

Exhibit No. 33
 Patricia Ruby, N.P. 8-12-88
 Witness

of a critical area in El Dorado County. The remainder of the year was devoted to preparing reports for publication as chapters of Bulletin 134 of the State Division of Mines. This report-writing is scheduled for completion in fiscal 1951. Of four chapters remaining to be finished, three are scheduled for transmittal to the state during fiscal 1951, and the final chapter the following year.

San Francisco Office. Through fiscal 1950 the staff at the headquarters of the cooperative program in San Francisco included two clerks, stenographers, a draftsman, and a scientific aide. The principal task was in assisting with texts and illustrations of geologic manuscripts, but the staff handled correspondence and supplies as well. During the fiscal year, 21 reports containing a total of 2,225 manuscript pages and 623 illustrations were processed. Twelve reports were transmitted to the Division of Mines for publication. Of the total material, 76 percent was the direct result of the cooperative program.

CONCLUSIONS

The Division of Mines acts as an information bureau on California's mineral resources, mineral industries, mining operations, basic geology, and related subjects. To give authentic information, it must maintain a staff of technical persons trained in the professions of mineralogy, geology, mining engineering, and related subjects, who must make surveys and investigations of mineral deposits in the state and the raw mineral materials used in various industries, and should do research work in the laboratory and library on their subjects. This staff must be acquainted with the work of technical persons of other similar agencies. The Division should cooperate, so far as possible, with other governmental agencies and educational institutions in order to acquire as much authoritative information as possible.

To inform the public and thereby assist in developing the state's bountiful supply of mineral resources, is the principal objective of the Division of Mines. This is done orally and by letter but most effectively and permanently through its publications.

To acquire information, to prepare reports concerning it, to process these reports for publication, and finally to issue authoritative public documents and distribute them for use throughout the state, the nation, or anywhere else when information is desired, requires continuous diligence and unselfish interest on the part of each and every employee. The public documents are placed on the shelves of libraries where they will remain for years and, therefore, the information printed in them must be authoritative and useful for all time to come.

Compensation for this work consists for the most part in the satisfaction given to the people of California and to other investors in the state's resources and industries. This satisfaction has made itself manifest in many letters and comments which have been received during the past fiscal year. It will only be through expressions of continuous interest of the public who have been rendered satisfactory services that the Division of Mines will be able to maintain a useful organization, to carry needed activities, and to contribute to the economic welfare of the

COUNTIES OF CALIFORNIA—MINERAL PRODUCTION AND SIGNIFICANT MINING ACTIVITIES OF 1940

PREPARED UNDER THE DIRECTION OF CHARLES V. AVERILL AND L. A. NORMAN, JR.*

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**DIRECTORY OF PRODUCERS OF METALLIC AND NONMETALLIC
MINERALS IN CALIFORNIA DURING 1949**

(Producers of Natural Gas and Petroleum May Be Found in the
Summary of Operations, California Oil Fields, July-Dec. 1949, vol. 35,
no. 2, of the State Division of Oil and Gas.)

HYDROTALLITES

OPERATOR	ADDRESS	LOCATION
ASBESTOS (TREMOLITE)		
Placer County:		MINE
Joe DeLano & B. Zindars (Mined but did not ship until 1950).....	Forest Hill.....	Iowa Hill.....
Shasta County:		
Elias Asbestos Corp.....	La Moine.....	La Moine.....
Powhatan Mining Co.....	Woodlawn, Baltimore, Md.....	Castella.....
BARTITE		
		MINE
Mariposa County:		
Bartlett Sales Division, National Lead Co....	830 Ducommun St., Los Angeles....	El Portal.....
Fresno County:		
Bartlett Products Ltd.....	Box 8A, Newark.....	ALBANY.....
BORATES		
		PROPERTY
Inyo County:		
Pittsburgh Plate Glass Co., Columbia Chemical Division.....	Bartlett.....	Bartlett.....
United States Borax Co.....	510 W. Sixth St., Los Angeles 14..	Sagehen.....
Kern County:		
Pacific Coast Borax Co.....	510 W. Sixth St., Los Angeles 14..	Porter.....
San Bernardino County:		
American Potash and Chemical Corp.....	3535 W. Sixth St., Los Angeles 54..	Trona.....
West End Chemical Co.....	606 Lathrop Square Bldg., Oakland 12	Westland.....
BORIC ACID		
		PROPERTY
Alameda County:		
Winters Chemical Div., Food Machinery & Chemical Corp.....	405 Lexington Ave., New York 17, N.Y.	Newark.....

The operation of the Irvine Salt Company on the east side of Newport Bay was purchased by the Western Salt Company on January 1, 1950. Unrefined salt produced by solar evaporation was sold for use in water softeners, steel mills, lumberdries, and for brine used by fishing boats. The bittern was used in weed killers and dust settlers.

Peat humus was produced by three operators from a bog near Huntington Beach. Operations of Pence's Peat Humus Company were typical. Peat from a bed that ranges from 4 to 32 feet thick was excavated with a clam shell and hauled to the drying area where it was spread and dried by aeration. The dried peat humus was ground. Nurseries, fruit growers, and vegetable growers were the principal consumers of this material.

The El Toro Clay Company operated two clay pits, the Robinson and the Serrano, in Trabuco Canyon approximately 12 miles east of El Toro. In July 1950 a third deposit was opened on the nearby Hunter Ranch, where future operations will be conducted. Material from these pits is a mixture of kaolin and quartz sand, the best grade of which averaged about 40 percent kaolin. Crushed ore with no additional processing is marketed as "pauister". Clay, considered by the ceramic industry to be a high-grade kaolin type, was produced by carefully washing the raw material at plants on the Robinson Ranch and in Los Alisos Canyon. Since early in March 1949, W. A. Shooppe has been grinding the quartz sand reject from the Los Alisos plant for sale as a high quality silica sand.

Gladding, McLean and Company carried out development work at their Claymont property, an underground mine whose output is a high grade fire clay used for ladle brick. The work included the driving of a new tunnel which was approximately 800 feet long at the end of the year, and the construction of a 1150-foot aerial tramway from the mine to newly installed bunkers. Clay was trimmed from the mine in 3-ton cars, lowered on the tramway to the bunkers, dumped, and later hauled away by truck.

In April 1949 the Liston Brick Company started producing building brick at their plant 6 miles southeast of Corona on State Highway 71. Clay was obtained from three deposits near the plant. The Mission Clay Products Company at Orange obtained clay from the bottom of a reservoir leased from the Santa Ana Valley Irrigation Company at periods when the reservoir was dry. Products were floor tile, roofing tile, and adobular brick. Clay for the floor and roofing tiles was ground, shaped in a brick machine, dried on shelves from 2 to 3 weeks, and fired. Adobular brick was shaped by hand, dried in an open field, and fired.

Sand and gravel producers operated at full capacity. The largest number of active producers was in the Santa Ana-Orange area, but production also came from properties at Anaheim, Fullerton, San Juan Capistrano, Seal Beach, Lincoln Park, and El Modena.

Metals. The Lippincott Lead Company at Santa Ana processed lead ore for use in making batteries. Most of the ore, which contained high silver values, was from the company's mine near Ubehebe Peak, Inyo County, and was used in the manufacture of high quality battery grids.

A 150-foot tunnel was driven in Santiago Canyon about 9 miles northeast of the deposit contains silver, lead, and zinc.

Placer County

Mineral production in Placer County during 1949 consisted of raw clay, dimension stone, sand and gravel, crushed rock, gold, and silver. The extensive clay pits and processing plant at Lincoln are the most important part of the county's mineral industry.

Nonmetallic Industrial Materials. Gladding, McLean and Company produced raw clay from the Mine and Mill, Towle, and Atkinson pits at Lincoln; the Mine and Mill unit was the most active during 1949. These pits are located in dark-brown to white colored clay at the loess formation. Fifteen to 20 feet of overburden, principally andesitic agglomerate, was broken by blasting and removed by power shovel in order to mine the clay by open pit methods. The properties of the stratified clay vary from layer to layer and consequently it was mined selectively. Operations were conducted only during the dry season. The clay was broken with rusters and loaded into trucks with power shovels. A portion of the mined clay was trucked to the plant at Lincoln, where it was utilized by the company in manufacture of ceramic products. The remainder was hauled to the mill at the Mine and Mill pit, where it was stock piled and sacked for sale as raw clay. At Gladding, McLean and Company's plant in Lincoln the clay was mixed with other raw clays and manufactured into such products as architectural terra cotta, face brick, roofing tile, sewer pipe, and chimney pipe. Approximately 600 persons are employed in the mines, mill, and plant at Lincoln.

Lincoln Clay Products Company continued operation of its pit at Lincoln, mining clay throughout the dry season. This company does not manufacture ceramic products, but sells its entire output as raw clay. The mined clay was run through a 2-inch Williams single-roll crusher, and conveyed from the pit to railroad storage bins. Several grades of clay were gravity loaded into freight cars. The clay was sold largely in carload lots; however, a small percentage of the output was ground and sacked for sale in smaller lots.

Union Granite Company produced dimension stone from two quarries in Placer County. "White granite" was quarried at Rocklin; and gabbro, sold as "black granite", was obtained from a quarry 2 miles east of Loomis. The rock was drilled and blasted into large blocks, which were trucked to the finishing plant at Rocklin. Here, they were sawed into slabs of desired dimensions, and polished and otherwise finished to meet customer requirements. Production during 1949 included approximately 8,000 cubic feet of finished stone, principally cemetery monuments, and 2,000 tons of other monumental stone, building stone, fireplace stone, riprap, and waste.

Marshall and Miles Gravel Company produced crushed rock on the Bear River a few miles east of Colfax. The river gravel was removed by a slack-line cableway equipped with a 2-yard bucket. Size reduction was made by a primary jaw crusher and a secondary cone crusher. The production, 12,000 to 15,000 cubic yards per month, was sold largely for cement aggregate. Bear River Sand and Gravel Company, adjoining the Marshall and Miles property, also produced crushed rock primarily for

use as concrete aggregate. In addition, these companies sold boulders and cobbles for use as building stone.

Metals. The Mary Len mine, a lode gold property at Penryn, was active during the year. Gold ore was amalgamated and concentrated in the 25-ton mill, and concentrates were shipped to a custom cyanide plant. A total of 581 tons of ore was treated during 1949 for the recovery of gold and silver.

Schwartz and Mitchell operated a dragline dredge in Auburn Ravine. Bean and Armstrong Mining Company ground-sluiced at Canada Hill, using a bulldozer for excavating the gravel. Sporadic production by many small placer operators, including snipers, was reported from Forest Hill, Michigan Bluff, Iowa Hill, Bear River, Dutch Flat, and the Last Chance district. S.J.R.

Plumas County

Barite for oil-well drilling mud was mined near Almanor Dam. Gold was recovered from shallow gravel deposits near the head of Rush Creek. Manganese ore was mined in open cuts and shipped from properties near Almanor Dam and Crescent Mills.

Nonmetallic Industrial Materials. The Cameron barite mine in the Ohio Valley, about 3 miles south of Almanor Dam, was operated from April to August. Dark gray-colored barite occurs as a 4- to 6-foot wide lens in slate, and has been mined by an open cut 12 feet wide, 8 feet deep, and 100 feet long. The ore is pushed into a truck-loading hopper by a bulldozer and transported to consumers for use in heavy drilling mud.

Metals. Placer gold was recovered from the shallow gravel deposits near the head of Rush Creek by Francis Schultz and associates. The gravel was 6 to 14 inches thick above yellow clay and included pebbles and cobbles of quartzite, jasper, sandstone, and white quartz. The sands included some chromite and magnetite. Mining was done by clearing the surface of forest litter with a hand slip and loading the gravel into trucks with a quarter-yard power shovel or by hand shoveling. The gold, largely coarse, was recovered in a washing plant on the Come-back claim. Here the trucks dumped the gravel into a hopper from which it was washed through sluice boxes fitted with cast-iron riffles. Minus one-quarter-inch material dropped into the undercurrent and flowed to a side-shaking sluice 24 inches wide and 10 feet long fitted with steel riffles. Water for the plant was pumped from a pond on Rush Creek. Because of the heavy snowfall, the placer was worked only during the summer months. The search was continued for a faulted segment of the Rush Creek channel on the Sara claim. A new adit was driven 80 feet through rock slough in a direction S. 85° E., from a point about an eighth of a mile south of the discovery adit. Loose rock moved by a bulldozer from the hill above the adit included some gold-bearing float. The adit will be driven farther into the hill and raises run at intervals in search of the channel.

Manganese ore was shipped from the Sunset group of claims located in the mountains about three airline miles southeast of Almanor Dam. Psilomelane and some pyrolusite associated with red chert occurs in small lenses and nodules in black shale. The principal work was done on the Sunset No. 3 claim where the surface was stripped over a circular

area about 300 feet in diameter. The manganese was mined from a T-shaped trench 125 feet long, capped by a trench extending 50 feet north-east and 15 feet southwest, which followed a contact with soft gray shale. The trenches were dug with a bulldozer to an average depth of 12 feet and the manganese ore was sorted from the shale. The material was shipped to Geneva, Utah, but the average manganese content was too low to mine and load on cars at Canyon Dam profitably at the price of 45 cents per unit of manganese. The operation was shut down January 7, 1950.

Manganese ore was shipped also from the Britto claims near Crescent Mills. Ore was mined from a vein 10 feet wide through an adit. Psilomelane and pyrolusite, associated with red chert between slate walls, were the principal ore minerals. A fault cut the vein and surface prospecting for the faulted segment was done by bulldozing. The property was closed in September 1949 when the price of 45 cents per unit for the ore proved unsatisfactory. J.C.O.B.

Riverside County

Shipments of iron ore from the Eagle Mountains reached a substantial figure during the year. Development work was in progress at gold mines in the Pinto Basin area, where two mills were erected. A small quantity of lead ore was mined and stock piled. Large quantities of non-metallic minerals were produced as follows: low-iron glass sand at Corona, clay at Alberhill, gypsum at Midland, limestone and cement at Crestmore, and concrete aggregate at numerous points.

Mineral Facts. No accumulations of petroleum have been found in Riverside County. In 1949 one well was drilled to 950 feet near Corona without favorable results.

Nonmetallic Industrial Materials. The Owens-Illinois Glass Company produced glass sand near Corona during the year and shipped almost all of it to their own plant in Los Angeles. A water shortage was alleviated by installation of two thickeners to reclaim process water for re-use. Products were flint glass sand averaging 0.035 percent iron and colored glass sand averaging 0.06 to 0.07 percent iron.

The Los Angeles Brick and Clay Products Company mined clay at Alberhill for making fire brick, blue lining, face brick, sewer pipe, roof tile, and hollow building tile. The company's high grade fire clay was hand-sorted at the quarry and loaded with a skiploader. The lower grades of building clay were excavated with bulldozers and then loaded. The Alberhill Coal and Clay Company purchased a drill during the year and initiated a testing program that has revealed a number of types of clay differing from those being mined. Toward the end of the year the company's principal source of sewer pipe clay was exhausted and a new pit was opened. Shipments from the new deposit started about March 1, 1950. During the latter part of the year Gladding, McBean and Company started drilling and testing work at their Alberhill property. Stripping operations were begun February 13, 1950.

The Riverside Cement Company, one of the major producers of cement in California, continued to produce portland cement at their plant at Crestmore. The company's Crestmore mine, which produced limestone from underground workings for many years, has been inoperative for some time. The bulk of the limestone now being used is obtained from the old Jensen quarries located 3 miles west of Crestmore. The Riverside Cement Company also operates a plant at Arroyo Grande, San Bernardino County.

OPERATOR	ADDRESS	LOCATION
SODA		PLANT
Inyo County: Natural Soda Products Co. (Soda ash, Trona)	502 Central Tower Bldg., San Francisco 3.	Keeler.....
The Permanente Metals Corp. (name changed to Kaiser Aluminum & Chemical Corp. on November 28, 1949) (Soda ash)	Kaiser Bldg., Oakland 12.	Lone Pine.....
Pittsburg Plate Glass Co., Columbia Chemical Division (Soda ash, Trona)	Barflett.	Barflett.....
Sacramento County: American Potash & Chemical Co. (Soda ash, Salt cake)	3032 W. Sixth St., Los Angeles 5.	Trona.....
Dale Chemical Industries, Inc. (Salt cake)	P.O. Box 319, Twenty-nine Palms.	Twenty-nine Palms ..
West End Chemical Co. (Soda ash)	605 Latham Sq. Bldg., Oakland 12.	Westland.....
San Diego County: Inyo County: Grain Grower, E.E. Kitching.	P.O. Box 783, Brawley.	None Brawley.....
TALC, PYROPHYLITE, AND SOAPSTONE El Dorado County: Pacific Minerals Co., Ltd. (Soapstone)	137 10th St., Richmond.	None Sagehen Springs.....
Inyo County: W.E. Andersen (Talc)	517 N. Ave. 50, Los Angeles 42.	Eureka Valley.....
William Bonham (Talc)	Lone Pine.	Keeler.....
Louise Grantham (Talc)	809 E. Sixth St., Ontario.	Shoshone.....
F.M. Hendraon (Talc)	Box 24, Moapa, Nevada.	Pigme.....
Huntley Industrial Minerals Inc. (Talc)	P.O. Box 305, Bishop.	Talc City.....
T.C. Ims (Pyrophyllite)	Bighorn.	Bighorn.....

OPERATOR	ADDRESS	LOCATION
George W. Koest (Talc)..... Little & Hildebrand (Talc)..... Mulle Little & Ray Horlis (Talc)..... James F. Kichhaus (Talc)..... Sierra Talc & Clay Co. (Talc)..... E.K. Stewart & Homer Taylor (Talc).....	Darwin..... P.O. Box 15, Bigpine..... Bigpine..... 109 S. Main St., Bigpine..... 5505 Hancock St., Los Angeles 22..... Bigpine.....	Davis..... Bigpine..... Bigpine..... Bigpine..... Keefer, Tecopa, and Shoshone..... Lone Pine.....
Los Angeles County: Dr. Leon Mann (Sparagone).....	3279 Welder Ave., Los Angeles 41..	Acton.....
More County: Charles Bower (Pyrophyllite)..... Hendley Industrial Minerals, Inc. (Pyrophyllite).....	Lava..... P.O. Box 305, Bishop.....	Lava..... Lava.....
San Bernardino County: Robert Talc & Clay Co. (Talc)..... Minerals Material Co. (Pyrophyllite)..... Sierra Talc and Clay Co. (Talc)..... Southern California Minerals Co., W.S. Skroch (Talc)..... Western Talc Co. (Talc).....	Pomona..... 1115 Westminster Ave., Alhambra..... 5525 Raymond St., Los Angeles 22..... 320 S. Mission Rd., Los Angeles..... 1921 E. Slauson Ave., Los Angeles.....	Tuca Grove..... Victorville..... Baker and Shoshone..... Tuca Grove and Shoshone..... Tecopa.....
San Diego County: Robert Pyrophyllite Products (Pyrophyllite)	Box 686, Grants Vista.....	Cerrillos.....

was approximately 75 feet high by 300 feet long. Toe-holes were drilled in the face of the quarry with wagon drills, and after blasting, the fragmented material was loaded onto trucks by a dipper-type 2½-yard North-west shovel.

The Harrison-Birdwell quarry and rock plant, 1 mile south of Clayton, has been producing crushed stone for road fill and drain rock since July 1947. This operation employs seven men. Two pits have been opened in members of the Jurassic Franciscan formation, one in serpentine and one in sandstone. The former pit was abandoned after a large area of soft rock was uncovered near its center, and operations were shifted to the latter pit located a quarter of a mile southward.

The Blake Brothers operation at Point Richmond on San Francisco Bay includes a quarry; a rock crushing, sizing, and distribution plant; a ready-mix concrete plant; and a hot asphalt plant. The quarry is in Franciscan sandstone. The coyote hole method was employed to shoot down as much as 500,000 tons of rock with a single blast. The adits were about 60 feet long, and the crosscuts were driven at right angles to the adits about 100 feet in both directions. After charges had been placed at 20-foot intervals, and the openings had been completely back-filled, all charges were electrically detonated simultaneously. Steam shovels loaded trucks which hauled the rock to the primary crusher located in the quarry. Trucks hauled the primary crusher product to the plant receiving bins, a distance of about an eighth of a mile. Several stages of crushing and screening in the plant produced nine rock sizes from a quarter inch to six inches. Riprap was also produced.

Serra Brothers operated a rock quarry and crushing plant a quarter mile south of Pacheco on the Pacheco-Walnut Creek road. The quarry was in moderately well-consolidated, light-brown sandstone, interbedded with some soft shale. These rocks are part of the Sobrante formation of Miocene age.

The Pittsburg Pumice Company mined pumice in the foothills south of Pittsburg for light-weight aggregate in concrete building blocks. The pumice was obtained from a bed of waterlaid pumiceous tuff interbedded with sandstone and conglomerate. The pumice was mined with a Caterpillar tractor and roofer and pushed to the crushing plant with a bulldozer. After crushing to minus three-eighths inch, the pumice was hauled to the block plant on the highway 3 miles west of Pittsburg. Here the pumice was mixed with cement and sand and pressed into blocks. The block-pressing machine has a capacity of 1000-1200 units per day. Blocks were oven-dried for 8 to 10 hours at 100° F., and then placed in the curing yard for 28 days. During the curing period they were sprinkled occasionally with water.

Two brick plants, the Port Costa Brick Works on Carquinez Straits (three-quarters of a mile east of Port Costa), and the United Materials and Richmond Brick Company at Point Richmond, manufactured bricks from clay mined in the county. At Port Costa brown and blue clay-shale mined near the plant was used and a large, coal-burning, continuously-fired Hoffman kiln was in operation. During summer months, the time of high demand, several gas-fired field kilns supplemented the production from the Hoffman kiln. At Richmond, bricks were produced from a mixture of black shale mined adjacent to the plant, and clay from Lincoln and Lone. Six oil-fired kilns were in operation.

Foundry sand was produced from beds of Eocene sandstone that outcrop south of Antioch and at Nortonville. Demand for this material was small in 1949, owing to the closing of the Columbia Steel Company foundry. Dune sand from east of Antioch was shipped to asphalt plants. J.W.V.

Del Norte County

The principal mining activity in Del Norte County during 1949 was the quarrying of rock for a breakwater-jetty in Crescent City harbor. A small quantity of chromite was shipped from the Tyson mine at French Hill.

Nonmetallic Industrial Materials. Rock for the Crescent City harbor breakwater-jetty was quarried at Point St. George about 4 miles northwest of Crescent City. The contract called for an estimated 650,000 tons of rock to be quarried and placed by 1954. Sixty men were employed on a 10-hour shift each season between May 1 and October 15, when the sea was quiet. The rock, principally gray Franciscan sandstone, was blasted by the coyote-hole method. Bags of black powder were loaded into 60-foot crosscuts driven at right angles in both directions from the ends of coyote drifts 3½ feet wide, 5 feet high, and 10 to 60 feet long. The rock broke well and powder consumption averaged three quarters of a pound per ton of rock broken. The broken rock was sorted into three sizes; "A" stone weighing 7 to 20 tons, "B" stone weighing 3 to 7 tons, and "C" rock weighing 5 pounds to 3 tons. Power shovels loaded the rock into 15-ton Euclid dump trucks for the haul from the quarry to the jetty.

Metals. From the Tyson mine on French Hill a small amount of chromite was shipped during the year. A few small lenses of chromite in serpentine were exposed in the floor of the pit after the loose overburden was removed by hydraulic mining in 1948. The mine was idle in August 1949, although the equipment remained on the property. J.A.C.B.

El Dorado County

Several of the largest mining operations in the county involved the mining and quarrying of high-calcium and high-magnesium limestone. Much of this limestone was burned to lime and the remainder was sold for industrial and agricultural uses. Slate was mined by underground methods at Chili Bar. Rhyolite and massive quartz were quarried at four localities and used in the construction industry. Eight lode mines produced a total of 1,071 ounces of gold, and 13 placer properties reported production of gold and silver. Sand and gravel, crushed rock, and talc were also produced.

Nonmetallic Industrial Materials. The Diamond Springs Lime Corporation at Diamond Springs produced crushed limestone, high-magnesium lime, and high-calcium lime. Dolomitic (high-magnesium) limestone was quarried 3 miles east of the plant, but high-calcium lime stone was shipped in. Stone from the quarry was transported by train to the plant where it was reduced in size to minus 1½ inches. Plus 1-inch material was burned to lime and all smaller sized material was used for road aggregate, concrete aggregate, white wash, and the manufacture of sheet targets. The lime was burned in two rotary kilns and passed through two rotary coolers. The company's high-calcium lime

was used in steel-making, pottery production, and water purification; and the dolomitic lime was used largely in construction and agriculture.

Lime and crushed industrial limestone were also produced by the Auburn Lime Products Company at Rattlesnake Bridge, 4 miles south-west of Pilot Hill. High-calcium limestone was quarried about a quarter of a mile north of the plant. Primary crushing was done at the quarry and secondary crushing and screening at the plant. The fragments over a quarter of an inch in diameter were fed into two 4- by 60-foot rotary kilns and were burned to lime. The lime passed through a rotary cooler and into loading bins for sacking or bulk loading. The minus one-quarter inch stone was screened into four sizes and marketed for various industrial uses.

The El Dorado Limestone Company, 3 miles southwest of Shingler Springs, mined high-calcium limestone by underground methods. Two lenses of Calaveras limestone, one 80 feet thick and the other 30 feet thick, were mined in shrinkage stopes, and the limestone was hoisted to the surface through a 750-foot vertical shaft. A large crushing plant at the head of the shaft reduced the stone to minus 1 inch, and separated it into several sizes. It was marketed for use as metallurgical flux, asphalt filler, roofing granules, and for the manufacture of lime, glass, and water paint.

Crushed high-calcium limestone was also produced by Cragco Products, Incorporated, from a large quarry 1 1/2 miles north of Cool. Stone broken in the quarry was hauled a short distance to a crushing plant. Material over 2 inches in diameter was sold mostly for sugar rock, metallurgical flux, and for the manufacture of milk of magnesia. Minus 2-inch stone was sold largely for road material.

Crushed stone for road aggregate was produced intermittently by the county from a number of quarries. Sand and gravel was taken from a bar on Weber Creek, about 5 miles northwest of Placerville, by the El Dorado Rock and Sand Company.

Tale schist, with lenses of nearly pure tale, was mined by Pacific Minerals Company at Shrub, a siding on the Southern Pacific Railroad about 3 miles northeast of Latrobe. A mixture of unweathered rock and red clayey weathered rock was taken from an open pit and shipped to the San Francisco Bay area. Here it was ground and marketed for use as an insecticide filler and, to some extent, as a lubricant.

The Pacific Minerals Company also operated a large underground slate mine at Chili Bar, on the South Fork of the American River near Placerville. Black Mariposa slate was mined in long open stopes, 16 feet high and 20 feet wide, and trammed to a crushing and screening plant adjacent to the mine. The fines were passed through a rotary drier and the larger pieces were put through a hammer mill. The crushed slate was screened in closed circuit with a secondary hammer mill to produce two final products: roofing granules, minus 7 mesh to plus 16 mesh, and dust, minus 200 mesh. Saturating oil was added to the finished granules to facilitate binding to asphalt and to reduce the amount of dust given off during handling. The dust was used as inert filler in asphalt, paint, and linoleum.

T. C. Hunt quarried pink-colored rhyolite tuff, and white and yellow-colored rhyolite tuff from a deposit at Johnson's Mill, 2 miles south

of Camino. The stone was used in the construction of fireplaces, walls, and buildings. Similar white and yellow-colored rhyolite tuff was quarried near Pleasant Valley by R. C. Young. During 1949 Mr. Young was conducting experiments (by firing the tuff in a stationary kiln) to change the colored bands in the stone from yellow to deep red. Massive quartz and green-colored mariposite was mined underground by Jack Penland from a small mine on the edge of Placerville. It was used for garden stone and in construction work.

Metals. The Shaw mine, 4 miles southwest of Placerville, was put into operation June 1 and was worked for the remainder of the year. The ore was in the margins of a highly weathered diorite dike, about 25 feet thick, which intruded Mariposa slate. The ore was mined in an open pit with a power shovel and hauled to a nearby mill. Free gold was recovered by amalgamation, and concentrates containing gold-bearing sulfides were shipped to a smelter.

Other producing mines were the Cosumnes mine near Grizzly Flats, the Gardner mine at Kelsey, the Hazel Creek mine south of Collock Pines, the Spanish Dry Diggings mine at Spanish Dry Diggings, and the Summit Hill mine at Spanish Dry Diggings.

Gold and silver production was reported by: the Matherly suction dredge on the American River near Lotus, the Ernest Wilsey dragline dredge on Cherokee Bar, the River Pines dragline dredge on the Middle Fork of the Cosumnes River near Diamond Springs, the Twin Forks dragline dredge on the North Fork of the Cosumnes River near Youngs, and the dredges of Lord & Bishop on Carson and Greenwood Creeks. M.D.P.

Fresno County

Its extensive petroleum and natural gas industry has placed Fresno among the counties of the state in value of annual mineral production. The products of sand-gravel and crushed rock plants located along the channels of the San Joaquin and Kings Rivers were valued at more than 1 million dollars. Monumental stone was quarried at Academy. Gravel for agricultural use was mined in the foothills along the western edge of the San Joaquin Valley. Suction gold dredges operated intermittently along the San Joaquin River near Friant. A small quantity of clay was also produced.

Mineral Fuels. Four discovery wells were drilled in Fresno County during 1949. The Pacific Western Oil Company's "Wachtler" 12-X achieved production northwest of the productive wells of the San Joaquin area on March 1. Initial yield was 100 barrels per day of 31.4-degree gravity oil from a stratigraphic trap in Eocene sediments. The producing interval was 7019-7020 feet. L. M. Lockhart's "Postal Union" well had an initial production of 108 barrels per day from a stratigraphic trap in Miocene sediments in the interval 6550-6570 feet. This discovery, made March 22, established the northwesterly extension of the Barrell productive areas. In April 1949 a new productive zone was discovered in the Gujarral Hills in the Miocene Tumbador formation, 500 feet stratigraphically above the Leda zone (Oligocene), by Barnsdall Oil Company's "Allison" 73-34-2. Initial production was 250 barrels per day of 22-degree gravity oil. By the end of the year there were no completed wells in the field. On October 10, the northwesterly extension of the

supply, were blasted at one time. Processing to produce a finished product size averaging 50 percent minus 200-mesh, included grinding, screening, and air classifying.

The Superlite Corporation operated pumice deposits at Punier Butte, and pumice block plants at Calipatria, Phoenix, Arizona, and Albuquerque, New Mexico. The Calipatria plant produced its first block during 1949. At the deposit 8 miles northwest of Calipatria, two 16-cubic yard carryalls pulled by D-8 Caterpillars mined pumice from open pits and discharged it into grizzlies. Blasting was not required. The pumice was crushed and screened to the following sizes: three-eighths to one-quarter-inch, one-quarter to one-eighth-inch, and minus one-eighth-inch. About 20 percent of the crushed pumice was too fine for use in making blocks. Production of about four 50-ton cars a day has since been increased to nine cars a day, and a second shift has been added.

The United States Gypsum Company's plant at Plaster City produced at peak capacity except for a temporary curtailment in the early part of the year, caused by a slackening in demand for building materials. Gypsum quarried from a large deposit at the north end of the Fish Creek Mountains was shipped over a private railroad 26 miles long to Plaster City for processing. In the spring of 1948 the company completed a program of modernization and expansion, which included the construction of numerous large buildings at Plaster City.

Cardox Western, Inc., produced carbon dioxide from its wells in the Salton Sea field. Most of the gas was used in the production of dry ice, but a small quantity was marketed as liquid carbon dioxide. The average depth of the wells is about 635 feet and their productive life is about 2 years.

Several sand and gravel operations were active in the county. Unique among these was the operation of J. B. Nelson near Holtville. Very carefully sized gravel was produced here and sacked for shipment to the company's plant at Long Beach. The gravel was used entirely for oil-well packing.

Metals. The Holmestake Mining Company spent the year prosecuting a law suit, which resulted from the destruction by fire of their mill at Winterhaven in March 1947. The company was awarded a settlement and construction of a new mill was started in February 1950. The new mill is all concrete and steel construction and is once again (August 1950) cyaniding the ores from the company's two properties, the Cargo Muehacho and the Padre and Madre mines. A jig has recently been introduced into the mill circuit to recover a small but as yet undetermined amount of scheelite that occurs in the ores.

J.W.C.

Inyo County

Metal mining activities were centered principally on lead-silver-zinc ores in the Darwin, northern Argus Range, and Tecopa areas and on tungsten ores in the Bishop area. These metals accounted for a major portion of the county's total mineral production. Tale, produced from several areas in the Inyo Range tale belt and from Warm Spring Canyon, and soda products from Owens Lake were the most important of the several nonmetallic industrial materials produced.

Nonmetallic Industrial Materials. Fuller's earth was mined by the Sierra Tale and Clay Company from the Calcearth deposit near Olancha. A room-and-pillar mining method was used, utilizing pneumatic spiders, or "clay diggers" instead of the conventional drilling and blasting equipment. The clay is used principally in the decolorizing and deodorizing of various oils and solutions.

Dolomite was produced by Dolomite Products, Incorporated, operating the Inyo Marble Company deposits north of Keeler. The dolomite was quarried from open cuts and hauled a short distance by truck to the crushing and screening plant at Dolomite, a siding on the Keeler branch of the Southern Pacific Railroad. Roofing granules and terrazzo chips were produced; lesser amounts were sold for plaster sand and poultry grit. Production was at a rate of 300 to 400 tons per month.

The West End Chemical Company produced limestone from a deposit located 13 miles north of Trona. The limestone was hauled to West End on Searles Lake, San Bernardino County, and calcined there to furnish carbon dioxide for use in the carbonation plant.

A relatively small tonnage of perlite was produced from the Fish Springs area south of Big Pine. Pumice was produced from several properties between the Haiwee Reservoir and Little Lake. The largest operation was that of the Desert Materials Company which operated an open pit located about 8 miles northeast of Coso Junction. The pumice was hauled by truck to the screening plant at Sykes siding. This plant has a capacity of from 45 to 115 yards per hour depending upon the size being produced.

Mr. H. A. Van Loon operated a pumice deposit north of Bishop, producing pumice fines which were hauled to Bishop and mixed with coarser material for making slabs or building blocks. Red volcanic cinders were being mined for aggregate material from Red Cinder Mountain north of Little Lake.

The Tale City mine, operated by the Sierra Tale and Clay Company, was the largest of several tale producers in the county. The property also provided most of the domestic output of steatite-grade tale. The principal tale body in this mine has a 70° westerly dip and has been mined to an inclined depth of 415 feet. The White Mountain mine, northeast of Keeler on the southeastern slope of the Inyo Range, is also an important producer of steatite-grade tale. William Bonham operated this and other properties in the same area. Tale from the Tale City and White Mountain mine areas was hauled to the Sierra Tale and Clay Company mill at Keeler for grinding and sizing. Blue Star Mines, Limited, operated their custom tale grinding plant at Zurich. Some tale was shipped here from properties on the west side of Saline Valley. The Warm Spring Canyon tale deposits were operated by the Kennedy Minerals Company and Miss Louise Grantham.

Soda products and borax were produced by the Columbia Chemical Division of the Pittsburgh Plate Glass Company in their plant on Owens Lake.

Metals. The Trail Canyon road was rebuilt to the Old Dependable Antimony mine in the Panamint Range and some development work was done, but no ore was shipped. Gold was produced with the lead and zinc ores at the mines operated by the Anaconda Copper Mining Company at the Argus and Tecopa. There was some small-scale production of the Argus and Tecopa. There was some small-scale production of the Argus and Tecopa.

mine in the Argus Range, the Corona and Skidoo mines in the Panamint Range, and the Stockwell mine in the State Range, but no gold production was reported.

The Amconda Copper Mining Company continued its operations at Darwin and Tecopa and was the principal producer of lead, silver, and zinc in the state. The prices of lead and zinc dropped sharply in the second quarter of the year, and because of this, the operations at the Darwin mines were suspended from July to September, 1949. Only necessary maintenance and a small amount of development work was undertaken during this period. During the rest of the year, however, normal mining operations progressed. The average grade of ore milled in the 300-ton mill was approximately 7.5 percent lead, 7.5 percent zinc, and 5 ounces of silver per ton.

The Shoshone mines operation near Tecopa continued through the year, and the company developed substantial additional tonnages of both direct-shipping and milling grade lead-silver ore. The 100-ton mill, which had shut down in September 1948, resumed operations in July 1949, after the discovery of ore in the faulted segment of the War Eagle vein on the 500 level. This ore proved to be continuous to the 690 level. Over 12,000 tons of mill ore and nearly 13,000 tons of shipping-grade ore was produced during the year.

The Defense mine in the Argus Range was operated by L. D. Foreman and W. V. Skinner. The principal ore mineral here is coronadite, an oxide of lead and manganese. New development work included the start of a haulage adit located 150 feet below the main entry. At the Minidetta mine in the same district, a small mill was in operation treating old mill tailings. The concentrate from this mill was shipped with ore from the mine. Other producers in the area included the Surprise and the Empress mines.

The Cerro Gordo mine near Keeler which had been leased by the Enterprise Mining Corporation, was purchased by them in 1949. Development and exploration work was continued in the China Stope area between the 200 and 550 levels. Several cars of ore were shipped from the Lippincott lead mine in the Ubehebe district to the Lippincott Lead Company smelter at Santa Ana. The Gold Hill Dredging Company commenced development work on the Kordell lead mine in the Panamint Range; the Christmas Gift mine in the Darwin district was being reopened by Christmas Gift Mines, Incorporated.

The United States Vanadium Corporation operating the Pine Creek tungsten mine continued development work from the new Zero tunnel level. This tunnel, started in 1943 and completed in December 1947, is 7400 feet long and 1500 feet below the upper main haulage level. Two ore bodies were being developed for a sub-level stoping method of mining. Surface installations, which were completed during 1949, include a rotary tipple for dumping the mine cars into a coarse ore bin, a 36 by 48-inch jaw crusher and a 1000-ton live storage bin. Crushed ore is fed from this bin by apron feeders into buckets on an aerial tram which transports the ore to the 1200-ton mill on Pine Creek. In February 1949, a fire destroyed the tram terminal and crusher installations at the upper main haulage level, so all ore from there was hauled by truck to the Zero level installations during the balance of the year. Molybdenum and cobalt concentrates, the latter carrying some silver and gold, were produced in addition to tungsten.

The Kittle Mining and Exploration Company operated the Round Valley mine in the Tungsten Hills west of Bishop. Ore was produced from a winze sunk off the west end of the inclined shaft level and was milled at the El Diablo mill. The grade of ore, on the basis of mill recovery, averaged 0.7 percent Wt. The Tungstar Corporation rehabilitated their mill on Pine Creek and milled about 1000 tons of ore from the Black Rock mine in Mono County. Percherite concentrates were produced from the Yaney mine located 4½ miles southwest of Bishop.

R.M.S.

Kern County

The value of Kern County's mineral production was the highest in the state, and more than 90 percent of this value was in oil and gas. Of the other mineral commodities produced, boron minerals and cement were the more important. Metal mining was confined to gold in the Mojave and the Randburg districts.

Mineral Fuels. Kern County, in addition to having the highest production of oil and gas, was the most active county in the state in regard to footage of wells drilled. It was also the scene of numerous new pool discoveries and new zone discoveries in proved fields. Of significance was the discovery of a new deep pool by the Standard Oil Company in the Wasco field. The discovery well came in at 330 barrels per day of 38.9 gravity oil from an Eocene formation at an interval between 15,110 and 15,500 feet. This is the world's deep production record.

Nonmetallic Industrial Materials. The Pacific Coast Borax Company mined large quantities of borates, in the form of crude borax (tincal) and kernite, from their property at Boron near Kramer. The extensive deposits of these minerals occur interbedded with Tertiary shales at depths of from 300 to 1000 feet. The deposits of commercial importance underlie a ½ by 1½-mile area. Two mines, the Baker and the West Baker, were worked by a room and pillar method of mining. The crude borax, which is in the hanging wall of the kernite deposit, and the kernite were mined separately. These ores were hoisted through vertical shafts, crushed and shipped to the company's refinery at Wilmington, or put through the concentrating and treatment plant at Boron.

The only cement plant in Kern County was operated by the Monolith Portland Cement Company at Monolith. This is a wet process plant having a capacity of 7500 barrels per day. Limestone was quarried from a deposit located about 1 mile north of U. S. Highway 466 and midway between Tehachapi and Monolith. Electric power shovels at the quarry between "glory holes" serving an underground haulage system to the crushing plant. Crushed limestone from this 300-ton plant was hauled by diesel locomotive to Monolith. Clay was obtained from a deposit 4 miles northeast of Monolith, and gypsum was mined from a deposit in Ventura County. Wet fine grinding of the clay and limestone resulted in a slurry, 35 percent water, which was pumped to slurry storage tanks then through correction tanks to a storage bin. Cement clinker was produced in five rotary kilns. Two separate clinker grinding circuits were used and the finished cement was stored in silos, which have a total capacity of 240,000 barrels.

Clay for rotary drilling mud was produced from the dry lake in the Rosamond and Murco areas. The Mojave Corporation excavated it from a deposit on Murco Lake. The material was hauled by truck to the

Hough loader equipped with a 4-cubic-yard bucket dug the gravel to water level at a depth of about 5 feet, and the material was loaded in trucks of 5-cubic-yard capacity, about a quarter of a mile to the crushing and screening plant. The capacity of this plant was increased to 400 cubic yards of washed and screened sand and gravel in 8 hours.

The Lang Brothers pit on Kelsey Creek, 7 miles south of Lakeport, intermittently produced commercial sizes of sand and gravel. A bulldozer pushed gravel from the pit into a hopper at the screening plant, which had a capacity of 100 cubic yards per day.

The Aggrellite Company used altered basalt from one of the waste dumps of the Sulphur Bank mine as aggregate for concrete building blocks. In a plant, adjacent to the waste dump, the aggregate was crushed and screened to minus three-eighths inch before being mixed with cement in a conical concrete mixer. The blocks were molded in a Form Vibrating block machine. Capacity of the plant was 2,000 blocks per 8 hours.

Mineral water containing sodium chloride, magnesium and sodium carbonates, and other minerals was bottled at Grizzly Spring. The spring flowed about 2 gallons per minute and the water was piped to a bottling machine with a capacity of 60 dozen 12-ounce bottles per hour. The water was marketed chiefly in the Clear Lake area.

Metals. The Abbott mercury mine was reopened in June. The workings to the 300-foot level were unwatered and the drift was extended 1200 feet to a total length of 1500 feet. The drift, which followed a serpentine-shale contact, encountered some new ore about 1300 feet from the shaft. The ore-shoot was 50 feet long, 4 to 8 feet wide, and dipped 70° southwestward. Some trenches and pits were dug on the surface above the new ore shoot, but no ore was found there. Development work was suspended in December 1949.

J.C.O'B.

Lassen County

Basalt rock for concrete aggregate was quarried near Susanville. Gold quartz claims in the Diamond Mountain district were prospected with trenches, short adits, and shallow shafts.

Nonmetallic Industrial Materials. Basalt rock was mined at the Grayson and Spurgeon quarry 8 miles west of Susanville. Vertical holes were drilled 5 feet deep and at 5-foot intervals with a jackhammer. From 40 to 50 holes were blasted with 40 percent dynamite each week. The broken rock was pulled over a rail grizzly with 10-inch spaces by a 1-yard slusher, and the undersize was crushed and screened. After Harold Grayson purchased his partner's interest in December 1949, the name was changed to Grayson Cement Material Company.

Metals. Gold in the Diamond Mountain district is associated with red and yellow limonite-stained quartz that occurs in veins and stringers, and particularly with minute quartz crystals incrustated with black manganese stains. No shipments of gold ore or bullion were made, but small piles of ore were stored at many prospect cuts, adits, and shafts. Several narrow quartz veins were prospected on the Blue Bell group of claims owned by C. L. Musgrove and M. L. Harris. The quartz veins developed are from 10 to 30 inches wide and strike N. 45° E. in quartz diorite, and in addition, there are quartz stringer zones from 4 to 15 feet wide in quartz diorite which also strike in a general N. 45° E. direction and dip steeply to the southeast. George McIlwain, Jr., prospected his Gold Bell

group of claims with six bulldozer cuts 3 to 4 feet deep and from 20 to 25 feet long. Several quartz stringers were cut but no samples were taken. Frank Schmidig extended an adit on the Red Jacket group of claims where the quartz vein, 6 to 8 inches wide, strikes N. 45° E. and dips 80° W. Both walls are quartz diorite. Several tons of ore were piled on the dump awaiting construction of a milling plant.

J.C.O'B.

Los Angeles County

More than 90 percent of the mineral substance produced in Los Angeles County during 1949 was petroleum and natural gas. Non-metallic industrial minerals were next in importance, with the sand and gravel industry being the largest. Over a third of the sand and gravel produced in California is derived from the Los Angeles County deposits. Other important nonmetallic industrial minerals produced in Los Angeles County were clay, diatomite, and iodine. Small amounts of flagstone and granite were also produced. Of the metals, only small amounts of gold and ilmenite sands were obtained.

Mineral Fuels. In 1949, petroleum and natural gas was produced from 33 fields in the county. The most important single discovery during 1949 was the opening of the higher gravity pool in the Placerita field. This pool was discovered by the Somavia and Yant well "Juana 1," which came in flowing 310 barrels per day of 23° gravity oil, 10° higher in gravity than the oil from other Placerita producers. The heightened drilling activity, caused by this discovery, continued until the end of 1949. Activity was further increased by the decision of the California Superior Court on September 23, 1949, which declared the state's Spacing Act unconstitutional and opened about 80 acres of highly subdivided land in this pool to unrestricted drilling. By the end of 1949, the peak of the excitement had passed, and the newly opened pool had about 170 producing wells on it, each pumping an average of about 175 barrels per day.

In the first half of 1949, the northwest part of the Long Beach field on the south side of the fault also experienced a minor boom caused by the discovery of the DeSoto zone. Wells in this zone, which is 10,000 feet deep, averaged initial productions of 115 barrels per day of 28° to 30° gravity oil.

Nonmetallic Industrial Minerals. Cement has been manufactured for some years by the Blue Diamond Corporation in its Los Angeles plant. The company uses clinker obtained from the California Portland Cement Company at Colton, and the Southwestern Portland Cement Company at Victorville. The clinker is crushed and blended in the manufacture of cement.

Clay was produced in Los Angeles County by over 20 operators. No high grade clays are produced, but large quantities of common clay are mined for use in the manufacture of heavy clay products, such as bricks, tile, and sewer pipe, and in pottery.

The only producer of diatomite in Los Angeles County was the Diatom Division of the Great Lakes Carbon Corporation. The deposit is at Waveria in the Palos Verdes Hills. This is an open pit operation mined with power shovels. The mill, which includes several stages of crushing, drying, and burning, is located on the same property. The product, a finely pulverized pure diatomite, is used as filter absorbent and abrasive material.

Small amounts of flagstone were intermittently produced by the Blue Goose Quarry in San Francisco Canyon. No power machinery was used in this small operation. Mining was carried out by hand, using hammer, crowbar and chisel. Other small quarries produced flagstone from the Mochelo shale at various places in the Santa Monica Mountains.

Minor amounts of granite were quarried by Mr. H. A. Jones of Pasadena from a granite-gneiss deposit near Saugus. The rock is used mainly as a rough building stone for walls and buildings, and is occasionally split for flagstone. Extensive fracturing of the rock prevents its use as dimension stone. The quarry is operated intermittently by hand methods.

All of the iodine produced in the United States is from Los Angeles County. Two companies using different processes are actively producing iodine from oil-well brines in the Dominguez, Seal Beach, Venice, and Inglewood fields. The Deepwater Chemical Company at Dominguez uses the silver process. Silver nitrate is added to the cleaned brine, forming a fine precipitate of silver iodide. The silver iodide is coagulated with ferric chloride and allowed to settle, and the clear water is decanted through a sand filter. The sludge, containing silver iodide, ferric hydroxide, and other ferric compounds, is treated with sulphuric acid to remove the ferric compounds. The silver iodide is filtered, washed, and tumbled in a tank containing metallic iron and water. This results in the formation of fine metallic silver in a ferrous iodide solution. The silver is removed by filtering and converted to silver nitrate to be used over again. The ferrous iodide is reacted with potassium carbonate, which forms potassium iodide. This solution is evaporated, yielding crystalline potassium iodide.

The Dow Chemical Company uses a blowing-out process. Clarified oil field waste water is acidified and treated with chlorine to free the iodine. The iodine is removed in a blowing-out tower in which the descending current of water containing free iodine meets a rising current of air. The air current carries the free iodine to another tower, where the iodine is extracted from the air with a solution of sulphurous acid. This results in a mixture of hydroiodic acid and sulphuric acid. The mixture is treated with chlorine, which displaces the iodine. The free iodine is then filtered out of solution.

While iodine is found in the brines of many oil fields in California, only a few have commercial concentrations. Little is known regarding the origin of the iodine, but it appears to occur mainly in oil-bearing horizons of Miocene age.

A large portion of the foundry sand requirements for low temperature castings in the Los Angeles area were supplied by local sources. Several pits of foundry sands were operated during the year, mostly centering around the Torrance-Redondo area. Small amounts of foundry sand were obtained from a deposit near the eastern end of Elysian Park.

The sand and gravel industry is the largest mineral industry in the county except for petroleum and natural gas. Main centers of activity for this industry are in the San Fernando Valley and the San Gabriel Valley, where extensive deposits of sand and gravel have been laid down in the channels and flood plains of Tujunga Creek and the San Gabriel River. Over twenty plants were producing sand and gravel during 1949, most of them in these two areas. Two plants were operating in the vicinity

of Long Beach. The large amount of building and construction in the county has resulted in the industry's continued growth and activity.

Metals. Gold was produced from two operations in Los Angeles County during the year. The Hi-Trade mine in Mint Canyon erected a 12-ton mill at its shaft, and by the end of the year had increased the capacity of the mill to 20 tons per day. The mill, operated intermittently throughout the year, is equipped with a jaw crusher, classifier, ball mill, and amalgamation plates. The mine is developed by an inclined shaft to a 210-foot depth, with drifts at the 210-foot, 140-foot and 118-foot levels. The ore is quartz veins containing free gold, and copper sulphides associated with gold.

The Large Plant of the Consolidated Rock Products Company at Azusa also produced a small amount of gold as a by-product during the washing stage in its sand and gravel operation. The sand and fines are washed down a flume fitted with rubber riffles, which collect the gold and black sands and allow the sand to pass on. The black sand is shoveled from the riffles and sacked every 2 weeks. This material is run over an Anderson rotary motion table to make a final concentrate which is shipped to the American Smelting and Refining Company at Selby, California.

A small quantity of ilmenite was produced by the Ferro-Titan Minerals Company as a by-product of the sand washing section of Consolidated Rock Products Company's Roseme plant in San Valley. The black sands are concentrated from the flow of wet sand by use of black sand recovery pans. Concentrates are dried and then cleaned with a magnetic separator. Most of the equipment used has been developed by the manager of the Ferro-Titan Minerals Company, Mr. Frank Moody of Glendale, California. The black sand plant is able to handle large tonnages of sand, and make quick primary concentrations up to 97 percent heavy sand, which contains 92 percent combined ilmenite and magnetite. The ratio of magnetite to ilmenite is about 55-45 percent. The black sand plant, however, works only when the rock plant works. Most of the product is sold for roofing granules, although small amounts have been sold for use in the manufacture of welding rod, and in the ceramic and pyrotechnic industries.

G.C.H.

Madera County

Three operators produced pumice, two near Friant and one north-east of Lane's Bridge. Gold production was reported from 10 operators, eight of whom used suction dredges. Small quantities of natural gas were produced from the Gill Ranch and Moffatt Ranch fields in the Mendota-Firebaugh area. Plaster and concrete sand were quarried and processed at Firebaugh.

Mineral Pools. The northwesterly extension of the Moffatt Ranch field was established by Natural Gas Corporation's well "Moffatt" in June 1949. The productive interval was 3912-3947 feet in the Bocone. Initial production from this well was 500 thousand cubic feet per day. Some gas was taken from one well in this field during the year. Production came from five wells in the Gill Ranch field, the field being shut in during the summer months. The Chowchilla field has been shut in for many years.

Mono County

Output of nonmetallic materials continued to lead mineral production in 1949. Construction of a new gold mill at the Chemung mine near Masonic, however, was outstanding among recent developments. Pumice operations ranging from the south shore of Mono Lake to the southern border of the county produced a variety of aggregate and abrasive materials. Kaolin from the Casa Diablo Hot Springs area and pyrophyllite from two deposits on the lower slope of the White Mountains added to total mineral production. Gold mining was active in the Masonic district; tungsten operations were limited to a small production and limited exploration.

Nonmetallic Industrial Materials. The pumice industry in Mono County is outstanding for its variety of products. Lightweight concrete aggregate, plaster aggregate, abrasive media, scouring blocks, and containers for plant culture are among the several items.

United States Pumice Supply Company, Inc., quarried block pumice from two localities near Leeving. The deposits located near the southern edge of Mono Lake were worked by open-pit methods. Overburden was removed by a carryall; the pumice was then drilled and blasted into blocks as much as 5 feet in diameter, which were hand-sorted and transferred to a truck-loading bin by a Traxcavator. The plant at Leeving uses saws and other equipment to produce two nationally-known products, Thrillmaster, a scouring block for griddles, and Plantmaster, a shaped pumice container for growing plants.

Delta Pumice mine, about 10 miles southeast of Casa Diablo Hot Springs, operates an aggregate and block plant. Pumice was mined from an open cut with a skiploader and transported to the adjacent plant. The unconsolidated pit-run material passed over a 4- by 8-foot vibrating screen, with the minus three-quarter-inch product falling directly into the block storage bins. Capacity of the block plant is 2,300 blocks per day. The blocks are water-cured for 17 days before marketing. Insulation and plaster aggregate products were produced by passing crude pumice through a trommel, the screen size on which was varied to meet consumer specifications.

Benton Pumice Company was producing as much as 400 tons per month of aggregate material from their deposit south of Old Benton. Here two pumice beds are separated by 3 feet of clay. The upper bed, 15 feet thick, contains material as large as 1½ inches; the lower bed, 10 feet thick, is composed principally of fine material. A bulldozer was used to excavate the pumice and deliver it to a receiving bin from which it passed over a shaking screen for sizing. Production in 1950 was a mixture of minus three-eighths-inch to plus nine mesh pumice that was consumed in Los Angeles for pumice-block manufacture.

Insulating Aggregates Company's modern plant, 6 miles north of Laws, produced several types of blended plaster aggregate and abrasive materials. Pumice used was mined from a large deposit adjacent to the plant. The extensive bed of white, fine-grained pumice is as much as 15 feet thick and is overlain by a pinkish brown colored tuff.

B. A. Van Loan worked a pumice deposit in the Yellowjacket district. Material was transported to Bishop for use as an aggregate in concrete blocks and slabs.

Pyrophyllite was mined from two properties along the lower west slope of the White Mountains east of Shady rail siding. The pyrophyllite occurs in a zone of highly metamorphosed rocks in the vicinity of the abandoned Champion Sillimanite, Inc., andalusite operation. Huntley Industrial Minerals, Inc., worked a deposit at the north end of the zone. The raw material was mined by open-pit methods and loaded with a power shovel into trucks for delivery to the company's grinding plant at Laws, Inyo County. Charles Bowen mined pyrophyllite from a deposit 2 miles south of the Huntley property. Most of the pyrophyllite production is consumed as an insecticidal carrier; some was used as material in red-burning tile.

Kaolin was produced by Huntley Industrial Minerals, Inc., from a newly developed deposit in the Little Antelope Valley east of Casa Diablo Hot Springs. The clay, derived from altered, acidic volcanic rocks, was worked by open-cut methods. After drilling and blasting, the clay was loaded by a skiploader into trucks for delivery to the company's grinding plant at Laws. The finished product was marketed for filler material in paper and rubber products.

Metals. Metal mining in Mono County was stimulated by the construction of a 300-ton gold mill at the Chemung mine by the Sarita Milling Company. This company contracted to build the mill and to treat ores from properties leased by Sarita Mining Company. Several formerly prominent mines are held by the latter, some of which are the Sarita, Chemung, Pittsburg-Liberty, and Lakeview. The Sarita Milling Company had also contracted to mine ore at the Sarita mine.

In mid-1950, a 200-foot adit had been driven at the Sarita property to intersect the crushed ore zone. Ore was drawn from that point, loaded into mine cars by a mucking machine, and trammed to a loading bin from which it was trucked to the mill. Beneficiation was by cyanidation and consisted of two-stage crushing, fine grinding in a ball mill to minus 100-mesh material, thickening and agitation. The leaching cycle was 36 hours with a 92 percent recovery for a \$12.00 per ton heads assay. An estimated 80,000 tons of similar grade ore had been developed at the Sarita mine by July, 1950.

Tungsten Associates, Limited, continued exploratory and development work at their tungsten property near Saddlebag Lake. No. 1 tunnel workings were extended 400 feet, of which about 135 feet was drifting in ore assaying 1.2 percent WO_3 . A second exploratory adit was started in late 1949.

Tungstar Corporation treated 1,000 tons of tungsten ore mined from the Black Rock mine 8 miles south of Benton. Scheelite ore occurs along a contact between carbonate rock and dacite. The property had been worked extensively in previous years.

Two small shipments of gold ore were made from the Sacramento mine 11 miles north of Laws on the west slope of the White Mountains.

L. A. No. 40.

Monterey County

A large quantity of dolomite was quarried and calcined at Natividad. Calcined dolomite was combined with sea water at Moss Landing to produce a line of magnesia products, some of which were used in the manufacture of basic refractories at the same locality. Salt was also produced here by solar evaporation of sea water. Dolomite was also mined at...

traps. The concentrate from each bank of jigs flowed over an amalgamating sluice. Rusty gold was recovered by routing this sluice discharge to a jig, a 3-foot pebble mill, and a final sluice with mercury traps. The total gold recovery was estimated to be 90 percent, and 85 percent of the total recovery was made in the jigs.

The General Dredging Company operated a dragline on Alder Creek south of Polson and dredged over 1,000,000 yards of gravel. The dragline was equipped with a 2½ yard bucket on a 70-foot boom, and discharge to a floating wash plant with a Goddison pontoon hull. Gold was recovered by expanded metal riffles and mercury traps in sluices which flanked the 24-foot tramuel. About one percent of the total recovery was in platinum values. The capacity of the dredge was approximately 200 yards per hour.

The Capitol Dredging Company operated two bucket-line dredges and the Lancha Plana Gold Dredging Company operated one bucket-line dredge part of the year. The Cosumnes Gold Dredging Company operated a bucket-line dredge on the terrace deposits south and east of the Cosumnes River. Placer gold was also recovered by the Mountain Gold Dredging Company in the Michigan Bar area.

R.M.B.

San Benito County

Large quantities of cement rock were quarried and manufactured into cement at San Juan Bautista. Dolomite was mined at Hollister. Crushed rock was quarried and processed in a large plant at Logan. Quicksilver was produced at four mines in the New Idria district, although total output was below that of recent years. A small quantity of bentonite was produced. Exploratory drilling for oil proceeded at an active pace.

Nonmetallic Industrial Materials. Good quality dolomite was quarried in the La Cienega district 12 miles south of Hollister by the Westvaco (Chemical Division of Ford Machinery Corporation). The dolomite was shipped to the company's magnesite plant at Newark where it was calcined and used to process salt-plant bitterns in the manufacture of various magnesite products. This district has long been a producer of limestone and dolomite from lenses or roof pendants, which occur both in schistose and granitic country rock in the Gabilan Range. The dolomite at this quarry is a white, fine grained material that runs about 22 percent MgO and is low in iron, silica, and alumina. It was mined from one of four 20-foot quarry faces by a caterpillar-mounted Northwest diesel shovel equipped with a 1-yard dipper. Since the quarry was in the San Andreas fault zone, the rock was fractured, broke readily, and was easily removed by the shovel. Careful chemical control of production was maintained by constant sampling of the working faces. The quarry operated 5 days per week on one 9-hour shift.

The San Juan Bautista plant of the Pacific Portland Cement Company was reopened in 1947 and has been operating continuously since that time. Natural cement rock for cement manufacture was mined at a quarry in San Juan Canyon about 8 miles from the plant. The deposit which was in the San Andreas fault zone, was so fractured that only occasional light shots in torches were required. A 2½ yard shovel was used to load quarried rock to 30-ton trucks. Benchmarks with 100-foot levels were maintained. The crushing house was located at the mill site, where

crude limestone was reduced to minus three-quarters-inch size by a gyratory crusher and a hammer mill, and was then conveyed to the mill stock pile. The cement mill included four gas fired, counter current, rotary kilns, having a 6-foot inside diameter, four underlying rotary coolers, tube mills for clinker grinding, and a battery of concrete storage silos 68 feet high. Shipments were by bag or bulk. The plant employed 131 men, including six men in the quarry, and has a rated capacity of 2500 barrels of cement per day.

A large quantity of crushed rock was produced at the Granite Rock Company's Logan quarry, one of the numerous quarries in the area located in the San Andreas fault zone. The fault, which crosses the north end of the property has so fractured the rock that blasting requirements were reduced. Quarry operations consisted of removal of overburden by hydraulic digging when necessary, light blasting, shovel loading the quarry rock into railroad cars, and transportation to the adjoining crushing and screening plant for further processing.

Metals. The New Idria and Juniper mine were the principal quicksilver producers in 1949; a small production was also made at the Aurora and North Star mines. The rate of production at the New Idria mine was far below capacity. Here the size of the operating crew has been periodically reduced since the termination of World War II in 1945, owing to the continued decline in the price of quicksilver. By June 1950 the company had decided on a complete shut-down of the mine and was removing electric wires and track from the workings. Considerable ore of average grade remained on the tenth level, but it could not be profitably worked at prevailing prices.

At the Juniper mine, formerly the Lea Grant, Henry Berg and Louis Sciochetti have continued to develop the property, which they began operating about 5 years ago. Current work was centered around the old Lily workings near the entrance to Griswold Canyon where ore occurs in hydrothermally altered Panoche sandstone on the north flank of the Cervo anticline. Entrance to the workings was gained through two adits. The lower adit extended westward about 250 feet, and track was laid to the face. A number of raises extending to the upper level provided ventilation and permitted the transfer of ore to the lower level. The walls stand well, but timbering was used in a few places where the adit had been widened by removing ore. In places seams of cinnabar a quarter of an inch thick traversed the back and walls of the adit, and near the working face the roof was solid cinnabar. A considerable quantity of 3 percent ore has been mined. Operations were slightly handicapped by lack of water. The ore was hand trammed to the portal of the lower level, dumped through a grizzly into the mine bucket, and trucked about a half a mile to the retorts. The latter consisted of two units, each containing two alloy steel cylindrical rocket tubes, half an inch thick, 12 inches in diameter, and 12 feet long.

P.P.H.

San Bernardino County

The production of nonmetallies in San Bernardino County during 1949 far exceeded that of metals, both in quantity and value. The basic mining operations in the county were those of the portland cement plant at Colton, Oro Grande, and Victorville, and of the heavy chemical plant that treat the Searles Lake brine. Talc, lime rock, silica sand, and other nonmetallies contributed to the total nonmetallic production.

was hindered by uncertain metal prices and high operating costs. Lead, zinc, and tungsten were mined in the greatest quantity; but silver, copper, gold, and iron ore were produced also.

Mineral Fuels. During 1949, five dry holes totaling 14,506 feet were drilled in the Barsow, Cajon Pass, Chino Hills, and Victorville areas. Oil has been sought in San Bernardino County for many years, but with the exception of an area of small production near Chino, the exploration has been unsuccessful.

Nonmetallic Industrial Materials. The county's three portland cement plants, the California Portland Cement Company at Colton, the Southwestern Portland Cement Company at Victorville, and the Riverside Portland Cement Company at Oro Grande continued production at a high level.

By far the most important saline producing area is the Searles Lake district where the American Potash and Chemical Company at Troma continued to produce borax, boric acid, potassium sulfate, potassium chloride, sodium sulfate, soda ash, lithium salts, bromine sales, and bromine from the Searles Lake brine. The West End Chemical Company, also at Searles Lake, continued production of borax and soda ash from the same brines.

Common salt and calcium chloride were produced at Bristol Lake. The California Salt Company worked a 5-foot bed of rock salt that lay beneath 6 to 7 feet of overburden. After a dragline had removed the overburden, the salt was drilled with wagon drills, blasted, and loaded into small cars by draglines. At the mill at Saltus, 4 miles from the deposit, the salt was crushed to 2 inches, washed on conveyors, crushed again to minus three-fourths inch, and reworked on a set of spiral conveyors that discharged directly into gondolas. Approximately half of the output was consumed by the Los Angeles Metropolitan Water District and the remainder by the Stauffer Chemical Company at Henderson, Nevada. Capacity of the plant was 50 to 60 tons per hour. The Hill Brothers Chemical Company produced flake calcium chloride at Saltus from brine obtained from the California Salt Company. M. M. Stevens of Amboy also produced calcium chloride. Lake brine that seeped into a collecting ditch was pumped into evaporation ponds where it was concentrated to a gravity of over 40° Baumé (over 50 percent evaporation). At this density sodium chloride precipitated, with calcium chloride remaining in solution. The calcium chloride brine was pumped into storage tanks and shipped in tank trucks. A flaking plant owned by Mr. Stevens has been inactive since 1948. The sodium sulfate plant of the Dale Chemical Industries, Incorporated, at Dale Lake was shut down in February 1949, and no shipments were made.

The Victorville Lime Rock Company produced a wide range of sizes of ground limestone at Victorville. Two grades of rock were produced from the same quarry 4 miles north of the plant. One, a very white material selected by hand picking, was used in paint and putty, while the other, which is slightly off-color, was used in ceramics, stucco, plaster, stock feed, for roofing granules, and in the ceramic, rubber, and foundry industries. The mill, which employed a process of dry crushing and air classification, ran 24 hours a day throughout the year. The Chubbuck L. Company opened a new quarry late in 1949 half a mile from Chubbuck. Crushed limestone was produced.

W. H. Johnson and Company produced granite for building stone at a fabricating and polishing plant in Victorville. Although the company quarried a little stone from its own properties, most of the stone processed came from California localities outside of San Bernardino County, other sources in the United States, or from foreign countries, notably Sweden. Some stone came from the company's Lucerne Valley property where three quarries had been opened. Three deposits of different colored stone near Baker and a newly discovered deposit of green granite at Stoddard wells were being developed. At the Victorville plant granite was sawed into 1- to 6-inch slabs, plastered to polishing beds for preliminary polishing, shaped with diamond saws, and given the final polish.

The Atlas Silica Quarry made large shipments of various grades of crushed and screened silica and quartzite from a plant and quarry about 3 miles east of Oro Grande. The operation, which was owned by the Mineral Materials Company of Alhambra, California, began production in 1939. The material was used as a refractory and in the manufacture of sulfate-resistant cements.

The Baroid Sales Division of the National Lead Company produced bentonite from the Hector mines 4 miles south of Hector. Although in the past bentonite had been obtained from an open pit, all of the 1949 operations were underground. The material was trucked to Hector, sun-dried, and shipped by rail to the company's grinding plant at Los Angeles. Most of the output was used in the manufacture of drilling muds. The Inerto Company of San Francisco also produced bentonite from an underground mine close to the Hector property. Hand-picked, high-grade bentonite was used by the Inerto Company for filtering beer; the remainder was sold for numerous other purposes. The clay deposits near Hart were worked by Gladding, McLean and Company of Los Angeles and by the Southern California Minerals Company. Clay from these open cut operations was used mainly in the production of wall tile.

The four tale producers that had been active in previous years mined tale primarily for the ceramic industry, although a substantial tonnage was consumed by the paint, rubber, and textile industries. The largest single tale operation in the county was the Western mine several miles southeast of Tecopa which has been operated by the Western Tale Company for many years. The Pomona Tile Company worked its deposit near Yucca Grove, while the Southern California Minerals Company, whose tale operations are centered about an area north of Saratoga Spring, worked the Superior mine continuously and put the Pongo mine into production. The Sierra Tale and Clay Company mined tale throughout the year at the Silver Lake mine northwest of Baker and at the Hex and Monarch mines near Hex Springs. This company also operated the Smith mine in the western Kingston Mountains during the early part of the year.

Bastnaesite. One of the most significant mineral discoveries in the state was made in April 1949 when bastnaesite was discovered near Mount Pass, about 34 miles east of Baker, immediately north of U. S. Highway 94. Bastnaesite is a fluorocarbonate of cerium and lanthanum, with minor amounts of thorium and uranium present as impurities. The

uranium and thorium content is apparently too small to allow the deposits to be worked for these elements, but is sufficient to impart radioactivity to the mineral. However, up to the present, most of the rare-earth elements used in the United States have been obtained from monazite, which is largely imported. The discovery is therefore of economic importance as it may serve to make the United States independent of foreign sources of these elements.

Geologists of the U. S. Geological Survey assigned to map the deposits discovered that the bastnaesite occurs in carbonate veins, which also contain barite, fluotite, quartz, limonite and hematite, and a small amount of galena. The veins of the discovery area are contained in shonkinite, a plutonic rock closely related to syenite. The shonkinite has intruded pre-Cambrian schists and gneisses. In this area at least five veins containing bastnaesite are known, and a shallow shaft on the largest exposed a 15-foot vein containing 20 to 30 percent bastnaesite. The veins also contain other rare-earth minerals, including at least one previously undescribed species. Since the discovery, veins have been discovered at other localities through a belt at least 6 miles long. Most of these are contained in pre-Cambrian gneisses and schists rather than in the shonkinite. At the end of 1949, arrangements were being made for the Molybdenum Corporation of America to purchase and develop the original sixteen claims. In the surrounding territory many prospectors have been active staking and developing other claims.

Metals. The Mohawk mine at Clark Mountain, the principal lead producer of the county, made shipments during the first half of 1949. Because of a drop in the price of lead, operations were curtailed after June and the crew reduced to two men; the mine was closed at the end of the year. The ore was principally lead and zinc carbonates carrying silver. Development work was restricted to 800 to 900 feet of diamond drilling on the 256-foot level of the Winter Quarters winze. Reserves of relatively low-grade ore were reported to be large. The Carbonate King zinc mine on Kokoweef Mountain shipped ore averaging nearly 40 percent zinc to the International Smelting and Refining Company at Tooele, Utah. The principal ore minerals were smithsonite, hydrozincite, and sphalerite. A small amount of diamond drilling was done, and a winze was sunk 100 feet during the year. Ore was found after crosscutting 20 feet from the bottom of the winze. The New Trail copper mine in the Ivanpah Mountains was leased by the Alloy Mining Company in October 1949. Small shipments of copper-gold ore were made in the first half of the year. The Roosevelt (Bagdad-Chase, Pacific) mine produced copper-gold ore, mainly from the 400-foot level of the inclined shaft. Little development work was undertaken. From four to six men were employed throughout the year. The California Silver Corporation built a 50-ton mill at Silver Lake, 7 miles north of Baker, to process ore from the company's Silver Hill mine which was 12 miles from Silver Lake near Riggs. The new mill operated about 4 weeks and then was shut down. Concentrates were shipped to the American Smelting and Refining Company at Selby.

Shipments of iron ore were made from the Cave Canyon deposit to the California Portland Cement Company for use in the manufacture of portland cement. The California Portland Cement Company, which owns the deposit, contracted the moving and loading of the ore to the Mineral

Materials Company of Alhambra. The deposit has been worked about every 2 years to maintain a stock pile at the Colton plant. At the Bessemer iron mine, 8 miles southeast of Newberry, experimental work was carried out to determine the best method of mining the ore. Intermitent shipments were made to several foundries and steel mills, some as far away as Oregon and Washington.

The Surecase Mining Company of Sacramento, California, produced scheelite from lodes and scheelite and gold from placers at Avoca. Lode operations by the company were restricted to open pit mining with draglines, but underground lode mining was carried on by leasers. A small portable plant treated the placer ore. Gravel excavated with a dragline was washed and screened into three sizes with a trommel. The two coarsest sizes were hand picked under ultra violet light, while the finest size was treated with jigs. Gold was recovered with two Andy bowls fed with mercury at the rate of 10 milligrams per hour. Plant capacity, which was influenced by the grade of the feed, averaged about 80 cubic yards per hour. Three shifts per day were working on draglines and two on the placer concentrating plant until the middle of the year when but one shift per day was employed on all operations. (C.C.M.)

San Diego County

In 1949 the entire mineral output of San Diego County was composed of nonmetallic industrial materials. The county has yet to yield petroleum in commercial quantities, and metal mining was dormant during the year. As in past years, salt and aggregate materials continued to be the county's principal mineral commodities. Also active were operations producing clays for use in the manufacture of brick and hollow building tile, crushed rock for poultry grit, granite dimension stone, magnesium compounds, pebbles for filters, pyrophyllite as an insecticide carrier, and sands for use in glass manufacture, sand blasting, and foundries. The total mineral yield for the year was valued at slightly more than \$5,000,000.

Mineral Fuels. Although commercial accumulations of oil have been sought in the county for many years, none has been found. The only well drilled in 1949 is near Oceanside. It was abandoned at a depth of 1,028 feet when no oil showings were encountered.

Nonmetallic Industrial Materials. All of the salt produced in San Diego County is obtained at the plant of the Western Salt Company in Palm City, where sea water is subjected to solar evaporation. The sea water is first introduced into tide ponds, then successively transferred to evaporating ponds, pickling ponds and crystallizing ponds. Gypsum, magnesium salts and other materials are deposited in the pickling ponds; relatively pure salt forms in the crystallizing ponds. The remaining brine, known as bittern water, is delivered to the nearby plant of the Westlake Chlorine Products Company where it is used in the production of various salts of magnesium and calcium. The salt at the Western Salt Company's plant is harvested during the summer months. It is loaded by a dragline into gondola cars and is used principally as a preservative for foods and hides, and in refrigeration and water softening processes.

The production of sand and gravel to meet the demand for building and construction industries in San Diego County is

uranium and thorium content is apparently too small to allow the deposits to be worked for these elements, but is sufficient to impart radioactivity to the mineral. However, up to the present, most of the rare-earth elements used in the United States have been obtained from monazite, which is largely imported. The discovery is therefore of economic importance as it may serve to make the United States independent of foreign sources of these elements.

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The production of sand and gravel, in meeting the demand of the building and construction industries in San Diego County, accounted for

a high rate. Twenty-four sand and gravel pits were active in 1949. Most of these are along the San Diego, Sweetwater, Otay, and Los Penasquitos Rivers. Several of the relatively large operations center about the Mission Valley area. These include pits operated by the Canyon Rock Company, Caudell and Johnson, and the H. A. Benton Material Company. Among the other principal sand and gravel sources is a pit at Poway operated by Caudell and Johnson, pits in Murray Canyon, Chollas Valley, and the Otay area operated by the H. A. Benton Material Company, and a pit near Otay operated by Nelson and Sloan.

Specially processed sand, used mainly in stucco and plaster, but also marketed as a sand blasting or filter material, is produced by the Crystal Silica Company at Greenside. The sand is removed from large open cuts. After its moisture is removed by heating, it is classified by screening and sold in numerous size grades.

Foundry sand, which for many years has been quarried at a locality within the San Diego city limits, continued to be produced in 1949. The quarry is operated by the Hubbard Molding Sand Company, and the sand is marketed throughout California for use in the manufacture of low-temperature castings.

Common brick and various types of pipe and tile were manufactured in three plants in San Diego County during 1949. These are the La Jolla Canyon Clay Products Company near La Jolla, the Union Brick Company in Rose Canyon, and the Vitriified Products Company in Linda Vista. The raw materials for these plants are obtained from nearby clay deposits. In recent years the county's brick and tile industry has installed much modern equipment, including extrusion-type brickmaking machinery and mechanized equipment for handling the raw materials and finished product.

The quarrying of granitic rocks as dimension stone, which for many years has been one of San Diego County's best known mineral industries, was continued at seven operations during 1949. Three companies, the Crystal and Black Granite Company, the Pacific Cut Stone and Granite Company, and the Valley Granite Company, worked quarries in the Spooks Canyon area near Escondido. The California Black Granite Company and the Clemens Granite Company operated quarries in Twin Oaks Valley near Vista and in the Sumerest area, respectively. Quarries near Pala and Vista were operated by Emil Johnson and Sons.

All but the Sumerest quarry yield black granitic rock known as gabbro. Although never mined in large volume, the rock is widely used as a dimension stone for monuments and the ornamentation of buildings. Most of the gabbro quarried to date has been obtained from large residual boulders. Each boulder must be worked separately. It is first split by drilling and blasting, and is broken into smaller blocks by the "plug and feather" method. The blocks are then shipped to finishing shops.

Crushed granite is marketed for use as insoluble poultry grit by the Ramona Granite Company of Pomona. The rock is quarried near Ramona and is marketed in both the Los Angeles and San Diego areas.

In the San Dieguito Canyon area is one of the few commercial concentrations of pyrophyllite in western North America. This deposit has been in operation for about 10 years and is worked by the Pioneer Pyrophyllite Products Company. The material is mined in an open cut, is dry-ground, and is marketed as an insecticide carrier.

Pebbles concentrated along some of the beaches in San Diego County were formerly gathered for use in ball mills. This market no longer exists, but the pebbles are now used in large water filtering systems. Several large city plants which replaced their materials in 1949 used these pebbles and brought an increase in their output.

Metals. Although no metal production was reported in San Diego County during 1949, early in 1950 a tungsten property, 5 miles south of Julian, was put into production. The mine is operated by the Live Oak Mining Company, which ships concentrates to a firm in Azusa. To date this operation has been on a relatively small scale. L. A. W.

San Francisco County

The small area and intense urban development preclude the establishing of extensive or diversified mineral production in this county. Nevertheless, sand, fill rock, mineral water, and a small quantity of placer gold were produced during the year.

Nonmetallic Industrial Materials. Sand bunkers near 41st Avenue and Pacheco Street in San Francisco, supplied from nearby sand dunes, market sand used as aggregate and fill. Mineral water was produced from a spring in the Mission district for use in beverages. Building contractors quarried "red rock" for fill from several places in the county, particularly in the Twin Peaks area of San Francisco.

Metals. Gold was produced by hand methods, using portable equipment, from black sand deposits which occur periodically on the ocean beach between Fleishacker Zoo in San Francisco and San Mateo County line. One miner used amalgamation plates to recover the gold. These plates were mounted in a sloping sluice box about 3 feet long; the sluice box being held in a light, wood framework, which also supported a small hopper for the black sand, and a 5-gallon can holding the wash water. Jets of water from a pipe connected to the bottom of the water container washed the black sand through a slot in the bottom of the hopper and over the amalgamation plates. The necessary water for this operation was bailed from the surf. The amalgam was scraped from the plates with a razor blade. Sufficient gold was recovered in this manner to attract part-time workers during element weather. J. A. W.

San Joaquin County

Gold was produced by a bucketline dredge near Clement and the tailings were leached to rock plants in that area. A large rock plant at Kerlinger processed a deposit of sand and gravel derived largely from the Franciscan formation. Sand and gravel products were also produced in the vicinity of Escalon and Riverbank. Lightweight building blocks were manufactured near Stockton, from pumice from Napa County. The clay products industry was centered in the Stockton area where common clay was mined. A substantial quantity of natural gas was produced at the McDonald Island field.

Mineral Fuels. Natural gas was produced from several fields in the county. The McDonald Island field near Stockton is the second most important gas field in northern California. Four producing wells, totaling 21,119 feet in depth were completed by the Standard Oil Company in this field. Standard Oil Company also drilled a deep test hole, 665 to 8,810 feet. The Ametada Petroleum Corporation drilled a deep test, to the Tracy to 11 to 3,600 feet.

DIRECTORY OF MINERAL DEALERS AND COMMERCIAL LABORATORIES

LIST OF MINERAL DEALERS, CUSTOM MILLS, AND
COMMERCIAL GRINDING PLANTS IN CALIFORNIA

FIRM	REMARKS
American Minerals Co., 840 Mission St., Los Angeles, Calif.	Commercial grinding of minerals.
Athins, Kroll & Co. 320 California St. San Francisco 4, Calif.	Dealer in tungsten ores, wolfram, gypsum and limestone.
Barold Sales Division National Lead Co., 830 Ducommun St., Los Angeles, Calif.	Talc and other soft non-acidic minerals ground by contract or purchase.
Bishop Concentrate & Cleaning Co. Bishop, Calif.	Custom mill; purchases tungsten ores and base metal ores.
Blood, Harry E., Co., 5028 Alhambra Ave., Los Angeles, Calif.	Dealer in industrial sand and silica products.
Blue Star Mines, Ltd., 667 S. Anderson, Los Angeles, Calif. (Mill at Zurich)	Dealer in talc and clay.
Bradley & Ekstrom, 320 Market St., San Francisco 11, Calif.	Dealers in all commercial minerals.
Bramley-Donaldson Co., 557 Howard St., San Francisco 5, Calif., and 3050 E. Slauson Ave., Buntington Park, Calif.	Dealer in sand, clay, limestone, dol- omite, and other minerals.
Burton Bros., Rosemead, Kern County, Calif.	Custom cyanide mill. Gold and silver ores purchased.
Butte Lode Mining Co., Kendeburg, Calif.	Custom amalgamation mill, gold-silver ore.

Commercial Minerals Co.,
310 Irvin St.,
San Francisco 7, Calif.

Commercial grinding by contract or
minerals purchased.

Dalley Chemical Laboratories,
Box 228,
Oroville, Calif.

Custom mill for black sands.

Empire Star Mines Co., Ltd.,
Grass Valley, Calif.

Amalgamation, flotation and cyanide
mill; gold ore and concentrates pur-
chased.

Hidecker Co.,
800 S. Mission Rd.,
Los Angeles, Calif.

Clay grinding plant; non-metallic
minerals ground by contract or pur-
chased.

Hill Bros. Chemical Co.,
2159 May St.,
Los Angeles, Calif.

Grinding asbestos, and custom milling
of small lots of soft non-metallic
minerals.

Holmestake Mining Co.,
P. O. Box 308,
Winterhaven, Calif.

Cyanide mill; gold and silver ores pur-
chased.

Huntley Industrial Minerals,
P.O. Box 305,
Bishop, Calif.

Dealers in talc, pyrophyllite, garnet
sands, clay and mica.

Industrial Minerals & Chemical Co.,
836 Gilman St.,
Berkeley, Calif.

Non-metallic minerals ground by con-
tract or purchased.

Kennedy Minerals Co.,
2550 E. Olympic Blvd.,
Los Angeles, Calif.

Non-metallic minerals ground by con-
tract or purchased.

Los Angeles Chemical Co.,
1960 S. Santa Fe Ave.,
Los Angeles, Calif.

Dealer in non-metallic minerals.

Mojave Mining & Milling Co.
Martin Beck,
Mojave, Calif.

Custom mill, amalgamation and flotation

Ontario Rock Milling Co.,
7557 E. Olive,
Paramount, Calif.

Non-metallic minerals ground by con-
tract or purchased. Roofing granules
prepared.

Sierra Talc & Clay Co.,
3509 Randolph St.,
Los Angeles 22, Calif.

Dealers in talc and clay.

Southern California Minerals Co.,
320 S. Mission Rd.,
Los Angeles, Calif.

Dealers in talc, clay and other minerals.

Twining Laboratories,
2527 Fresno St.,
Fresno, Calif.

Purchase and sell concentrate tungsten ores on a contract basis, also tungsten grinding.

U.S. Vanadium Co.
Bishop

Tungsten mill, ore purchased.

Western Talc Co.,
1901 E. Slauson Ave.,
Los Angeles, Calif.

Non-metallic mineral grinding plant; minerals ground by contract or purchased.