (Berlin), discussing the zinc industry in Upper Silesia; and two booklets published by Wilhelm Knapp, Halle (Salle), these being parts 2 and 3 of "Abhandlungen zur praktischen Geologie und Bergwirtschaftslehre." Part 2 is by Prof. V. Pollack, entitled "Die Beweglichkeit bindiger und nicht bindiger Materialien," 139 pages, price 9.80 marks, and Part 3 is entitled "Die Anwendbarkeit der geophysikalischen Lagerstättenuntersuchungsverfahren insbesondere der elektrischen und magnetischen Methoden," by Rudolf Krahnemann, 40 pages, price 2.5 marks. The last named discusses the development of geophysical mine research, taking up the specific gravity method, the magnetic method, the electrical resistance and conductivity method, and the measurement of the spread of artificial earthquakes.

Roasting—In the Jan. 5 issue of *Chemical Engineering and Mining Review* (Melbourne, Australia; price 12d.) Alfred T. Fry has a four-page article on "The Roasting of Copper Concentrate," discussing some operating considerations in the preparation of copper concentrate for leaching. Close control of the furnace is, of course, more necessary than in roasting for smelting.

Washington Geology—Professional Paper 140-A, of the U. S. Geological Survey, obtainable free of charge, contains a 16-page paper entitled "Geology of the Latah Formation in Relation to the Lavas of the Columbia Plateau Near Spokane, Washington," by J. T. Pardee and Kirk Bryan.

<sup>2</sup>Bulletin of the Geological Society of America, 1925, Vol. 36, p. 564.

<sup>3</sup>See *Econ. Geology*, June-July, 1925, Vol. XX, No. 4, p. 297.

<sup>4</sup>The Ore Magmas, Vol. II, pp. 550-704.

## Mineralized Breccias at Calico, Calif.

Contain Silver and Lead in Varying Amounts  
and May Become Commercial Ore

By F. B. Weeks  
Daguerre, Calif.

RECENTLY I discovered mineralized breccias in one of the old and nearly forgotten mining districts of the West, wholly unlike anything I have seen or read about in a fairly wide experience in the study of ore deposits and their literature. The Calico Mountains in San Bernardino County, Calif., were the scene of active mining operations during the 80's and early 90's, and have produced many millions from their silver and borax deposits. There still remain millions of tons of low-grade deposits that some time will be made to yield a profit.

This desert range of mountains was formed by the intrusion of late Tertiary volcanic materials that broke through the Cambrian and Pre-Cambrian sediments and certain Tertiary strata, known locally as the "Borax beds," and to a great extent covered them with flows, breccias, and tuffs. A considerable part of these volcanic materials is a fine-grained breccia, or in places a tuff, that everywhere carries some silver and often a small amount of lead.

The principal part of the deposit occurs in three large areas and extends along the south slope of the mountains from near the former townsite of Calico and the Silver King mine in a northeasterly direction for nearly two miles to a point near the divide above the former borax operations at Borate, with a width of 300 to 1,000 ft. Another area of apparently the same deposit extends in an east-west direction along and near the summit of the range in the vicinity of the Bismarck mine, one of the large silver producers of the former operations, with a width of 500 to 800 ft. A smaller and more irregular deposit, as indicated by present exposures, lies about the head of Odessa canyon. Probably two-thirds of the whole breccia area (8,000,000 sq. ft.) is exposed, the remainder being covered by surface mate-

rials brought down by erosion from the higher parts of the range. At a few points erosion indicates a thickness of 100 ft., but throughout most of the area neither erosion nor former mining operations afford any evidence as to the thickness of the deposit. The breccia is light but compact and would require 15 to 20 cu. ft. in place to weigh a ton. A possible tonnage of 400,000 tons per foot in depth is indicated.

This breccia silver-lead deposit lies in part upon an irregular surface of a dark-colored mudflow. It appears to be a surface flow, though in places it stands up like a dike, due probably to later movements, though there is no evidence of displacement. The breccia, or tuff as it appears to be in some places, is soft but massive in structure in part, and in part occurs in beds several feet in thickness that appear to represent successive flows. Its composition varies in different parts of the mass, markedly calcareous or siliceous, with considerable barite in many places. The mass is not highly fractured, and where fractures occur they are cracks probably due to shrinkage on cooling, though in one place where a depth of 76 ft. had been reached by a tunnel there are well-defined iron-filled cracks.

The principal metallic contents are silver, lead, iron, and manganese. The silver is probably a chloride and the lead is galena that may be a secondary precipitation. Neither iron nor manganese is a prominent constituent, though both are present throughout the breccia mass. The lead frequently occurs as a filling in the cracks, though it is also found disseminated or in small bunches. Silver appears to be disseminated in small but varying amounts through the mass.

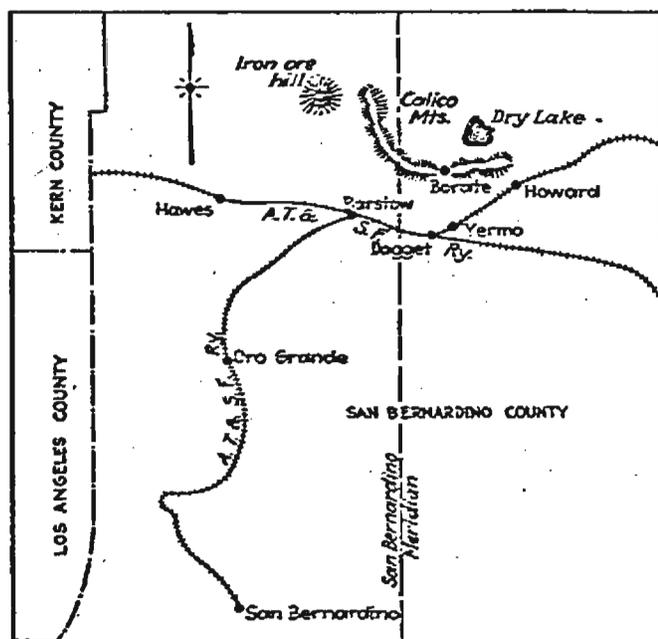
Sampling thus far done indicates that silver occurs throughout the deposit and that the lead is of irregular occurrence, but such sampling is wholly inadequate to form a basis on which to determine what parts or how much of the deposit can be made to yield a profit. Samples taken from 5 to 10 ft. lengths vary from 1 to 15 oz. silver. Selected material from the best portion assayed 17 oz. silver and 14 per cent lead. Another sample assayed 10 oz. silver and 12 per cent lead, which when concentrated 5 to 1 by panning assayed 40 oz. silver and 50 per cent lead. A thorough sampling of the surface workings will determine whether a complete sampling of the whole is warranted. Water for core or churn drilling would have to be pumped, but the cost would not be prohibitive.

### ORE AMENABLE TO FLOTATION

Small flotation and table concentrating tests have been made, and an excellent recovery has been secured, but they are insufficient to determine the method to be used or what recovery can be made from the whole or any considerable part of the deposit.

The high-grade material has been mined as shown by many pits, open cuts, short tunnels, and shallow shafts. The character and occurrence of the deposit indicates that as low or lower mining costs can be obtained as are being made anywhere at the present time, when modern methods are applied. Electric power is available within ten miles of the deposit, and with conservation the water supply will be ample for all purposes. Two transcontinental railroads are within four to six miles of the area.

Whether or not the silver and lead values in this fine-grained breccia and tuff deposit are sufficient to make it commercially valuable can be determined only by a considerable expenditure of time and money in complete sampling and in metallurgical tests.



Sketch map of Calico Mountains, San Bernardino County, Calif.

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### Gold Discovery at Kramer, Calif.

**S**OUTHEAST of Kramer, in San Bernardino County, Calif., John Herkelrath and his brother recently made a gold discovery in sections 35 and 36 of Township 10 north, Range 6 west, San Bernardino meridian. A vein was uncovered which panned gold in sufficient quantity to be called high grade, according to local reports. A mild "gold rush" is under way.

Prospectors, mining men, engineers and those merely curious have flocked to Kramer. The Kramer Hills were dry placers in a number of places for a long time, and some efforts were made to explore leads, but nothing of importance was found, although the dry washers usually made sufficient to encourage them to continue. Apparently the discovery of the Herkelrath brothers is in an area which escaped close attention and has now proved to be interesting.

### Mining Activities in Southern California

Although there are several mining districts in southern California, some of them have been dormant or almost dormant for a number of years. In the Rosamond district, 15 miles southwest of Mohave, the Tropic, Piute, and the Old Hogie prospects are being explored. The Old Hogie is producing ore, which is being milled in the Tropic mill. In the Soledad district the Gold Town Mining & Milling Co. is operating a twenty-stamp mill. Near Anaheim the Blue Lights silver mine, in Silverado Canyon, is being developed, and it is reported that ore has been cut on the 700 level. A small production was made in 1925. A zinc pigment plant is being erected at Anaheim by the California Zinc Pigment Co. Sufficient zinc ore can be obtained to meet the plant capacity.

In the Randsburg district, the California Rand continues to be the most important mine in operation. The Atolia tungsten mine is being operated by leasers. Yellow Aster, King Solomon, Butte, and Windy are in operation, each, with the exception of the Windy, operating its own mill. The St. Elmo, at Atolia, is preparing to resume exploration operations, and a number of smaller prospects have exploration work in progress. The Yellow Dog is exploring its holdings, but the Standard is idle. The Amelia-Lorain, east of Caliente, in central Kern County, and various small properties are being worked. It is reported that the Zenda, Oregon, and Barbarossa prospects are preparing to resume.

In San Diego County the Golden Chariot is the only mine in operation. A Diesel power plant is being installed, and development is to be extended. In November, 1925, the mill of the Lone Pine Mining Co. was destroyed by fire, and it has not yet been reconstructed. On Catalina Island the Wrigley interests are developing a lead-zinc prospect and have made ore shipments.

### Railroad from Crown King Mine Abandoned

The Crown King branch of the Santa Fé R.R., built several years ago to furnish transportation for ores from the Crown King mine, in Yavapai County, Ariz., is to be dismantled. The branch, 12 miles long, is one of the most famous pieces of track in the United States. The mine is at the top of Crown King Mountain and in making the ascent there are fifteen switchbacks, twelve trestles, and several tunnels. The grade is about 6 per cent. The Arizona Corporation Commission has given the company permission to abandon and dismantle the line.

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Lloyd Skinner, mining engineer and graduate of the University of Nevada, died in San Francisco on March 29, 1926. He was born Aug. 16, 1882, and completed his university work in mining in 1906. Inyo County, Calif., was his principal field of activity. His father, incidentally one of the Pike's Peakers, of Colorado, was also one of the early pioneers of Inyo County and was responsible for the introduction of irrigation in Owen's Valley. After leaving the University, Mr. Skinner was employed at Cerro Gorda from 1908 to 1911 and was superintendent of the property. He and his brother, William Skinner, of Lone Pine, took a lease on the mine when company operation was discontinued. Both were early leasers in the Original Bullfrog and also operated the Christmas Gift mine, at Darwin, for a number of years, making a gross production of \$500,000 from this small mine. About eleven years ago Lloyd Skinner met with a serious accident in an automobile wreck, and he remained an invalid since that time. Undaunted by his condition, he kept at mining work and was successful in building up an excellent reputation. Severely handicapped as he was, he maintained a cheerful front on life and did what he could to earn his way and to advance the position of mining in his immediate locality. Mine maps were brought to him and his advice was sought in planning exploration. Surveyors and engineers profited from his

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... Cont.

general knowledge of conditions of the region, and many went to Lone Pine to consult with him. His home in Lone Pine, where he lived with his mother and his brother's family, became a center of interest, proving that even though a man may be unable to go forth into the world, the world will come to his bedside if he has something to give, and Lloyd Skinner ever remained the cheerful giver and a helpful mining man. He had a wide circle of friends in Nevada and California who derived inspiration from the competent way in which he bore his misfortune.

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#### **New Mining Camp in Death Valley Region**

Leadfield is a new lead-ore mining camp in the Death Valley region of California. It is in the Grapevine Mountains about 18 miles from Beatty, Nev., to which it is being connected by road. Original locations are said to have been made by Ben Chambers and Frank J. Metts in March, 1925. In July, 1925, the Western Lead Mines Co. was organized by John Salsberry, Jacob Berger, and W. E. Stanton. Production was made from promising lead-ore prospects. Many additional locations have since been made.

out of order

## The Leadfield Boom; Ore Low Grade with but Little Silver

Activity at Leadfield, which is 22 miles westerly from Beatty, Nev., and about two miles across the state line in California, has stimulated business in Beatty and given an impetus to prospecting in the near-by sections of California and Nevada. Beatty is 70 miles southwesterly from Goldfield and 5 miles from the old boom camp of Rhyolite, on the Tonopah and Tidewater railroad. Beatty is the nearest railroad shipping point for Leadfield; hence its relation to the Leadfield boom.

Leadfield used to be 53 miles from Beatty, over difficult road via Death

centration on the ground appears to be the proper solution, provided sufficient ore is developed to justify the erection of a mill.

The total development work in the Leadfield district will not exceed 2,000 ft., mostly confined to tunnels, with drifts on the best showings. Conflicting reports have been made on the results of work performed to date, with evidence pointing toward the presence of an uncertain tonnage of material containing a low percentage of lead.

Leadfield, as a boom camp, is in the peculiar position of being in a fairly

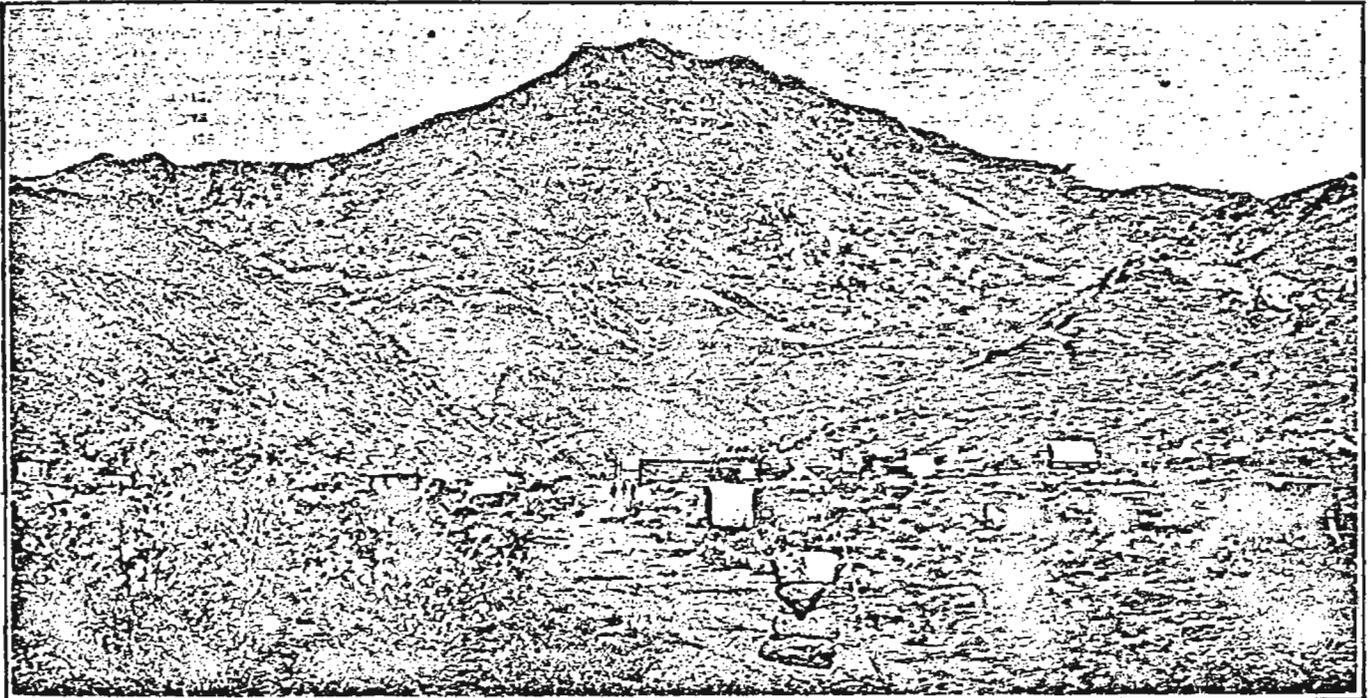
lead and about 25.0 oz. in silver per ton.

Salt Lake and Los Angeles capital has recently become interested in the Comet district, bonding the Stella mines for \$20,000.

The Tungsten-Comet mill is closed down, and will not be reopened until underground development indicates sufficient ore for at least a two years' run.

### Commonwealth Mine, Near Reno, Finds Good Ore

It is reported that leases on the old Commonwealth mine, 15 miles south from Reno, Nev., have recently opened a new high-grade orebody. The Commonwealth mine was worked in the



Leadfield, Calif., Titus Canyon at left of mountain. Western Lead in left foreground

Valley and Titus Canyon, but a new road, recently completed by interested companies at a reported cost of over \$50,000, has reduced the distance to 22 miles. The new camp is in the Grape Vine range of mountains, on the east side of Death Valley, at an elevation of from 3,000 to 5,000 ft. The topography is rugged.

The rocks of the district are mostly sedimentary, and comprise limestones, quartzites, and conglomerates, with some volcanics in evidence. The most important known mineralization is in the limestones, at times as fine- and coarse-grained galena associated with light-colored calcite in shattered portions of the limestone, and in other occurrences as very fine-grained galena in a dark-bluish lime. Values are in lead and silver, with some zinc, the relative proportion varying in different parts of the district, and are found scattered over a wide area. Silver content is low and, according to published figures, will average about one-sixth of an ounce for each 1 per cent of lead. This low silver ratio makes a difficult shipping ore, and con-

remote district, having good boosters and apparently first-class financial backing. The ore is regarded as too low grade to stand shipment costs, and therefore with nothing tangible upon which the prospective value of the district can be based. In this case we are confronted with optimistic statements, many of which appear to lack the confirmation which can be arrived at only by actual digging.

### Notes From the Pioche District, Nevada

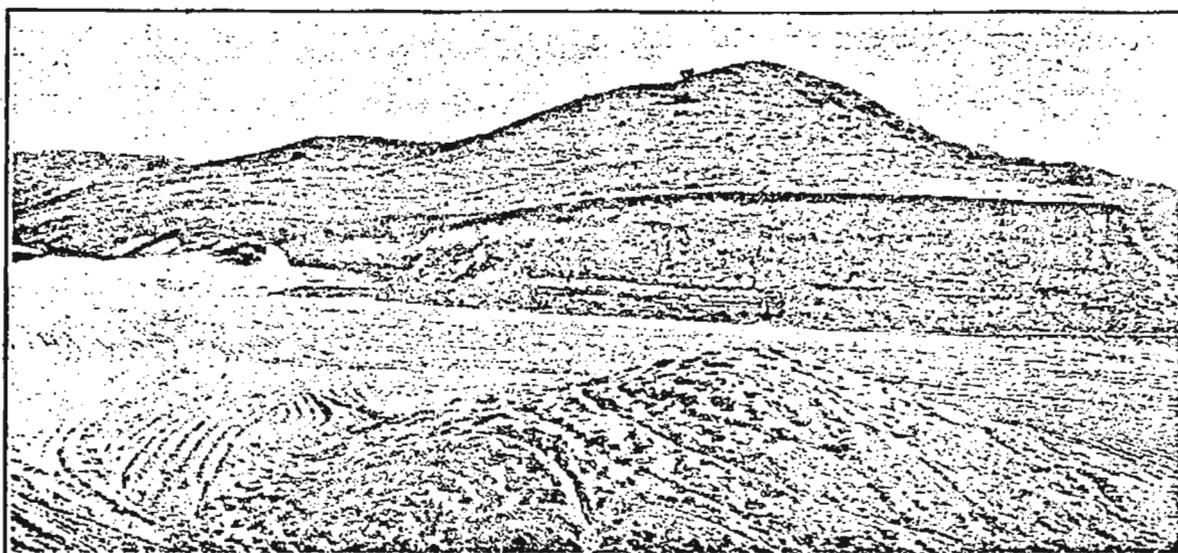
Shipments continue on a substantial scale from the Pioche district, Nevada, totaling 1,940 tons for the week ended April 20, distributed as follows: Prince Consolidated, 900 tons; Combined Metals mine, 600 tons; Black Metals mine, 200 tons; Bristol Silver mines, 240 tons. Increased shipments from the Prince mine were a feature of the week, the company having begun operations on the upper levels, concentrating work on the 200 level, from which a substantial production was made fifteen years ago, the ores mined carrying 1.50 per cent

70's, and is said to have produced a considerable tonnage of lead-silver and zinc ore. The low-grade ore was left untouched, owing partly to its complex nature, but the present prices for lead and zinc, with advantages of the modern improvements in concentration and flotation, make the property appear attractive.

The mine is opened by tunnels to a depth of over 300 ft. Its present owners, the Washoe Consolidated Mining Co., of Reno, Nev., are attempting to finance for extensive development work and a milling plant.

### New Cornelia Explores With Diamond Drill

The New Cornelia Copper Co. has awarded a contract to the E. J. Longyear Exploration Co., of Minneapolis, to put down a series of diamond-drill holes on the company's property at Ajo, Ariz. New Cornelia has considerable territory outside of the mine pit which has not been tested, and it is expected that the drill work will add an appreciable tonnage to the ore reserves.



*Otaylite deposit near San Diego, California*  
The furrowed material in the foreground is in the process of being dried. It is harrowed at intervals

## Mining Bentonite in California

*A Comparatively New Industry—Product Supplants Imported Fuller's Earth*

By John Melhase

Geologist, Southern Pacific Company

**T**HE MINING OF BENTONITE is a comparatively new industry in California. Attention was first called to the bentonite deposits of the state about 1916, although clays suitable for use as fuller's earth had been mined to a limited extent for some years prior to this. The necessity of finding local supplies of clays to supplant imported fuller's earth led some of the large petroleum-refining companies to institute a state-wide search for suitable materials for this purpose; and the result was the discovery and development of a number of bentonite deposits within the state. A great deal of experimental work with these bentonites was necessary before, eventually, one or more processes were evolved by which the material could be used successfully. Its efficiency as a substitute for the imported fuller's earth is now fully established, and the consumption has increased to approximately 2,000 tons per month, nearly all of which is consumed by refineries near Los Angeles and around San Francisco Bay.

### SEVERAL DEPOSITS IN CALIFORNIA

Though bentonite has been found at a number of localities within the state, the principal deposits occur in the desert regions of Inyo, San Bernardino, Imperial, San Diego, and Fresno counties. Its general distribution is indicated on the accompanying map. Of these deposits, the one located near Otay, in San Diego County, is perhaps the most widely known, since descriptions of it have appeared at various times in the newspapers and technical press. The deposit near Daggett, San Bernardino County, is small and irregular, but is of special interest because of its genesis and mode of occurrence; that south of Coalinga, Fresno County, has not been developed and little can be said regarding its extent, which is true, also, of the deposit west of Fish Springs, in Imperial County.

The most extensive beds of bentonite so far discovered in the state are those along the Amargosa River in Inyo County, in the vicinity of Tecopa, Shoshone, and Ash Meadows. Beds of the mineral which occur at Ash Meadows extend across the state line into Nye County, Nev., and other beds occur on both sides of the line near Stump Springs, about 22 miles east of Shoshone.

With the exception of that at Otay, the California bentonite deposits are confined to the arid desert.



*Map of Southern California, showing location of bentonite deposits*

1. Amargosa River deposits (amargosite).
  - a Standard Oil Co.'s mine.
  - b Associated Oil Co.'s mine.
  - c Bentonite in tilted Tertiary strata.
  - d Stump Springs deposit.
2. Otay deposit (Otaylite).
  - a Stauter Chemical Co.
  - b General Petroleum Corp. mine.
3. Fish Springs deposit.
4. Reef Ridge deposit.
5. Daggett deposit (Death Valley clay).

regions and in general are bedded deposits intercalated between unconsolidated marine or fresh-water sediments ranging from Miocene to Quaternary in age. An exception to this rule will be noted in the deposit near Daggett.

**Otay Deposit**—This deposit, part of which is owned and operated by the General Petroleum Corporation, is located four miles east of Otay, San Diego County. The bentonite bed outcrops at an elevation of 400 ft. above sea level in the breaks of an intricately dissected terrace known as Otay Mesa. Several thousand acres are underlain by bentonite, the overburden reaching a thickness of 100 ft. or more, but thinning out toward the outcrops. Otay River has cut a wide channel from east to west through the center of the mesa and divides the deposit into two nearly equal parts, the opposite outcrops of which are, on the average, about a mile apart. The holdings of the General Petroleum Corporation lie on the south side of the river; that portion of the deposit which lies on the north side is owned chiefly by the Stauffer Chemical Co.

Deposits of bentonite, which is known locally as "otaylite," occur near the middle of a series of shallow water marine deposits that constitute the San Diego formation, which ranges through the upper Miocene and lower Pliocene. This series consists of lightly consolidated lenticular members of conglomerate, sandy marl, coarse, friable sandstone, bentonite, and clay, all of which lie in nearly horizontal position. The bentonite member is from 4 to 6 ft. in thickness along its western outcrop; but it, too, is lenticular, gradually thinning out toward the east and finally disappearing about a mile back from the western outcrops.

The bentonite bed is made up of numerous thin strata which are of different colors, varying from pure white to green, pink, and chocolate tints. It is separated from the inclosing strata at top and base by selvages of dense dark-brown clay which are mined with it. The lower stratum of bentonite is pure white and closely resembles cascade soap in texture and feel. This stratum is about 6 in. thick and persists throughout the extent of the deposit; whereas the succeeding layers thin out and disappear. The different layers are separated from one another by crinkled partings or bedding planes. Some of these layers may be only  $\frac{1}{2}$  in. thick, but the only apparent difference in the character of the material constituting them is that of color. When mined, the different layers become intimately admixed and form an average product of uniformly light gray color.

#### PECULIARITIES OF GEOLOGY AT DAGGETT

**Daggett Deposit**—The bentonite deposit near Daggett, though not extensive, is of interest because of its unusual mode of occurrence. It is located in the foothills on the north side of Mohave River about midway between Barstow and Daggett. The inclosing rocks are rhyolites of Tertiary age in which the bentonite occurs in "pockets" or irregular masses of 10 to 200 tons, separated from one another by distances of several hundred feet. Here, the bentonite masses exhibit no evidence of stratification nor of transportation and are clearly the result of local alteration of the country rocks *in situ*.

Tests made with this material have shown it to be satisfactory in the treatment of lubricating oils, and a limited production from this locality has been maintained. Mining has been confined to the masses which

outcrop on the surface, but the sporadic occurrence of the ore entails high mining costs and uncertain production, which prevent active competition with deposits of estimable size and output situated in other parts of the state.

**Amargosa River Deposits**—The most extensive deposits of bentonite in the state are those which occur along the Amargosa River from Ash Meadows to a point some distance southeast of Tecopa. Known deposits underlie a large area on the east side of Ash Meadows, extending across the state line into Nevada, and other deposits occur at Shoshone and at Stump Springs, about 22 miles east of Tecopa. All of these deposits are identical with respect to age, derivation, and character of material and no doubt represent local alterations of a more or less continuous and widespread deposit of volcanic ash. It is believed that continued prospecting will reveal the presence of bentonite at other localities within this area.

About four miles southeast of Tecopa, in a canyon draining into the Amargosa, there is a 6-ft. bed of bentonite outcropping in the canyon wall. It occurs as a member of highly tilted Tertiary sediments which here dip to the north at an angle of 30 deg. The bentonite is of good quality and easy to mine, but contains a large amount of unaltered disseminated gravel, which would have to be removed before the material could be marketed. This deposit differs from the other Amargosa bentonites in point of age, being vastly older than those at Shoshone and Ash Meadows.

At Ash Meadows the Standard Oil Co. mines bentonite from a bed which occurs in a series of horizontally bedded brackish water sediments of recent age. These sediments at one time covered the entire floor of the Amargosa Basin to a depth of several hundred feet. As the river deepened its channel southward into Death Valley this basin was drained and a large portion of these sediments was subsequently removed by erosion. At the present time the basin and its embayments are fringed by terraces of varying widths cut in these sediments. On the east side of Ash Meadows the terrace, flanking the encircling hills, reaches a maximum width of about two miles. The bentonite bed, from 4 to 10 ft. in thickness, outcrops near the base of this terrace and is overlain by 50 to 100 ft. of sandstone, clay, and marl.

The deposit at Shoshone adjoins the right-of-way of the Tonopah & Tidewater Railway on the west. It occupies an area of several hundred acres and outcrops a few feet above the level of the valley floor in the face of a low terrace of recent sediments. The bentonite bed is from 1 to 10 ft. thick and with respect to origin and physical properties it is identical with the Ash Meadow deposits. The Shoshone deposit, now owned and operated by the Associated Oil Co., has supplied the refinery with filtering clay ever since 1920. Enough material is blocked out to assure an ample supply for many years.

#### SIMPLE MINING METHOD

**Mining Methods**—In mining bentonite the procedure depends somewhat upon the topography and on the amount of water in the inclosing rocks. At Otay the strata are well drained and no water is encountered in the mining operations. The bentonite, however, because of its great absorptive and retentive properties, is always quite moist, even though the adjacent strata are dry. In mining this deposit the overburden



Photo by F. G. Tickell, Stanford University.  
Photomicrograph of amargosite (bentonite) fragments  
in methylene iodide. X—750 diam.

is first removed with teams and scrapers, after which the bentonite is quarried out with pick and shovel. When the overburden reaches a thickness of 10 to 20 ft., the stripping process is no longer practicable, and drifting must be resorted to. Main haulageways are timbered and the entrances are provided with tight doors to prevent unnecessary circulation of air in the workings, which would cause the bentonite to dry and crumble down.

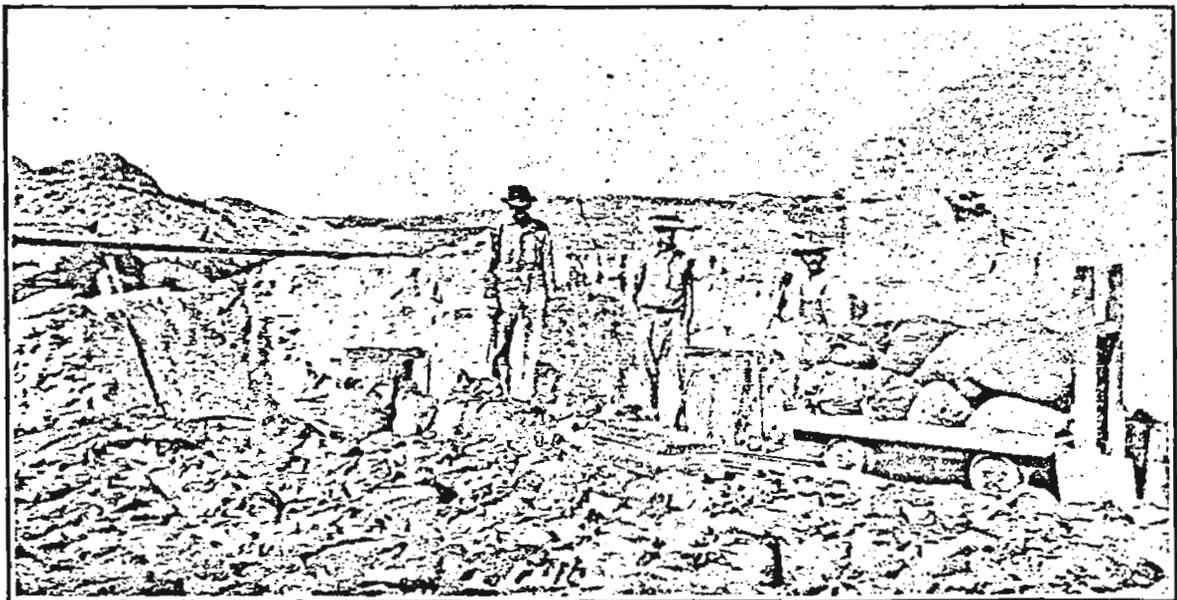
At Ash Meadows stripping has been found impracticable because of the thickness and solidity of the overburden, and drifting methods have been resorted to from the start. Though no difficulty has been encountered in supporting the roof at this mine, the bentonite bed itself is so saturated with water that it is plastic and heaves to such an extent that the haulageways and workings are often completely blocked. In the mine at Shoshone drifting has not yet become necessary, but the strata here are well drained, and these difficulties will not be encountered.

**Preparation for Shipment**—When the bentonite is freshly mined it is damp and somewhat sticky. The first step is the elimination of the excess water, which is accomplished by spreading the material in the sun to dry. At Otay it is spread on the open quarry floor in a layer 6 to 12 in. deep, which is stirred every day with a harrow drawn by horses. This pulverizes the lumps and exposes all parts of the layer to the air. After a week of this treatment the material is reduced to small fragments and the moisture content lowered from about 30 per cent in the freshly mined bentonite to 7 per cent in the dried product.

At the Shoshone and Ash Meadow mines the bentonite is spread on wooden drying platforms, where it is turned and pulverized with hand shovels. The desiccating atmosphere quickly eliminates the free moisture, and in three or four days the bentonite is ready to sack for shipment. The preliminary drying and pulverizing is the only treatment accorded the bentonite at the mines. Upon arrival at the refineries, however, it receives a more or less complex treatment before it is rendered suitable for use.

**Nature and Origin of Bentonite Deposits**—Bentonite is a term which has long been applied to a variety of so-called colloidal clays and, indiscriminately, to such minerals as halloysite, montmorillonite, and related species. The name was proposed in 1898 by W. C. Knight in reference to the peculiar material that occurs in the Benton shales near Rock Creek, Wyoming. This is the type locality for bentonite, but since its discovery in Wyoming it has been found at numerous other places in the United States, Mexico, and Canada, and has been reported from every country on the globe with the possible exception of the British Isles. The U. S. Geological Survey originally defined bentonite as "a transported, stratified clay, formed by the alteration of volcanic ash shortly after deposition." Recent investigations, however, show that bentonite need not be stratified nor transported, and that the mineral may be derived from materials other than volcanic ash. The comprehensive paper by Spence,<sup>1</sup> of the Canada Department of Mines, and the more recent investigations by

<sup>1</sup>Spence, H. S. "Bentonite." Canada Dept. of Mines, Bull. 626, 1924.



*Amargosite deposit at Shoshone*  
The clay is mined and sacked for shipment without drying

Ross,<sup>2</sup> of the Geophysical Laboratories at Washington, have established beyond question the nature and genesis of bentonite.

The facts, as brought out by Ross, are, first: that bentonite is a rock and not a distinct mineral species; second, bentonite is formed *in situ* by the devitrification of glassy igneous material, usually volcanic ash or tuff, but occasionally from lava flows and even from hypabyssal intrusives; third, the characteristic mineral which is developed in the alteration to bentonite is usually montmorillonite, although in some instances it is the talc-like mineral leverrierite or a related species as yet unidentified; fourth, bentonite is not a colloid or amorphous gel, but is of a crystalline nature. Wherry,<sup>3</sup> however, has advanced the theory that the crystalline plates of montmorillonite constitute one-dimensional colloids; that is, they are of microscopic area, but of colloidal thickness. The montmorillonite forms in aggregates of exceedingly minute plates or lamellæ surrounding each of the devitrified rock particles, and it is to the felted or lamellar structure of this mineral that bentonite owes its great adsorptive properties.

DIFFICULTIES IN MAKING THIN SECTIONS

In the microscopical examination of bentonite the greatest difficulty to be overcome is the making of thin sections of the material. This is best accomplished after the technique developed by Ross,<sup>4</sup> who found that, if the bentonite was first boiled in bakelite, it was rendered firm enough to be ground in oil to any desired thinness. By this process the ash structure of the material is not destroyed and becomes readily discernable under the microscope.

In thin section the otaylite is seen to be made up of small irregular grains with circular embayments characteristic of volcanic glass. Immersed in oil for several days, the mineral shows a moderate birefringence and a mean index of refraction of 1.520. When first immersed, the mineral grains, in part, stand on end and exhibit a maximum birefringence, but after prolonged immersion the grains gradually settle upon their micaceous cleavage faces. The mineral then shows a minimum birefringence, but in convergent light gives a bi-axial interference figure with a small optic axial angle. The optical properties determine the mineral present to be montmorillonite.

For the bentonites occurring along the Amargosa River, I in 1920 proposed the name "amargosite" as a means of distinguishing this particular material from bentonites occurring elsewhere within the state. This name will now be used in the ensuing discussion of the material.

In thin section the amargosite is practically isotropic. Some birefracting grains in the section appear to be feldspar. A number of areas clearly retain the original ash structure. The greater part shows irregular shaped grains with circular embayments so characteristic of volcanic glass fragments. The amargosite is so fine grained that its optical properties can be determined only with great difficulty.

CHEMICAL COMPOSITION OF OTAYLITE AND AMARGOSITE

The chemical analysis of otaylite given below was made by Booth, Garrett, and Blair; that of the amar-

gosite, by W. F. Foshag, in the laboratories at Washington, D. C.

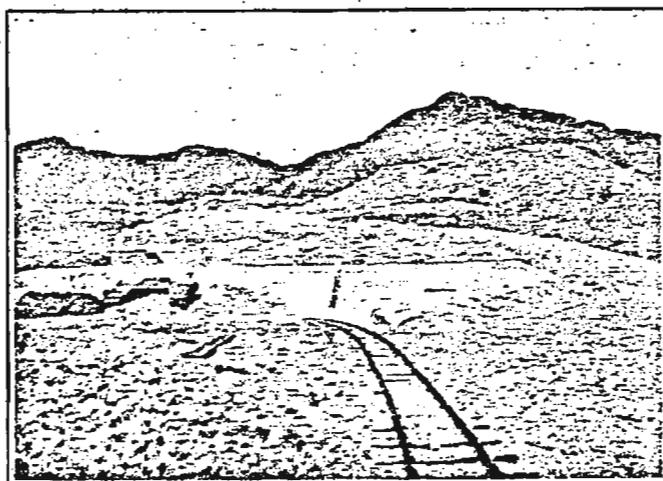
Otaylite

Constituent	Per Cent	Molecular Ratios
SiO <sub>2</sub> .....	51.20	0.451
Al <sub>2</sub> O <sub>3</sub> .....	15.46	0.157
Fe <sub>2</sub> O <sub>3</sub> .....	0.86	0.006
CaO.....	1.74	0.022
MgO.....	6.55	0.185
Na <sub>2</sub> O.....	1.29	0.019
K <sub>2</sub> O.....	0.45	0.004
H <sub>2</sub> O.....	15.41	1.311
	100.14	

Amargosite

Constituent	Per Cent	Molecular Ratios
SiO <sub>2</sub> .....	50.54	0.441
Al <sub>2</sub> O <sub>3</sub> .....	15.42	0.153
Fe <sub>2</sub> O <sub>3</sub> .....	0.74	0.007
CaO.....	1.41	0.017
MgO.....	4.51	0.114
K <sub>2</sub> O.....	0.64	0.006
NaCl.....	7.12	1.061
H <sub>2</sub> O.....	19.12	
	99.51	

The analysis of otaylite presented herewith gives the



Outcrop of amargosite in terrace at foot of mountain

formula MgO·Al<sub>2</sub>O<sub>3</sub>·5SiO<sub>2</sub>·8H<sub>2</sub>O; whereas the analysis of amargosite yields the formula MgO·Al<sub>2</sub>O<sub>3</sub>·5SiO<sub>2</sub>·7H<sub>2</sub>O. The latter is the true formula for montmorillonite according to the latest analyses of that mineral; hence it appears that the amargosite variety of bentonite consists almost entirely of montmorillonite.

PROPERTIES OF "NATURAL SOAP"

Amargosite, when freshly mined, weighs about 65 lb. per cubic foot; its specific gravity, however, is about 2.45. It is very smooth, soft and friable, and somewhat sticky, but not plastic. The color is almost dead white. Under the hand lens it appears very finely granular, with here and there minute dendritic specks of manganese dioxide. When placed in water, a lump of amargosite quickly disintegrates and if agitated forms a milky liquid in which the solid particles remain in suspension indefinitely. Because of its detergent properties, it is commonly known as "natural soap" or "soap rock." The Indians in this locality were aware of its cleansing qualities and the squaws frequently used it for shampooing purposes. R. K. Fairbanks, an early settler of Shoshone, having observed the Indians using this material in lieu of soap, became curious as to its nature and source and eventually found the outcrop from which it was obtained.

Origin of Bentonite—The bentonite deposits are

<sup>2</sup>Ross, Clarence S., and Shannon, Earl V. Paper read before the Geological Society of America, Jan., 1925.

<sup>3</sup>Wherry, Edgar T. Paper read before the Mineralogical Society of America, Dec., 1911.

<sup>4</sup>Ross, Clarence S. Personal communication.