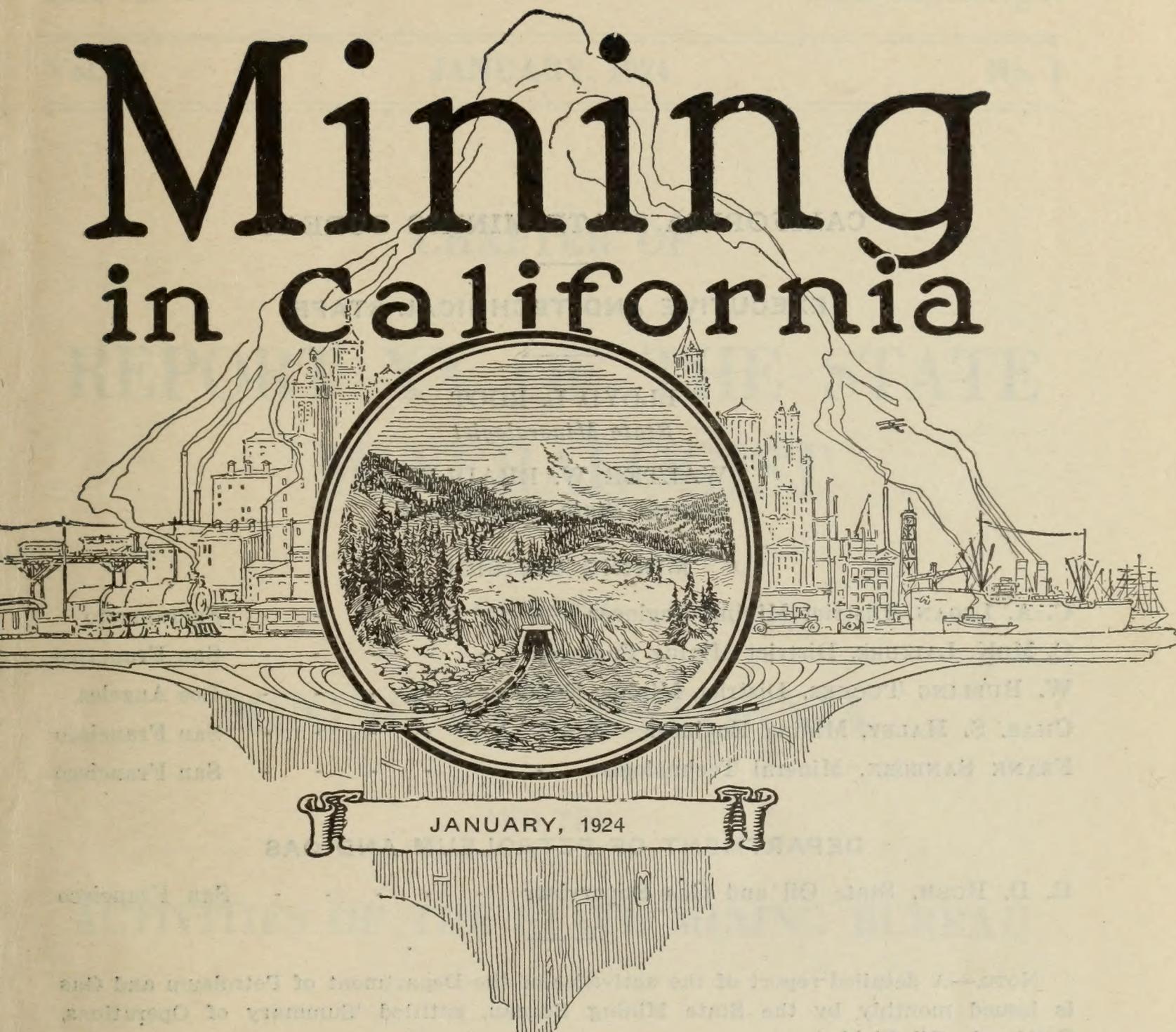


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Mining in California



JANUARY, 1924

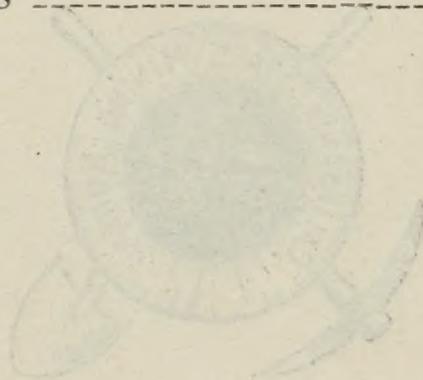
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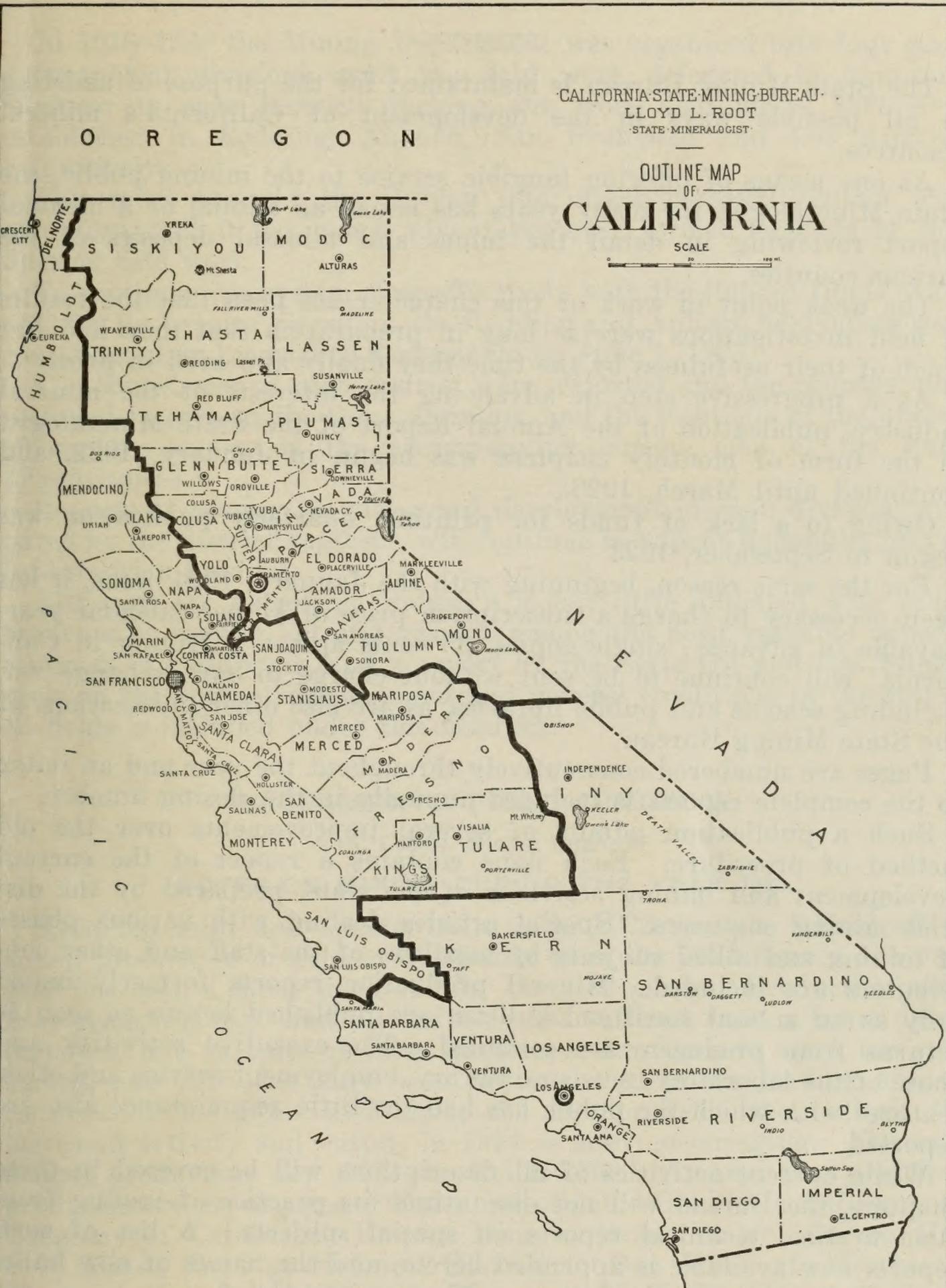
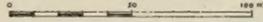
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CALIFORNIA STATE MINING BUREAU
LLOYD L. ROOT
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



- LEGEND -

- Mining Division Boundaries.
- Mining Division Offices.

MEXICO

PREFACE.

The State Mining Bureau is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing, quarterly publication was begun in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the State Mining Bureau.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the Bureau will not discontinue its practice of issuing from time to time technical reports on special subjects. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Mining Bureau is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively.

This move brought the Bureau into closer personal contact with operators, and it has many advantages over former methods of conducting field work.

To continue this system most effectively with the limited funds available for the present biennium, the Redding and Auburn field offices were consolidated and moved to Sacramento on June 1, 1923.

The boundaries of each district were adjusted and the counties now included in each of the three divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

SACRAMENTO FIELD DIVISION.

C. A. LOGAN, Mining Engineer.

NOTES ON MINING DURING THE YEAR 1923.

Although mint and smelter returns in 1923 show a falling off in actual production of gold in California from the 1922 figures, the past year has been a fairly good one for the gold mines. Production costs have remained high and the industry has suffered from a heavy labor turnover, but, in spite of these handicaps, development work has continued, new activities have been initiated and in the leading mining counties of the State and along the Mother Lode the outlook for increased activity and output in 1924 is most encouraging. The estimated production for 1923 is \$13,250,000. Among the principal producers are the dredges of Yuba Consolidated Goldfields and Natomas Company of California; Empire Mine at Grass Valley; Carson Hill Gold Mines, Inc., at Melones; Sixteen to One Mine, at Alleghany; Plymouth Consolidated Mine, at Plymouth; North Star Mines, at Grass Valley, and Kennedy Mine and Central Eureka, in Amador County.

Amador County.

Recent developments in the deep mines in this county as well as at Carson Hill in Calaveras County and at Grass Valley, make it appear that those geologists who have maintained that gold quartz mines invariably become leaner as the depth of working increases, will have to qualify their statement by citing an ever increasing number of California mines that are exceptions to their rule. The limit of some of

these deep mines may be determined by the costs of operation, and not by a diminution in the grade of ore. The bottom levels of such mines as the Argonaut and Kennedy are showing strong fissures and very flattering prospects and it has recently been said that these deep Mother Lode mines are apt to be as rich at the great depths attained as they ever were. Of course it does not follow that all the mines along this 'Lode' will be as rich, at great depth, as there are special geological conditions encountered in every property.

Argonaut Mine. During the first four months of the year the shaft and adjacent workings were repaired, after which repairs and replacements were made on the hoist and the shaft was concreted to a depth of 40 feet. The lower levels were unwatered and milling was resumed about the middle of the year, first with 20 stamps and about the middle of July with 40.

The mine is opened to an inclined depth of 4800 feet. Just previous to the last fire the south drift on this level was showing a width of 20 feet of quartz, and ore was being developed along the vein in new territory south of the region that had marked the limit of good ore in the levels above. Current reports are that this region is giving satisfactory results.

Bunker Hill Mine came under the control of the owners of the adjacent Original Amador Mine this year and it was hoped that the two mines would be worked as a unit, using the Bunker Hill shaft to explore the lower part of the Original Amador, but nothing came of it.

Central Eureka Mine continued mining and milling throughout the year, but not on as high a grade of ore as the previous year. The workings reached an inclined depth of 4100 feet early in the year. Many improvements such as a new headframe, new rails in the shaft and shaft repairs have been made.

Fremont Mine. The mill at the Fremont Mine was put in operation the middle of March after Metals Exploration Co. had spent a long time in repair work and prospecting. The mine and mill have since been in steady operation. About the middle of August, Metals Exploration Co. gave up the property and a new company, known as Fremont-Gover Mines Company, was organized. The directors of the new concern are Edwin Higgins, Roy Elliott, William Colby, S. A. Holman, and E. E. Check.

Due to the fact that considerable ore had been previously developed in the mine, the recent operations have shown a low cost. The mill was handling about six tons per stamp per day in August with 35 stamps in operation on ore of ordinary Mother Lode grade. The company is at present selling stock and the mill is operating.

Kennedy Mining and Milling Company has sunk its shaft from the 4050 to 4200 ft. level (vertical) and has crosscut on the 4200 level recently, with the work still going on as this is written. A width of 20 feet where the crosscut went through the footwall vein has been reported to assay so well that the owners are greatly elated, more particularly since this came close on the heels of the last stock assessment. After passing through the footwall vein the crosscut was being continued through the horse toward the East Vein and had reached a

length of 70 feet when this was written. It was said this entire distance assayed well, but this has not been substantiated.

The Kennedy has suffered a number of interruptions to operation during the past year, and production has been much below normal.

Marklee Mining Company. Jos. L. Del Monte, president, Federal Bldg., Oakland, Cal. Organized to work the Marklee and Alturas Mines, five miles north of Volcano. According to early U. S. government reports the Marklee Mine began production in 1869 and for several years yielded good ore. A boiler, hoist and new headframe have been installed and the old shaft had been partly cleaned out and retimbered late in the fall, with work continuing.

Moore Mining Company has sunk the shaft at the Moore Mine 100 feet and has opened a new level at 640 feet, where the ore body was encountered on the south after about 70 feet of drifting. The difficulty of sinking and keeping the mill running with a single drum hoist was to be overcome by conversion to a double drum hoist, according to plans announced. Milling with 20 stamps was resumed the middle of July. The first clean-up thereafter showed an average yield of \$6.82 per ton.

Old Eureka Mine was sold under foreclosure in July to Walter Harper of New York. This sale is the aftermath of the recent extensive operations about 1920, and the hope has been expressed that with the clearing up of the ownership there might be some action toward reopening.

Oleta Gold Mining and Milling Company has been doing some development work on the L. Smith property near Oleta and has lately been sinking a shaft.

Original Amador Mine was held in readiness for operation until late in the summer, when it was said plans for work had been given up.

Plymouth Consolidated Gold Mines have remained in steady operation during the year and have been one of the principal producers of the county. The operations reached a depth of about 4000 feet and a level was opened at 3850 feet early in the year. The deeper operations have been through a winze, but it has been planned to deepen the shaft if the prospects justify. William J. Loring, general manager. Stanley Arnot, superintendent.

PLACER MINES.

American Flats Gold Mining Company announced they would begin operation at Oleta in July.

Elephant Deep Hydraulic Mine was in operation as long as water lasted the past spring and it was stated that the cleanup amounted to \$15,000. Preparations were under way in the fall for a resumption of work. The mine is in the Volcano district and has been worked under lease by Barone Bros. of that place.

Ludekins Hydraulic Mine in the Volcano district was also operated the past season.

Calaveras County.**COBALT.**

During the past two years several samples of cobalt diarsenide (smaltite) with erythrite, have been brought to the attention of the Bureau. These apparently came from a single small prospect, which was visited in November, 1923. It is in the northwest quarter of Sec. 21, T. 4 N.; R. 14 E.; about a mile by trail from the Murphy-Sheep Ranch road and on top of a ridge at an elevation of over 3000 feet.

A surface cut 15 feet long and 3 feet deep had been made on a stringer of the ore. This had been only a few inches wide between a mica schist footwall and quartzite hanging wall, and had pinched out, so far as could be seen, both on the dip and strike. Only a few hundred pounds of ore had been found, but samples indicated it was of good grade. The claim was idle and the ownership uncertain. It was stated that some work was planned by R. C. Johnson.

COPPER.

Extensive improvements and additions, including enlarged power supply, have been under way at the properties of the *Calaveras Copper Company* at Copperopolis during the summer and fall. Actual production was started late in December.

GOLD QUARTZ MINES.

Apex Mining Company, 78 Bacon Building, San Francisco, Henry Hyde, president. This is a new stock company based upon the *Ford Mine*, one-half mile from San Andreas. The mine was formerly opened to a depth of 700 feet. The present company unwatered the workings to the second level, after cleaning out 60 feet of caved shaft. They report new work underground consisting of 182 feet west and 190 feet east on the 100 level. On this level on the west they found a vein on which they drifted 60 feet and crosscut 44 feet in vein matter. A portion 12 feet wide in the center of this is said to assay well. Some of the quartz seen in place by the writer shows free gold. This vein is a stringer lead in black and greenish schist, with talc on the walls. It strikes about N. 18° W. and in one part of the west workings dips west on account of local faulting, the normal dip being east about 62°. The fault gouge, where one portion of vein was thrust over the other, can be seen. The hanging wall part of the mine as explored in the east crosscut, shows a vein six feet wide, well mineralized with pyrite, 100 feet east of the shaft. It dips east about 50 degrees and is very tight with no gouge. In the next 100 feet, this crosscut shows several talc gouges, and an intrusive rock now changed partly to talc cuts off stringers coming in from the northwest.

The new company claims to have spent \$18,000 to October 1, 1923. They have built 2½ miles of electric line and have installed motors for the hoist, pump and compressor. Four men were employed when visited November 9.

Bullion Hill Mining Co. (Bibl. Preliminary Report 8, Jan. 1922.) This company suspended work about the middle of the year at the Washington Mine, six miles north of Murphy. Time and money that should have been spent in the development of a promising property

were wasted in litigation between members of the company, and work stopped, according to local report, when ore above the adit level had been removed. The owner has taken steps to recover the property.

Golden Eagle Development Co. R. C. Johnson, 453 Frederick Street, San Francisco, has a lease and option to purchase Golden Eagle Claim from the owners, and has located three other claims adjoining, and has formed a stock company to work them. Claims are a mile east of Sheep Ranch, in the southwest quarter of Sec. 9, T. 4 N.; R. 14 E. Equipment includes a small steam engine and hoist, headframe, and shed.

An old shaft 70 feet deep near the center of Golden Eagle claim had been cleaned out and deepened 30 feet up to November 3. The vein shows a wide outcrop near the shaft but can not be traced far on the strike. It strikes northeast. At 100 feet depth the shaft shows a decomposed dike about 20 inches wide with five inches of bluish quartz on the hanging wall and 3 or 4 inches of quartz on the footwall. It is possible the shaft is in the hanging wall of the main vein and that a crosscut will be needed to reach the vein.

Jolly Tar Mining Company. Based on a lease and option to buy a patented quartz claim of the same name in Sec. 28, T. 3 N.; R. 13 E.; one-half mile from Altaville on the Esmeralda road.

When visited November 9 the property was idle and deserted and the shaft more than half full of water. One of the owners stated the shaft had been sunk about 325 feet and that during recent work a sudden flow of water had been opened, forcing the men out until a larger pump can be installed. The dump shows that all the work has been done in blocky amphibolite schist with meager seams of calcite and quartz. Crosscutting to the east is planned.

Morgan and Melones Mines. These mines are now operated as a unit by Carson Hill Gold Mines, Inc., William J. Loring, general manager. The group also includes *Calaveras Consolidated Mine*. The combined properties with their central milling plant, which has a monthly capacity of over 15,000 tons, are the only producing mines on the Mother Lode in the county at this time, and rank among the five largest gold quartz mines in the state as regards both gold output and tonnage handled.

The story of the rejuvenation of the Morgan Mine by Loring after an idleness of 20 years, and the purchase and successful operation of the Melones Mine by him in conjunction with the Morgan after the Melones Mining Company had closed their mine down on account of high costs, is an instructive illustration of the possibilities of deep mining on the Mother Lode.

Ore is being milled from the flat veins of the Morgan Mine and from the deep workings of the Melones Mine. The Melones workings have reached an inclined depth of 4268 feet, measured from the apex on New Year Claim. The lower levels of Melones Mine are reached by a crosscut and new 3 compartment shaft. The later developments in this mine showed again that good ore recurs in depth on this lode if finances permit sinking and exploration at sufficient depth.

The annual production for 1923 is expected to be about as in the past.

DRIFT MINING.

Considerable work is being done on the Central Hill-Vallecito channel system between Parrot's Ferry and Dogtown. These gravel deposits have never been developed extensively because the ancient channels here are below the present drainage, making it necessary to work the ground with shafts and pump the water. The channel course had never been definitely determined this entire distance and it appears that former ideas as to its exact course near Vallecito have lately been proven erroneous. The whole history of the geologic periods when the ancient gravels were deposited, was also much more complex than has been appreciated. The limestone bedrock has proven to be a factor of uncertainty due to the great susceptibility of the limestone to solution and the consequent tendency toward the formation of underground channels, caverns and mud seams.

Balaklava Mining Company. 912 Santa Fe Bldg., San Francisco. Fred Niebling, president; Lee Wilson, secretary. Based on the property including the Osborn and I.X.L. mines near the Vallecito-Columbia road about two miles from Vallecito and between the old Moffat workings on the southwest and Lombard and Sloane workings on the northeast.

There is an inclined shaft on the west half of the property. This shaft is about 400 feet deep on 27° incline, or 185 feet vertical, with a station at 375 feet. From here an old drift, now partly caved, is said to run about 100 feet southwest. Geo. Condon, superintendent, states that a winze sunk from a short crosscut off this drift showed gravel, but no further work was done to explore this gravel so it is not known if it is in place in a channel. The superintendent said it was their intention to run a drift north and east from the 375 ft. station in a search for the north rim. The gravel channel is said to have not been bottomed in these workings, and its depth, width and exact direction are uncertain and it would appear that estimates of probable tonnage of gravel and tenor of same are guesswork.

Equipment consists of gasoline engine, skip for bailing water and blacksmith shop. Seven men were employed early in November, 1923.

Bishop Estate. A. H. McKenzie, L. L. Richard, R. D. Skelley and Don Steffa are associated in prospecting this property to get information on the ancient channel preparatory to mining. They have a lease on 285 acres, and if the prospects warrant may organize under the name of Vallecito Western. At present they are prospecting with a Keystone drill on Six-Mile Creek just above the Angels Camp-Vallecito road crossing, and west of the supposed confluence of the Vallecito and Central Hill channels. Up to the first of November, 1923, they had drilled four holes, of which the first was on the north rim, and the second is said to have passed through 52 feet of rhyolite ash and cobbles and four runs of gravel. The other holes were on the south rim.

Should the results warrant them in opening the ground, they plan to work through two shafts, one near Six-Mile Creek and the other a mile west. There is thought to be about two and a half miles of old channel in the property.

The same partners worked from January, 1920, to June, 1923, at the north end of Vallecito in a search for the Central Hill Channel,

which had been thought to pass that way. Working through a shaft 192 feet deep, they report they did a total of 5300 feet of underground work. This included a drift 1150 feet long northeast on what Steffa terms a fault; also a drift 350 feet south, both from near the bottom of the shaft. They also drove both ways from a depth of 106 feet. A winze was sunk 110 feet below the bottom of the shaft and they report the fissure is about 18 feet wide at that depth. At the 192 ft. level the fissure was about 72 feet wide, but they were there about 100 feet below where the channel might be expected. There is said to be some pay on this latter level for a length of 600 feet, but no bottom. It appeared as if the gravel had been swept or dragged into the open fissure before the lava ash covered the surface. The bedrock here was limestone, and the experience in this case showed the uncertainty of mining an old channel on this formation.

Hesperides Mining Company. H. B. Patterson, president and general manager. This company is working a combined gold mine and gravel pit on the Crocker Estate property adjoining Wallace, on the Lodi-Valley Springs railroad branch. The equipment includes digging, elevating, crushing and screening machinery, besides gold saving equipment. The management reports that the gravel contains a few cents in gold per ton. Several sizes of gravel and crushed rock and pea gravel and sand are produced and a capacity of 600 to 800 tons a day is claimed, with a fair profit on the rock products besides the gold.

Jackrabbit Mine and *Purington Golden Treasure Mine* are north of the Victor Mine on Central Hill Channel. Geo. Werley of Angels Camp and F. R. Purington have been doing some work on these properties, but have not reported any production up to November, 1923. Werley stated they had struck gravel in the Jackrabbit near the old Monarch line and had also run about 70 feet downstream in the Golden Treasure but not in pay. The combined properties cover about 2½ miles along the supposed course of the channel. The old workings of the Jackrabbit Mine included a shaft 191 feet deep and drifts totaling 1700 feet or more, the work having been done about 25 years ago. Equipment includes a Cornish pump, centrifugal pump and 3-stamp mill. The gravel is cemented.

Slab Ranch Mine is between the Victor Mine and Bishop Estate. Wm. Graflin had begun work here in November, 1923. A hoist had been put up and a shaft had been started to prospect the Central Hill Channel. This shaft was down about 45 feet at that time.

Vallecito Consolidated. This mine is on the Bishop Estate property, which see. The original lessees who are now drilling near Six Mile Creek carried on extensive work through this shaft, as described above. The fissure carried pay gravel in small quantity for a length of 600 feet, but the operators did not consider it a large enough showing for the scale of operations they planned, so they subleased this ground to Chas. Sanguinetti and associates of Vallecito, who are continuing work and express satisfaction at the results obtained and the gravel in sight.

Victor Placer Mine has been described in the monthly chapter for January, 1923. The mine has continued operation steadily throughout the year and has been making a small production of gold. The gravel is cemented and has to be milled.

El Dorado County.

There has been little activity in the gold mines of the county during 1923.

Crown Point Mine near Diamond Springs was unwatered during the year but it is said nothing was done in the way of mining.

Grit Mine was abandoned by the Grit Gold Mining Company, who have transferred their operations to the *Vandalia Mine*, which they are rehabilitating at this time.

Gold Standard Mining Company, which had been prospecting just north of the old Zantgraf Mine on a vein parallel to the Zantgraf vein, quit work after sinking a shaft over 125 feet.

There was some activity and a small production from the Slate Mountain district, but in general only small prospecting was carried on.

Just below Georgia Slide on Canyon Creek an effort was made by Wm. Kelliher and Henneuse Bros. to operate a drag line scraper in the gravel and debris that had accumulated in the creek as a result principally of the old operations at the Georgia Slide mines. This equipment was found not adapted to the work and a gravel pump was later put in, but so far there has not been any production.

STRUCTURAL AND INDUSTRIAL MINERALS.

Limestone has become in late years the principal mineral product of the county. *The Mountain Quarries* of Pacific Portland Cement Co. have been producing annually several hundred thousand tons of limestone for use in making cement. *El Dorado Lime and Minerals Company* quarry on the railroad below Shingle Springs and *Newcastle Lime Company's* quarry near Rattlesnake bridge have produced ground limestone and burnt lime for various uses, the latter quarry having been in operation the present year. Besides the kilns it is equipped with a mill to grind limestone for use as a soil corrective and 'sweetener.'

El Dorado Slate Products Company is a recently formed stock company based upon the *Chadbourne Slate* property on the steep south side of Big Canyon, a mile and a half from Placerville station. The property contains 32 acres, mostly patented and is well situated for opening by a series of benches at different levels along the canyon side. The slate will have to be hoisted to the top of the hill, a maximum vertical distance of about 400 feet. Due to its nearness to the railroad, this quarry would have an advantage in hauling costs, as the other quarries are all considerably farther from transportation.

Two or more abortive attempts have been made to open the quarry and bring it to production, but the work done and the output have been trifling. Two openings were started, one 175 feet below the brow of the hill and the other near creek level. The slate opened appears to be of good grade, free from pyrite so far as could be seen in the limited workings and of quality similar to that from other nearby quarries. In the upper pit there is a width of 22 feet without quartz seams which do, however, appear on the hill farther south along the strike.

Stock in the project is being sold but to date there has been no work done at the quarry by the present company. John F. Armstrong of Sacramento is president of the company.

For some years past the principal production of soapstone from the northern part of the state has come from the western part of this county near Shingle Springs and Brandon.

Nevada County.

Due to the lower price now paid for silver and the failure of Nevada to bring in any rich new gold mines, many of the Nevada companies have moved their activities to the Grass Valley district and in the past few months that city has taken on some of the aspects of a boom camp. There have been numerous investigations made and options taken and in several cases work has begun. The movement began too late in the year to permit the recording of actual results at this time, but it is probable that Grass Valley is due to take a prominent place in eastern stock exchange transactions next year and some interesting results may be looked for if promised underground work is carried out.

It has been the conviction of those best acquainted with our California mining districts that our mines need more active and aggressive prospecting companies, and that if new capital could be devoted to deeper exploration of undeveloped territory, the mines would be found not wanting. In this regard the new companies will be doing a real service to the mining industry of the state if they can develop even a few new mines of merit from among the many prospects that have been lying idle around the Grass Valley district.

As most of the mines and prospects of the district have been described in a recently published report of this Bureau, only a summary will be given here to indicate the lively condition of the region.

The mill at the *Alcalde Mine*, four miles southwest of Grass Valley, was put in operation July 23 last following a very flattering little discovery of high grade ore. It has been in nearly steady operation since and some very satisfactory cleanups have been reported. George W. Root and Lloyd L. Root are directing operations.

Alta Hill. (See Grass Valley Gold Mines.)

Ancho Mine, in the Graniteville district, reported taken under option in July.

Arctic Mining Company with claims on Canyon Creek in the Washington district, has been crosscutting during the past summer.

Banner Consolidated Mines including the *Central Consolidated* and the *Norambagua*, have had some preliminary work done during the past summer.

Ben Hur Divide Mining Company of Tonopah, Nevada, took an option in September to purchase the *Ben Franklin* group $2\frac{1}{4}$ miles southeast of Grass Valley. Two known veins have been worked, the Alaska dipping east and the Ben Franklin west. The deepest working was on the Alaska claim which has an inclined shaft about 500 feet deep. The last previous work was in 1916. Work was begun promptly by the present lessees, cleaning out the old workings on the Ben Franklin.

Brunswick Mine was unwatered by the owners during the summer and development has been under way for several months. At the end of November the management announced that they had found what

they thought to be the Mill vein in the 1100 level crosscut and would start another crosscut from the 1300 level.

Eagle Bird Mine in the Washington district was in operation and ore was milled during the year.

Empire Mine has continued mining and milling at the usual rate during the year and will be the principal producer of the county.

The Grass Valley district has been employing about 1000 men, of whom about 400 were working at the Empire, and a nearly equal number at the North Star, and the rest at smaller properties. The quartz mines around Nevada City were idle till late in the year, when work began on the *Mayflower Group*.

Gold Wedge Divide Mining Company of Tonopah, Nevada, has taken a lease and option on the *Randolph Consolidated* property on the Wm. Grant Ranch, near Rough and Ready.

Golden Center Mine at Grass Valley has been leased with option to purchase, to M. K. Harr of Philadelphia, who is locally connected with the Grass Valley Gold Mines. It is stated that water is being removed from the shaft at this time with the idea of beginning work on the 500 level as soon as possible. The owners claim they left a good prospect on this level. This mine is equipped with a 20-stamp mill and considerable machinery. The price agreed upon will give the stockholders of the old company a handsome profit if the deal is completed.

Grass Valley Gold Mines, under the direction of M. K. Harr, president, and F. Sommers Schmidt, engineer, has been sinking a shaft on Alta Hill, near the old Hope shaft. This work had reached a depth of about 415 feet with crosscuts run several hundred feet at a depth of about 275 feet, when operations were halted late in December by lawsuits brought by the various property owners whose land had been held under option by the operating company. No important strike had been announced by this company up to the time work stopped, though it was said some quartz stringers had been crossed in the crosscutting.

Gould Mound Mine in the Rough and Ready section $2\frac{1}{2}$ miles west of Grass Valley and containing about 100 acres, was reported taken under lease and option in May.

Hilltop-Nevada Mining Company. See Grass Valley Gold Mines.

Idaho-Maryland Mines continue under development by Metals Exploration Co. of New York. Early in the year a shaft section of about 1000 feet was completed to give more direct connection with the lower levels and reduce cost of operations. The mill has been used at times for sampling.

Normandie Mining Company has continued prospecting their property near the Alcalde Mine and have reported an encouraging showing found while crosscutting.

North Star Mines curtailed milling operations early in the year on account of a decrease in ore reserves caused by a lagging in development work in recent years and failure of some of the ground to come up to expectations. They began prospecting below the 6300 level through a winze.

Osceola Mining Company has been drifting on the vein in their property near Rough and Ready and have reported good prospects.

Republic Mine in the Graniteville district was operated this year and some ore was being crushed during the summer.

Twin Sisters Mining Company, J. W. Howard, General Manager, 420 Forum Building, Sacramento. Organized in Nevada to work the Twin Sisters Group of three claims and three claims on the Independence vein in sections 12 and 13, T. 18 N.; R. 10 E.; just south of Middle Yuba River and at the south end of the Alleghany district. The claims are 24 miles from Nevada City via Snow Point.

Five men have been employed during the fall of 1923. Two adits were run on the Twin Sisters vein by former operators. No. 1 adit strikes the vein 155 feet from the portal and continues on it 280 feet southward. No. 2 adit is 120 feet below No. 1 and was reported 946 feet long when new work began. For the first 300 feet it is in disturbed ground near the surface, then on the fissure for 385 feet, passing into footwall for 100 feet, and the balance of distance on the vein. The property has not been visited by the writer, and the above details are from a report by E. C. Uren, who states that the vein averages 18 inches to 50 inches wide for the last 160 feet. Since new work started some arsenopyrite ore has been found and good prospects have been reported.

The Eureka ditch crosses the Gold Beater claim 370 feet above No. 2 adit and offers a source of cheap power, 1600 feet of pipe being needed.

PLACER MINES.

The tunnel of the *Gold Lead Placer Mine* had reached a length of 1950 feet and 12 raises had been put up by the middle of the year. Oscar L. Coffin, manager.

Malakoff Leasing Company is engaged at North Bloomfield in exploring the deep channel in part of the old Malakoff diggings. When it was found that the shaft was not yet deep enough to bottom the channel, it was decided to sink 75 feet further, giving a total inclined depth of about 350 feet. An air compressor was taken in this fall to expedite work. W. S. Weaver is manager.

Penn-California Mining Company. Their mining claims are in the Willow Valley district and have been described in our past reports.

Their main adit was driven 2700 feet to a point 600 feet vertically below the center of the ridge then 1500 feet eastward. Raises were put up at 1100 feet (air shaft) 1500, 1800 and 2300 feet from the portal and Hoge reports that 1000 feet of drifts were run from these raises to explore for gravel. Gravel was found, but although a few hundred dollars worth of gold was washed out in the course of prospecting, the manager reports that as a whole the gravel was not of such grade nor of sufficient quantity to justify breasting. It was not confined to a definite channel, but appeared spread out and thin. The last 1500 feet of adit was in slate bedrock, the rest in granodiorite. The adit was in large part double track size.

Recent work has been directed to finding the Buckeye vein which Hoge said he expected to encounter during November or December this

year. He hoped this ledge would reveal ore that would partly pay for carrying on development. The claims are equipped with a 15-stamp mill and sawmill and nine men were employed this fall. Arthur W. Hoge, manager.

Time has not permitted visiting the placer mines of the county this year.

Liberty Hill Hydraulic Mine was in operation a short time early in the year and a small cleanup was made.

Sidney Wood has been preparing for hydraulic mining at You Bet.

COPPER.

Western Copper Company is a consolidation of numerous old mines in the Spenceville district. Eugene Aram of Sacramento and Otto Woehler of Spenceville are forming the company and are part owners of the holdings. The Golden Eagle, Index and Legion claims (formerly the *Mineral Hill M. & S. Co.*) Arkansas Traveler, Last Chance, Jackson, 16 to 1, San Francisco, Philadelphia and American claims, all patented, and 10 unpatented claims adjoining, are included. The claims are 2 to 3 miles north of Spenceville and 14 miles by road northeast of Wheatland. Many of the claims have been noticed in our last county report, and space does not permit a detailed listing of all the shafts and tunnels driven in the past.

Last Chance shaft is 240 feet deep with only a few feet of drifting at different levels. Mineral Hill adit on Index claim is a crosscut 498 feet long, and is said to cut five veins. In Golden Eagle claim a vein is exposed showing carbonate ore in shallow shafts. The dump of the old Bitner shaft, sunk in the sixties and reported to be 160 feet deep, on this claim, shows pyrite ore, which was evidently too low grade to ship at the time. The Jackson claim has been prospected by the California Tunnel, 950 feet long, which is in the wall rock two-thirds of the distance, then enters the vein through a crosscut, near which a raise was put up 60 feet and a winze sunk 40 feet. From here to the face stopes were put up 10 to 25 feet and according to report considerable good ore was taken out.

Recently work has been resumed cleaning out this last named tunnel, and Woehler reports some good assays. Samples shown as having come out in this work carry chalcopyrite, pyrite, galena, other sulphides and malachite.

BARITE.

Democrat Barite Mine near the Liberty Hill hydraulic mine has produced several thousand tons of off-color barite during the past summer for use in making lithopone. The ore has to be treated by a special process to render it sufficiently white for this use.

F. W. Bradley's Barite property north of the old Spanish Mine and six miles from Washington, was undergoing development during the summer. High cost of delivery of ore to the railroad, on account of the distance, has held back the exploitation of this property.

Placer County.

Mining has been rather dormant in this county also the past year.

American Bar Quartz Mine has been under development during the year and a flume has been built to bring in water to furnish power for the mill. The mine was described in Report XVIII of the State Mineralogist, 1922, June chapter.

Canada Hill Mines have been prospected under the direction of Fred Vahrencamp. The property was described in Report XVII of the State Mineralogist, 1920.

Daniel Webster Mine near Michigan Bluff has been active.

DRIFT MINES.

Baltimore Mine adjoining Forest Hill, has been rather extensively prospected by the owners, George McAulay and J. Steiner of Auburn, during the past two years, the work being done on contract by local miners who at the same time are mining gravel in other parts of the mine. The primary channel in this property was cut off by the later and deeper Blue Lead channel, which here was a wide stream with apparently gently sloping rims. The recent work has been done with the idea of picking up the other segment of the primary channel, and to do this they have run across the course of the Blue Lead, beneath the gravel, and have raised when they thought they were far enough on the other side to be beyond the later trough. The Blue Lead was found wider than expected, and the primary or Forest Hill channel has not yet been picked up.

Glen Mine has been in operation on a small scale. On the basis of royalty paid, the property is reported to have produced \$44,000 during 1922, but the yield for the current year has not been reported yet. As far as known, it has been the only productive drift mine in the county for some time, if we except a few prospectors' lone operations. The mine is described in our Preliminary Report 8.

Gold Dollar Mining Company continues prospecting the Blue Eyes claims near Duncan Canyon and beyond the Glen Mine, south of the Last Chance road. They also began this year the prospecting of the *Jack Robinson* drift claim, adjoining the Blue Eyes.

Gold Dollar or Blue Eyes adit has reached a length of 2200 feet. An air and exit shaft part way in is used also for ventilating with a blower. Near the face of the main adit crosscuts were run 150 feet each way and a raise was put up 20 feet from the top of which they ran 110 feet ahead. An electric lighting plant has been installed.

At the Jack Robinson claim a heavy run of secondary gravel, which was revealed by former work but never bottomed, is being prospected. This adit is now (Dec. 15) 280 feet long and Moss reports the floor is running into bedrock. Work at both properties is under the superintendence of F. A. Moss, who is convinced that there is a primary channel in the Blue Eyes that has been cut by the later Jack Robinson channel, and that this primary channel fed the fabulously rich early day diggings of Duncan Canyon and its tributaries, one of which was

worked up to near the site of the present Blue Eyes adit. The Blue Eyes claims cover some 2800 acres along a lava covered ridge which is two miles wide in places and the work by Moss is the first sustained effort to explore its possibilities, although many small 'breakouts' of gravel have been worked along the ridge. Moss reports that his company has made the first payment on the Blue Eyes property. This ridge, as well as the opposite ridge on the other side of Duncan Canyon contains large gravel deposits that have hardly been scratched. Some of these appear from such work as has been done, to be small and rich as in the case of the Glen; others are large and lower grade, but if intelligently worked may exhibit pay streaks that will be worth following.

The *Guggenheim dredge* operating in American River southeast of Applegate has been the principal gold producer of the county the past year.

Plumas County.

This county remains in the lead in the state as a copper producer. As a by-product of the copper mining operations there is also an important production of silver, running from \$150,000 to \$175,000 a year of late. The copper mines also contribute a large part of the gold produced in the county at present.

Engels Copper Mining Company operating Engels and Superior mines, is the largest metal mining company in the state in point of tonnage of ore handled and gross value of the products. The production of copper by this company has reached as much as a million and a quarter pounds per month during the current year. For the six months ending July first the company produced, according to their report, 7,398,106 lb. of copper, 82,852 ounces of silver and 1318 ounces of gold. On this basis if production does not diminish the year's output will be close to two and a half million dollars in gross value, making allowance for a slight decrease on account of the decreased price of silver. The mill handles about 1000 tons of ore daily, and a total crew of about 500 men is employed. They stated that their operating cost was about 11.45 cents per pound of copper for the first half of the year.

Feather River Copper Company's claims near the Engels Company's Superior Mine were bought this year by Engels Copper Mining Company.

Beardsley Copper Mining Company had completed a mill and were reported to be running an electric power line from the main line in Indian Valley to their claims near Taylor Lake, a distance of about 8 miles, during the past summer.

Walker Copper Mine, operated through a subsidiary by *Anaconda Copper Mining Company*, enlarged their flotation plant during the summer and it was expected that the new units would be ready for work in October. During most of the year they operated at a capacity of 250 tons a day.

Shasta County.

On account of the closing of the former office of the State Mining Bureau in Redding and the consolidation of the work with that of the former Auburn office at a new office in Sacramento, there has been an increased amount of work to be done both in the office and in the field and there has not been as much opportunity for field work in the northern end of the state since June as was desired. It may be said, however, that gold mining has been very quiet in that section, with little gold production for the year except from the dredgers and placer mines, most of the work recently begun at the quartz mines having been in the nature of prospecting, as will be seen from a short notice of the operations that have come to our attention.

The *American Mine* in French Gulch district was being prospected during the summer and fall and good ore was reported late in the year.

At the *Bonanza Gold Dollar Mine* just north of the town of Shasta, a 5-stamp mill was put up in the fall to crush an accumulation of a few hundred tons of ore.

Ganim Gold Mines Company was incorporated in August to continue operation of claims near Stella, and a small mill was reported to have been put up, but the mine was idle in October. The property is described in our 1922 report, December chapter.

Niagara Mine in French Gulch district was being prospected during the summer by H. M. Thompson.

Preparations were being made to unwater the *Reid Mine* in July, in anticipation of the reopening of the Kennett copper smelter. This mine was in operation 15 years previous to the closing of the above smelter and the quartz ore was used as flux at the smelter.

Uncle Sam Mine was being prospected during the summer by the *Colma Copper Company*. An unusual accident occurred at this mine in June, when lightning struck and destroyed the compressor building and a part of the machinery.

After eight years operation along Cottonwood Creek in the Gas Point district, *Shasta Gold Dredging Company* was cleaning up the last of its proven ground in that region in September, and it was doubtful if work would continue much longer.

COPPER.

Interest in mining in this county the past year has been centered upon the operations of the large copper mining companies and the possibilities of their resuming work. With an increase early in the year in the price of copper, and the anticipation that this increase would hold, work was started to put several of the mines in shape for ore production and two of the larger companies put crews of men at work getting the smelters ready. However, the price of copper dropped again about the time the mines and furnaces were ready for production, with the result that conditions were very uncertain toward the end of the year. In spite of the fact that the sales of copper during the past

month (November) and for several months this year, as indicated by the records of deliveries from refineries, have been record breaking, the price of copper delivered remained about thirteen and one-eighth cents a pound the middle of December. This is a price at which most California copper mines find little inducement to operate unless their ores carry sufficient gold and silver to help out.

Afterthought Copper Company's properties were sold under foreclosure late in the year to Forest P. Tralles of St. Louis, assignee of the executors of the will of J. F. Milliken of St. Louis, who, it is said, had loaned the company over a million dollars. A compromise between the Milliken interests and the bondholders is reported to have been arranged whereby the bondholders will receive a few cents on the dollar, leaving the stockholders out.

Mountain Copper Company's smelter at Martinez was fired July 26 after an idleness of four years and the first copper was turned out August 15. In September 125 men were employed at the *Iron Mountain Mine* and the oil flotation plant at Minnesota had also been put in operation. However, in November the Iron Mountain Mine had been shut down and the future operations were uncertain.

All the holdings of the *Trinity Copper Company* in Shasta County were attached in August by the Federal National Bank of Boston. The best known of the claims of this company is the *Shasta King*, nearby the Balaklala, and seven miles west of Kennett. The property had been idle a number of years.

United States Smelting, Refining and Mining Company put a crew of over a hundred men at work at the *Mammoth smelter* in August to prepare for reopening the smelter. At the same time, 65 men were put at work at the *Mammoth Mine* and about half as many at the *Keystone* and *Balaklala Mines*. Late in November one furnace was reported in operation, but there have been no opportunities for field trips to the district the past month, so it is not known whether work will be continued or not.

BARITE.

Loftus Barite Mine was being prospected the past summer by H. C. Austin who is planning to buy the property. It lies about 2 miles in an air line east of Castle Rock. Austin has been considering the installation of a tramway, as the claims lie in rough country. The surface extent of the barite outcrops is said to be very large and a depth of about 50 feet has been reached in prospecting. The color of the rock varies from white to gray.

COAL.

An adit was being driven in October on a coal prospect on the *Lon Luce property* in section 20, T. 33 N., R. 1 W.; a little over a mile from Oak Run postoffice. A. Stevens of Oak Run was in charge.

At the time of visit the adit had been driven 43 feet and showed at the face a width of five feet of coal, of which several layers appeared more lustrous and harder than the rest, but nearly the entire width was coal, the seams of clay being narrow. The quality of the material had improved rapidly after leaving the surface. It is jet black in color

and looks like a better fuel than the ordinary run of California lignite, approaching sub-bituminous and not checking and slacking as fast as the brown lignite, though it soon shows the effect of exposure to the air. The coal bed dips east and north about seven degrees, has a sandstone and shale roof and a shale floor. The tunnel was being run a little south of east, and water was beginning to show a little at the face. On account of the direction the work was taking, it was becoming a flat incline in which it would no doubt be necessary to soon arrange for handling the water. There was no time to make an examination of the enclosing strata for fossils that might show the age of the coal, but although there is some uncertainty, the coal may be Cretaceous.

Surface outcrops of coal have been noted in a belt some ten miles long, according to local people, but for the most part these outcrops have not been prospected, although the U. S. Geological Survey comments on some coal prospects in the Ingot region, in the Ione formation. The region appears worthy of closer investigation on account of this coal and it is hoped that there will be an opportunity for field work there by the Bureau next spring.

The greatest handicap to development of the prospects is the long haul to the railroad, the nearest railroad point now being Palo Cedro, 17 miles away. It would be necessary to develop a good sized field of merchantable coal to justify a railroad, unless some lumber company should decide to exploit timber lands in that section.

Sierra County.

The Alleghany district, and particularly the Sixteen to One Mine, has produced most of the gold mined in this county during the past year. Due to the fact that some of the other large producers of the state will show a decrease in yield this year from various accidental causes, it seems probable that the Sixteen to One Mine will rank among the three largest gold quartz producers for 1923. This record is all the more notable because it is being made with a normal working crew of 30 to 40 men. Relatively small production has also been made by the Plumbago, Tightner, Rainbow, Kate Hardy and Irelan Mines during the year, so far as reports late in the year indicate, but these figures are apt to be changed at any time by discoveries of rich bunches.

All the mines and prospects that were accessible at the time were described in the October chapter of our 1922 report. Some changes since are noted below.

Work at the *Brush Creek Mine* was suspended after two explosions of gas had resulted from workmen penetrating the old workings.

A mill has been put up at the *Contact Mines* during the past summer, and underground work has continued.

Some prospecting of the *Edwards claims* at Chips Flat was contemplated.

Gold Canyon and *Rainbow Extension* claims were taken under one management and work continued during the latter part of the year.

A new hoist was being put in at the *Irelan Mine* late in the fall.

Kate Hardy Mining Company has been running the mill on their mine just below Forest and report that the proceeds have been contributing toward the cost of prospecting.

The lease and option on the *Oriental* and *Dead River Groups* of claims was abandoned by *Tonopah Mining Company* after considerable unproductive work. Very soon afterward, Bert Austin and associates took the lease and option and began work.

Prospecting work has been going on at the *North Fork* claims near Forest.

The *Plumbago Mine*, which was being reopened at the time of the last report, has since been taken under option by *Alleghany Mining Company*. Some rich specimen rock was reported to have been found by the former operators just before the transfer was made.

The *Rainbow Mine* produced a bunch of rich ore during the year, but not sufficient to repay the outlay for prospecting, according to the company's engineer.

The *Sixteen to One* completed many surface improvements and additions to the mill during the year, and as noted above remained the principal producer of the county.

In the Downieville district there was not much mining activity aside from the seasonal work in the many small drift mines, where parties of two or more men are employed each summer. There have not been any important developments, however, in this branch of mining in the district recently.

Bessler Bros. make an occasional small crushing of ore in the mill on their mine just outside the town of Downieville.

City of Six Mine comprises seven claims, unpatented, lying at the head of Slug Canyon two miles west of south of Downieville by trail. It is being developed under lease and option by A. E. Hodgkinson, 801 Lane Mortgage Building, Los Angeles.

Development work on the quartz claims to October of this year consisted of two adits. No. 2 or upper adit was run as a crosscut 100 feet then on the vein formation and the serpentine contact southward for 800 feet. The lower adit, which is 360 feet lower than No. 2 and 960 feet north of it, has been run about 1200 feet on or near the serpentine contact. The vein varies in width from a foot or less up to $4\frac{1}{2}$ feet, and in general is parallel to the contact of serpentine and Calaveras formation. From the two adits a few raises and crosscuts were run and there are two possible ore zones indicated, both raking south at a steep angle. These two shoots have produced some high grade ore similar to that from the Alleghany mines, and the property is similar geologically to the mines there. The greatest depth reached by the lower adit is about 485 feet.

Dan McGonigal, J. T. Lane and H. G. Smith were cleaning out and reclaiming the old workings of the *Finncy* (or *York*) *Mine* just outside of Downieville during the past fall. The four claims and millsite of this property lie on both sides of the river. There is an old shaft 150 feet deep, with some drifting and stoping at a depth of 100 feet, and also an adit 350 feet long in which they were clearing a caved section. The mine has a record of some past production of high grade.

Gold Bluff Mine a mile from Downieville was taken under bond and option in the fall.

Tuolumne County.

QUARTZ MINES.

Many prospecting projects that were under way during the year in this county have been suspended; numerous new ones have taken their places, but in point of size of operations and number of men employed, the county has suffered a loss. The fixed price of gold relative to the cost of other commodities, which have been maintaining a high general price level, has especially affected the quartz mines on the Mother Lode in this county, as the ores that have been mined on that lode in this county have been as a rule low grade, taken as a whole. Before the war many properties kept running on rock that averaged \$3 to \$5 a ton and a recent perusal of old reports showed there were about 400 stamps in operation in the county in 1913 and 1914. In November, 1923, there was only one mill, containing 12 stamps, in operation on the Mother Lode in the county.

Alabama Mine. Work on this property, which had been carried on by the *Tonopah Mining Co.* during the year 1922, was suspended last spring. The claim was prospected through the Crystalline shaft, six hundred feet deep. Drifting was carried under the old Alabama shaft on the 600 level to prospect for the downward extension of ore.

Belmont Shawmut Mine closed down early in November, 1923. This was the last large mill operated on the Mother Lode. The owners returned to do some work after the Belmont Mining Company quit.

Crystalline Mine. Work was suspended in this property near Jamestown in the summer.

Casa Madera Gold Mines Syndicate, a Nevada corporation, has under lease and option a number of claims in the Basin Slope district, 20 miles by road and steep trail from Sonora via Confidence, three miles being by steep trail, or 8 miles from Tuolumne over a steep road. J. H. Sharpe, president of the company, Hearst Bldg., San Francisco. The claims are owned by John Nash and Rooker and adjoin the old Lewis Mine, once productive. They are near the contact of a gabbro intrusive and the extremely hard slaty quartzites and micaceous schists of the Calaveras formation. The intrusive is exposed on the mountainside just north of the workings and shows a sheeted zone the plane of which strikes northwest and dips 45° west.

The upper or No. 1 adit has been run east about 300 feet on a tight seam without quartz or gouge although the operators claim some assays. This is about 800 feet below the summit of the hill. A short way inside the portal of this adit, a crosscut has been run on a joint fissure striking about south, to follow a small bunch of sulphide ore that formed around the junction of the two joint seams. On the hillside about 100 yards south of the mouth of this adit and about on the line of the crosscut if produced, a small shallow prospect hole shows hard quartz carrying galena and other sulphides. There are no definite walls or gouge here, but there appear to be two systems of joint planes in the schist, one striking southeast and dipping vertically, and the other striking west of north and dipping 40° west. No. 2 or lower adit, 100 feet vertically below No. 1 was 60 ft. long on Nov. 3 and

showed the formation at the face similar to No. 1 adit, but the rock carries considerable sulphide.

A milling plant was being installed just below No. 2 adit when visited. It is to contain a ball mill of 40 tons capacity and 2 Plat-O concentrators, and 35 h.p. motor to run the mill. All this machinery was on the ground, as well as a 10 x 10 in. air compressor run by 50 h.p. motor at the lower adit and a 20 h.p. gas engine and 1-drill compressor at No. 1, with a tramway for supplies from the top of the ridge to the mill. Electric power was brought three miles from Confidence during the summer. The company has broached the idea of getting a water supply by running the upper adit ahead to tap the old mine workings nearby. This would be an uncertain and expensive method. If ore has been found on the surface of the claim as reported, it appears that erosion must have lain bare one of the west-dipping joint planes, which coincides with the present surface of the hillside in places. If this has occurred, the almost inevitable result would be an overestimate of the amount of ore available. The amount of work done had not yet justified a mill. Twelve men were employed in November, of whom three were working underground.

Clio Mine. Clio Vindicator Mines Co. A new surface plant is under construction at this mine, $\frac{1}{2}$ mile south of Jacksonville on Tuolumne River. A new headframe is up and hoisting is to be done directly to the surface dispensing with the old adit. A new 10-stamp mill is being prepared for to replace one lost by fire.

Cherokee Mines, Consolidated, of Modesto has been doing some work at the *Donella Mine* at Arastraville and have also reopened the old adit on the Cherokee Gravel Mine, a mile and a half north of Tuolumne and are reported to have hauled some cemented gravel for a test run at the Columbus mill.

Erin-go-bragh Claim. During 1923 J. L. Bryson and associates have sunk a shaft 92 feet deep on this claim at Stent. Early in November the claim was idle, but it was stated that a few rounds of crosscut had been run and that work had stopped only a few weeks before. The crosscut was required on account of the shaft being flatter than the vein, but it could not be learned if the vein had been picked up.

Experimental Mine. Conlin Bros., Columbia, owners. Lately this mine has been taken under a ten-year lease with option to purchase by L. L. Coffey and F. L. Mitchell, who formed a stock company. Wolfley and Schank have taken an option on the majority of stock and work had begun in November with shaft repairs. The geology and workings of the mine are briefly described in Preliminary Report 8. This mine was being profitably worked in 1854, when a mill of 8 square stamps with wooden stems was put up and used to crush rich ore from near the surface.

Harriman Mine has lately been taken under lease and option, which were later transferred to A. G. Fraser and J. Hibbard of Los Angeles.

Heslep Mine. This old Mother Lode mine at Quartz has lately been leased to J. A. Keyes and associate, their lease embracing, however, only the section from the surface to 300 feet in depth. Keyes was

foreman at the mine at the time of the big cave in 1912, when a length of about 300 feet on the north end was lost, and he knew of good ore that had been left in the upper workings. The Heslep vertical shaft is about 50 feet south of the caved ground and is being used by Keyes. The stamp mill has been moved from the Patterson Mine near Tuttle-town and 10 stamps have been erected and are in use, besides which two stamps are occasionally used.

Cost of mining and milling are low on account of the special conditions and the short distance ore is hoisted. Ore value at the same time is satisfactory, and will leave a very handsome margin of profit if the ore continues to mill as well as in October and November. Keyes states this ore shoot is about 260 feet long and six feet thick, and is in the Whitford vein which lies between the Heslep and Bull Quartz veins.

Hudson and Calhoun Pocket Mines near Sawmill Flat have made a small production of gold during the year.

Red Cross (Omega) Mine which was reopened for a short time during the summer has been closed down and is idle at the end of the year. Little more than unwatering and repair work was accomplished.

Some work has been done at the *Spring Gulch Mine* since July of this year. The shaft was cleaned out and repaired to the 200 ft. level, and crosscutting on this level is reported to have exposed a hitherto unexplored vein, which lies in the footwall of the Marshall vein, the one formerly worked. The operators planned to drift on this new vein. The mine is about five miles southeast of Tuolumne and was not visited.

A little work has also been done during the summer at *Temescal Mine* 2 miles from Confidence. Two men were employed.

DRIFT MINES.

Monarch Mine is near Confidence. *Monarch Gravel Mining Co.*, Jerry Casey, secretary, 510 Page street, San Francisco. The company has kept at work since the 1920 report. There are now (Nov., 1923) 3500 feet of tunnel and crosscuts, mostly main tunnel. A shaft was sunk 135 feet deep on 25° incline at the face of the main tunnel and is reported to show coarse gravel. A winze level 100 feet below the main tunnel has also been run about 100 feet. A new shaft to furnish air and a second exit was being sunk in November to connect with the main tunnel. The gravel noted above as having been found below the main tunnel had not been prospected and nothing is known yet as to its extent.

Sledge Mine is about 4 miles by road from Confidence. The property has been prospected and worked in a small way for many years by the Sledge family but as far as could be learned without much output. It was drilled by *Tuolumne Deep Channel Mining Company* about 1913. A tunnel was also run 200 feet or more by former operators. The last company, which suspended work during the present year, is said to have spent about \$35,000 on the property. Several new buildings were put up and the tunnel was extended to a total length of 600 feet.

Gravel shows in the face of the pit, near where the tunnel enters. The course of the tunnel turns west, northwest and north and strikes rim gravel near the face. This is apparently an intervolcanic channel, most of the sand and gravel being green with very little quartz. No work was done after striking the gravel. About a quarter of a mile ahead of the face of the tunnel presumably along the supposed course of the channel, a shaft had been started, but was nearly full of water at time of visit and had apparently not reached gravel, judging from the material on the dump. As no crosscutting nor drifting had been done in the gravel, the width, depth and direction could not be judged except by surface indications.

Springfield Tunnel and Development Company have continued to work their mine on a small scale. When the work had reached the old shaft where such a fine prospect had been found several years ago that they were led to great exertions and expense to reach it with a tunnel, it is reported the rich ground was found to be limited in extent, and they found mostly lower grade gravel surrounding it.

MARBLE.

Bell Marble Company, office address S. P. Building, San Francisco. The quarry at Columbia was being worked again in November after an idleness of six months. A crew of six men is employed. A Sullivan double channeling machine has been installed and a new 50-ton stiff leg derrick has been erected.

The market for marble is reported good but the demand is said to be principally for sawed slabs. The company is now selling stock to finance a marble sawing mill at West Berkeley. The Bell Marble Company has helped to build up a new industry in California raw material and has experienced the satisfaction of establishing the high quality of its product in competition with eastern and other marbles.

Columbia Marble Company continues the operation of its large marble quarry on the south side of the Stanislaus River canyon north of Columbia. This company has its own marble sawing mill and has been a steady producer for many years.

GRANITE.

Sonora Granite Company has a quarry on the Rablen Ranch in Sec. 14, T. 1 N.; R. 15 E.; three miles from a shipping point on the Sierra Railway. J. E. Sasek, manager, Jamestown.

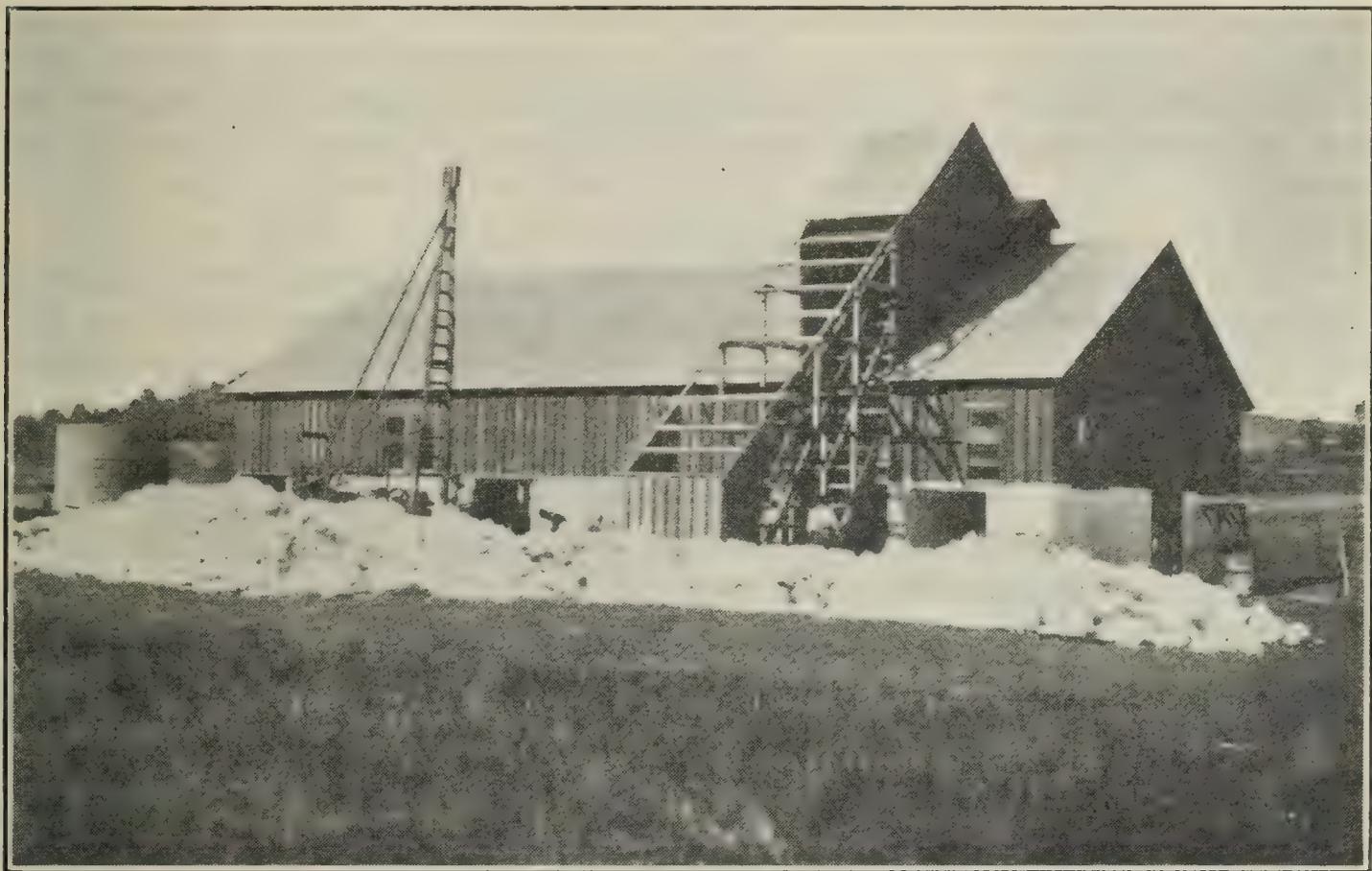
The stone is a pleasing dark granodiorite. They have brought in electric power to the quarry and have an air compressor, a few small buildings with accommodations for ten men, and some small tools. A few carloads of the stone have been shipped during the two years of desultory work, but the quarry has been idle since last July.

MAGNESITE.

The *Gray Eagle Magnesite Mine* near Chinese Camp has been taken over under lease by H. R. Vail and John P. Maxwell, 820 Syndicate Bldg., Oakland. When visited in November last, they were building a calcining plant (see photo) on the Sierra Railway at Chinese Camp

station. The kiln is of 15 tons calcined product daily. The ore is hauled from the mine, a distance of two miles, by motor trucks.

The vein is developed through an adit which crosscuts it at 310' in, thence a drift has been run 50'. This level is at a depth of 98' below the outcrop, and 34' below the upper drift, which was driven from the bottom of the shaft. In the stope the vein shows 8' to 10' in width. Mining of the ore is being done under a contract.



Vail and Maxwell calcining plant at Chinese Camp, Tuolumne County, California, for handling magnesite from the Gray Eagle Mine. Photo by Walter W. Bradley.

SAN FRANCISCO FIELD DIVISION.

C. MCK. LAIZURE, Mining Engineer.

REVIEW OF ACTIVITIES IN 1923.

During the past year the Redding field division office was discontinued and the former Auburn field division office moved to Sacramento. This change necessitated a redistricting of the State and some change in the counties assigned to the present three district offices at Sacramento, San Francisco and Los Angeles, respectively.

Del Norte, Humboldt and San Luis Obispo counties were added to the San Francisco field division, and Glenn, Colusa, Yolo, Sutter, Sacramento and Mono counties were placed in the new Sacramento district.

The net result was that Mariposa is now the only gold mining county of any importance in the San Francisco field division.

METAL MINING.

Mariposa County was not visited during 1923, but reports indicate that it has shared fully in the general revival noted in gold mining activities throughout the State, and that the outlook for continued improvement of conditions in 1924 is favorable.

The only other metal of importance produced in this district is quicksilver. Some interesting speculations regarding a possible increase

in the use of quicksilver have developed since the reports of experiments with the Emmet mercury-steam boiler system have been made public in the technical press.

An experimental installation of this system on a commercial scale was made by the General Electric Company in the plant of the Hartford Electric Light Company, Hartford, Conn., and its successful operation demonstrated. Theoretically, this system permits increased efficiency of about 100 per cent over steam alone. At the test installation the increase in output of electric power per pound of fuel was practically 50 per cent. With boilers especially adapted to the system and other refinements, it is expected that an increase in efficiency of 80 per cent over the present practice of steam-power plants will be reached.

Such a wonderful saving would lead to the conclusion that in a short time mercury will be used in all steam-power plants; however, the following figures will show that the world's production of quicksilver is far too small to meet such a demand.

According to the *Engineering and Mining Journal-Press*¹ "the Emmet boiler at Hartford holds about 30,000 pounds of mercury. The total production of mercury in the United States in 1919 was 1,601,000 lb., enough to equip only fifty-three boilers like the one already equipped, which has developed about 1500 k.w. or nearly 2000 h.p. In 1922 the mercury produced in the United States had fallen to 478,000 lb., or enough to equip sixteen boilers of the size of the Emmet installation at Hartford. This United States production was, to be sure, only about one-fifth of the average production for nearly twenty years; nevertheless, it is clear that these twenty years have skimmed the cream from our deposits.

We have a tentative figure of the total amount of boiler horsepower used in the United States in the mining industries at 2,258,000 h.p., which, taking the amount of mercury required for the Hartford boiler, would require altogether nearly 34,000,000 lb. of quicksilver, which is more than the total amount of quicksilver produced in the United States in the last twenty-one years—1902 to 1922 inclusive. But the total amount for all purposes in the United States is 18,000,000 h.p., whose equipment would require 270,000,000 lb. of mercury!

The world production of mercury in 1921 was only 4,451,000 lb., enough to equip only 148 boilers of the size of the Hartford plant! The total world's production for fourteen years from 1908 through 1921 inclusive was 110,337,000 lb., or less than half what would be required to change the high-pressure steam boilers of the United States alone to the mercury system."

As a further illustration of the revolutionary character of this system, it is said that the mercury used in the Hartford plant boiler cost about \$16,000. This represents a considerable sum of money, but officials of the Hartford Electric Co. expect their coal bill to be cut in half by the installation of this boiler system, and their coal bill in 1922 was about \$1,500,000, showing that they would save the cost of the mercury, at that price, in about eight days. Even with a much higher price for mercury, such an installation would prove economical in many cases. The mercury is used over and over again and need not be replaced.

¹Eng. & Min. Jour.-Press, Vol. 116, No. 25, page 1057, Dec. 22, 1923.

It is quite evident from these figures that, if the demand for quicksilver for mercury-boiler power purposes grows, the lack of supply will send quicksilver prices soaring, and even this use in only a comparatively few boiler plants is likely to cause an immense increase in the price of the metal.

The principal producers in 1923 were the New Idria Quicksilver Mining Co., the New Almaden Co., Inc., and the Cloverdale mine of the Western Mercury Co. Mercury produced was about 75 per cent greater than the 1922 output.

Announcement has been made by Mr. Andrew Rocca, president of the Western Mercury Co., of the sale of the Cloverdale mine to H. W. Gould, et al.

The Helen mine, situated near Middletown, Lake County, has been purchased by Ludwig Graefe and A. Romaine.

A small production of manganese ore was recorded from San Joaquin and Stanislaus counties.

NON-METALLIC MINERALS.

Although the mining of metals is limited, the mineral products of the twenty-five counties in this division approximates 25 to 30 million dollars annually, or twice the total gold production of the State. The products are chiefly those minerals classified as fuels, structural materials, industrial materials and salines; and they include petroleum, natural gas, coal, brick and tile, cement, granite, lime, magnesite, sand and gravel, crushed rock and other miscellaneous stone, asbestos, pottery clay, dolomite, gems, gypsum, diatomaceous earth, limestone, mineral paint, mineral water, silica, sulphur, magnesium salts, potash, common salt and a few other minor minerals.

The mining and marketing of these products differ widely from metal mining in general and especially from gold mining. The gold producer has an unlimited market for his product at a fixed price of \$20.67 per ounce, while the production of the structural and industrial minerals, fuels and salines is on a competitive basis. In the case of large mineral deposits of comparatively uniform composition, mining operations acquire many of the characteristics of a manufacturing industry. For aiding in the development of the mineral industry, reports upon the activities of going concerns of this character are of less value than are data on undeveloped deposits and new discoveries.

Fresno County, the principal mineral products of which are petroleum and natural gas, leads in value of production in this district. At the same time 'wildcat' drilling has continued more or less steadily in over half of the twenty-five counties, but to date no new commercial production has been established. That there are possible producing areas in this district, yet unproved, is unquestioned concerning both petroleum and natural gas.

Lively interest has been shown in the coal deposits of the State and development in this district has been carried on in Mendocino and San Benito counties, with additional activities probable in Contra Costa, Alameda and Monterey counties. A report upon the Eel River district in Mendocino County, where development work has been particularly active, was published in Report XIX of the State Mineralogist, Chapter IV, September 1923.

Coal investigations have taken the form of the possible utilization of California lignite in the production of pig-iron and steel in the electric furnace under the Driscoll patents. This is a process in which the volatile gases are driven from the coal and used in a gas engine to generate the required electric current. The carbon remaining is utilized to reduce the iron ore to metallic iron (sponge iron), which is then melted in the electric arc. The apparatus comprises a combination rotary kiln and electric furnace and the process is continuous. Small scale tests have shown California lignite to be suitable for this process. Others have investigated the low-temperature distillation of the lignite under a German patented process with the production of a semi-coke briquette, said to be an ideal smokeless domestic fuel, and other by-products. Still other investigators are figuring on the manufacture of calcium carbide (CaC_2) from lime and lignite coal. Apparently, the time is not far distant when the coal deposits of California will be developed to a much greater extent than at present; the better grades being used for domestic and steam fuel, in competition with imported coal, and the lower grades as powdered coal, in the manufacture of producer gas, or in one or more of the other industrial processes outlined above.

The demand for building materials continued active during 1923 and the established cement plants in this district, one each in Contra Costa, Solano, Santa Cruz and San Benito counties, enjoyed a prosperous year.

Pacific Portland Cement Company started the construction of a 2000 barrel per day unit of a new cement plant, located on San Francisco Bay near Redwood City, approximately at the site of the construction and launching during the war of the concrete ship, Faith.

The wet process of manufacture will be used. Two of the principal raw materials, oyster and clam shells, and clay, will be obtained from the bay bottom by a suction dredger, and conveyed to the plant. These shell deposits are said to be practically inexhaustible. The plant is expected to be completed by July of this year. Its location gives it the advantage of direct water and rail shipment for the finished product, while at the same time the principal raw materials are at hand.

It is reported that the Guadalupe Portland Cement Company expects to build a plant six miles southwest of San Jose, which will have an initial capacity of 2500 barrels per day. An immense hill of limestone is said to have been acquired in the vicinity of the proposed plant.

Yosemite Portland Cement Co. began construction of a large cement plant at Merced. Limestone occurring near El Portal will be utilized.

MAGNESITE.

Magnesite production, which is confined almost entirely to the San Francisco field division, showed a healthy growth during 1923. Several old properties were re-opened and one new deposit was worked.

The following data on the active magnesite properties in the district were prepared by Mr. Walter W. Bradley, deputy State Mineralogist, as the result of a short field trip.

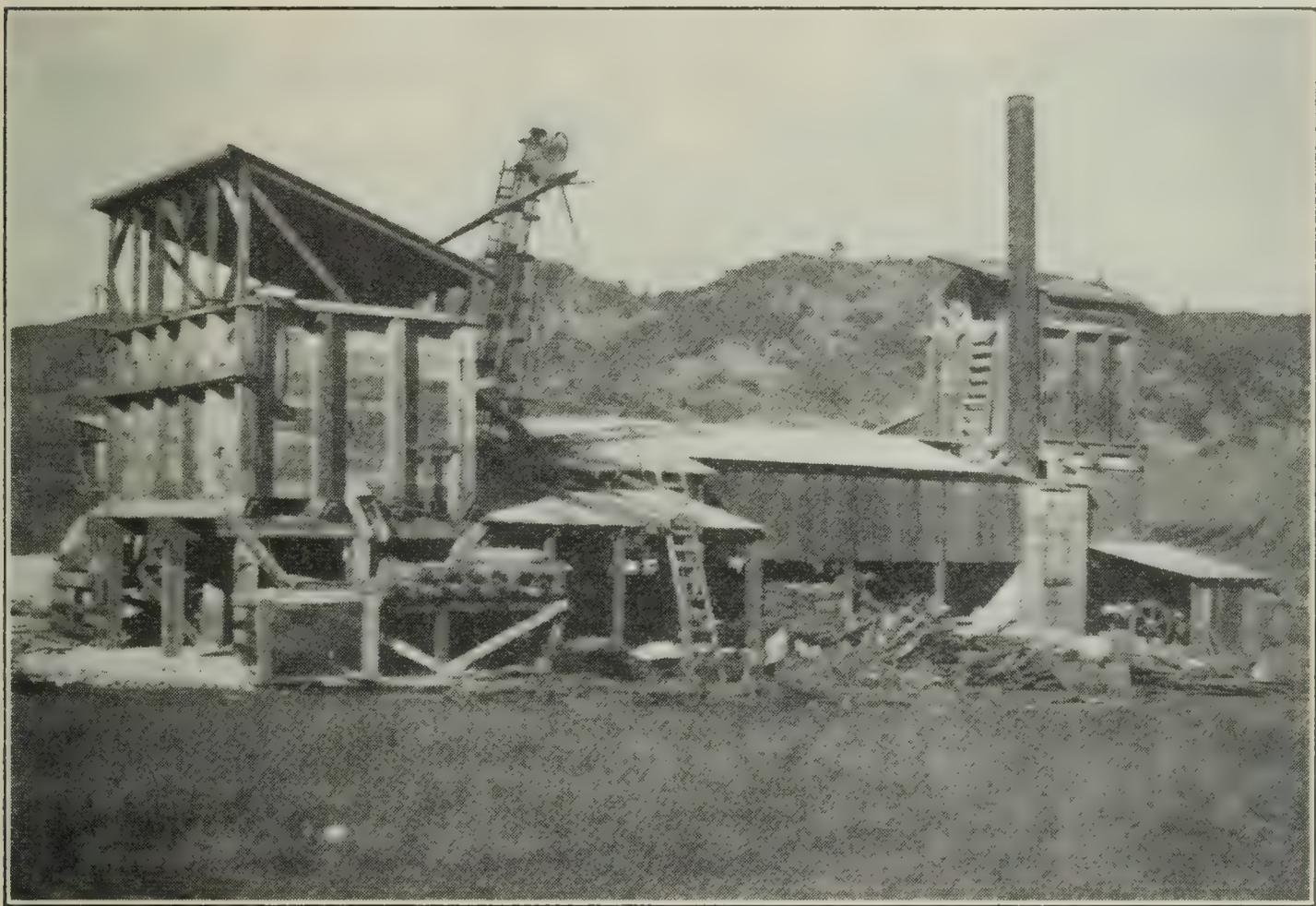
Napa County.

Maltby No. 2 Magnesite Mine, C. S. Maltby, Humboldt Bank Bldg., San Francisco, lessee. The lease covers the old *Blanco* and the *Snowflake* mines, owned by the Tulare Mining Company, the first-named

having been operated by that company during 1917 and 1918. They were among the first magnesite mines to be worked in California, shipments having begun in 1891 and continuing for ten years at a rate of over 1000 tons per year. They are in Sec. 28, T. 8 N., R. 4 W., M. D. M. about two miles south of the old Chiles mill in Chiles Valley.

Since taking over this property in February 1923, the present lessee has driven a new adit in the Blanco ground 1000' long which crosscuts the vein at 78' on the dip (or 53' vertical) lower than the bottom level of the former operators. Drifts have been run 100' north and 165' south, the vein showing an average of 6' in width. The ore is being broken down by overhand stoping, and the small proportion of waste is sorted in the stopes, by forks and by hand.

Calcining equipment consists (see photo) of a rotary kiln, 3½' inside diameter, by 50' long, driven by a 6 h.p. gas engine and oil fired. The



Calcining plant at Maltby No. 2 Magnesite Mine, Chiles Valley, Napa County, California. Producing dead-burned magnesite in a rotary kiln. Photo by Walter W. Bradley.

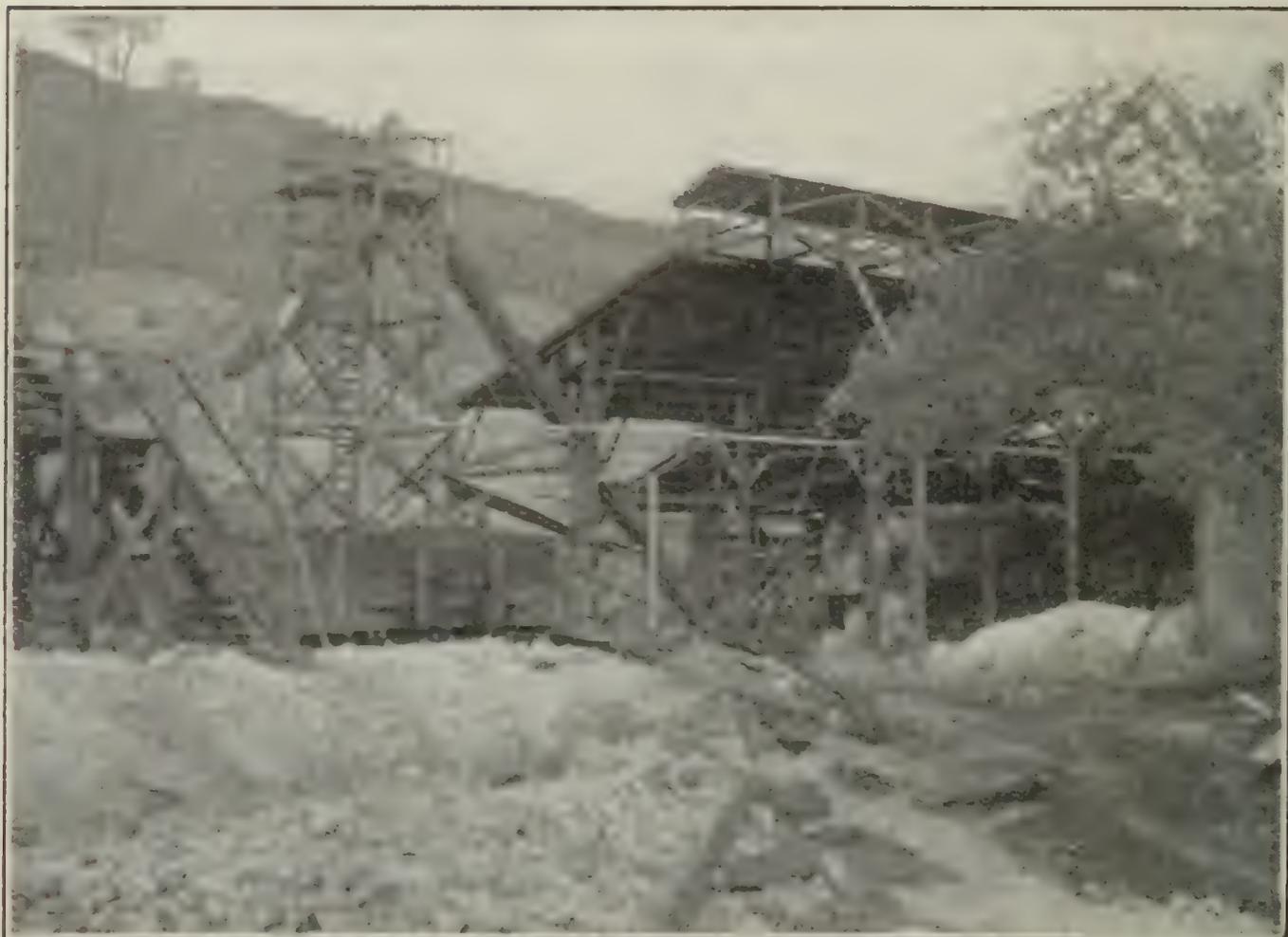
ore is crushed to pass 1-inch mesh before charging to the furnace, and is dead-burned for refractory purposes. The output of the furnace is 15 tons of calcined material per 24 hours. This rotary kiln was formerly in use for quicksilver reduction at the Bella Union quicksilver mine near Oakville in the same county. The calcines as discharged from the furnace are raised by a bucket elevator and run over a sheet-iron chute to the bunker, from which the motor trucks are loaded which haul the product to the railroad at Rutherford. Maltby states that he is having a ready sale, mainly on the Pacific Coast, for the dead-burned magnesite which he is producing here and at the Sampson mine in San Benito County, which he is also operating.

The *White Rock* magnesite mine in Pope Valley, operated by C. S. Maltby of San Francisco under lease during 1921-1922 was closed

down early in 1923 and the movable equipment transferred to the Blanco mine in Chiles Valley. It is stated that the orebodies of the White Rock were bottomed at a depth of 300 feet below the outcrop.

San Benito County.

The *Sampson Magnesite Mine* (known also as *Maltby No. 3*), west of Idria, is being operated under lease by C. S. Maltby, Humboldt Bank Bldg., San Francisco. The six vertical kilns formerly in use at this mine have been replaced by a rotary furnace 7' by 80' (see photo), operating at $1\frac{1}{2}$ minutes per revolution. It is oil-fired and is producing 35 tons of dead-burned magnesite per 24 hours. The ore is crushed to $\frac{3}{4}$ -inch mesh before charging, and $2\frac{1}{3}$ tons of crude ore are required



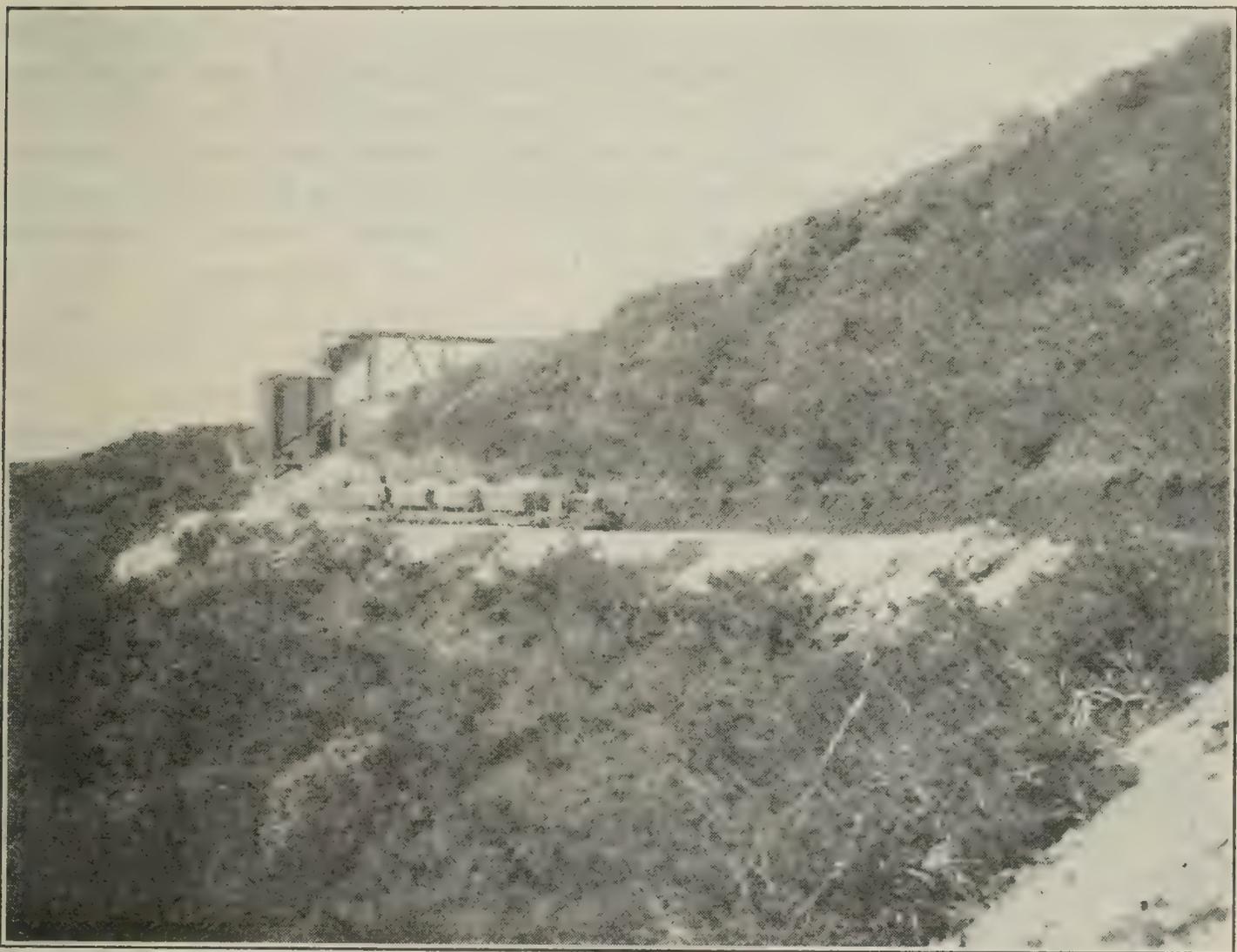
Calcining plant at the Sampson Magnesite Mine, west of Idria, San Benito County, California. Producing dead-burned magnesite in a rotary kiln. Photo by Walter W. Bradley.

for 1 ton of calcined. Steam power is used. Fuel oil is obtained from the pipe line of the Associated Oil Company at Mendota, there being a pumping station on the line at that point. The calcined ore is hauled by trucks to the railroad at Mendota.

As the orebody is on top of a ridge, the ore is broken by quarrying operations, and carried to the furnace by a Painter aerial tram, 5000 feet in length, having 16 buckets and being gravity operated. Jackhammer drills are used in the quarry. The compressor is driven by a 4-cylinder gasoline engine which formerly did duty in a Packard automobile. At the time of our visit (in November, last) it was certainly shooting merrily along on all four with a sharp bark out there on the open hillside without any muffler to worry it.

Santa Clara County.

The *Western Magnesite Company's* properties (known also as *Maltby No. 1 Mine*) 33 miles southeast of Livermore have been operated under lease by C. S. Maltby, Humboldt Bank Bldg., San Francisco, since 1919. Many improvements have been made in the plant equipment, and new orebodies have been developed. The earlier underground operations were due east from the furnaces, and some ore is still being drawn from that portion of the property. Later developments have been towards the north and northwest from the older workings. While none of the north-end stopes have as yet reached the size of some of the older south-end orebodies (there was one, 300' long x 50' wide x 300' high;



Tramming ore from north end workings at Maltby No. 1 Mine (Western Magnesite Development Co.), on Red Mountain, Santa Clara County, Cal. Photo by Walter W. Bradley.

and another 200' long x 150' high x 30' wide), some are over 20' wide in places. The ore is of the same, white, high-grade character.

Ore from the north end is trammed around the hill (see photo) to the loading bunkers of the main aerial tram (of which there were two). When visited in November 1923, preparations were being made for the installation of a third aerial tramway, at the north end, in order to eliminate the long haul around the hill. A total of 150-200 tons of ore per day was being delivered to the furnaces, of which 40 tons was being mined at the south end, 30 tons from the extreme north end, and the balance from the main north workings. A new 4-inch pipe line was being laid direct to the north end to serve those workings with compressed air, in place of the line from the south end around the hill.

Pressure is maintained at 100 pounds at the compressors (two 50 h.p. Chicago Pneumatic, direct-connected to oil engines; also a Doak compressor as extra stand-by) and at least 90 pounds at the mine.

There are four upright kilns which burn the lump ore, and a Scott fine-ore quicksilver furnace which handles the fines. The ore as it comes from the mine is dumped on grizzlies set with a $1\frac{1}{4}$ inch opening; and the through material passed over a $\frac{3}{4}$ -inch screen. The plus $\frac{3}{4}$ -inch material goes to the Scott, and the minus $\frac{3}{4}$ -inch to the waste dump as it contains mostly impurities. There is a Thwing electric pyrometer on the Scott furnace, by which the temperature is maintained at 2100° F. The calcines are drawn each hour, and an output of 20–24 tons per day obtained. The upright kilns are drawn every 2 hours, and their output totals 50 tons daily for the four. The burned lump ore is carried by a belt conveyor to a trommel with 1-inch apertures. The waste and off-colored magnesite are picked off the belt. The unburned cores after passing out of the trommel are hauled back to the main ore bin and re-burned in the kilns. Steam for atomizing the fuel oil is provided by two boilers, of 100 h.p. respectively. There were 14 motor trucks in service, hauling the calcined magnesite to the railroad at Livermore.

Tulare County.

Magnesite mining in Tulare County at the present time is practically confined to the several properties operated by the Sierra Magnesite Company, and to the Hoff-Harker lease on the old Harker or Porterville Hill mine.

Harker Mine. This property is owned by Mrs. Barngrover, Porterville, widow of Chas. S. Harker, and is at present under lease to Hoff & Harker. From 1915 to 1921 it was operated by the *Porterville Magnesite Company* and a large tonnage of ore mined, a part of which was calcined before shipping. It is two miles from the railroad at Porterville. During 1922 the property was operated under lease by the Sierra Magnesite Company, the ore being calcined in their furnaces at Porterville.

When visited in November, 1923, the rotary kiln was not in use, the present lessees confining their work to a vertical kiln of 15 tons calcined daily capacity. The product is shipped for plastic purposes. There is a small crushing plant, the equipment of which includes a hammer mill and a buhr mill for grinding the calcined material, although not being utilized at the time. The ore is being mined from the veins on the north side of Porterville Hill and hauled by motor trucks around to the furnace, which is on the south side of the hill.

Sierra Magnesite Company. This company was organized in 1920, and took over all of the important producing properties in the vicinity of Porterville, which they still retain with the exception of the Harker Mine (Porterville Magnesite Company) which, however, they operated during 1922. The Sierra company now owns in fee the properties described in preceding reports of the State Mineralogist¹ under the following names: Rex Plaster Company, Lindsay Mining Company, Tulare Mining Company, and mineral rights of the Oakland Magnesite

¹ Report XV, pp. 919-940, 1917; Report XVIII, pp. 528-535, 1922.

Company on 80 acres adjoining the Harker Mine on the north. This company also has a lease on the magnesite deposits on the Gill ranch adjoining the Oakland ground on the north. The first three groups adjoin and are in the Success district 7 miles east of Porterville. The Oakland-Gill groups are on the north of Porterville Hill 3 to 4 miles northeast from the railroad station at Porterville. At present, mining operations are confined mainly to the 'Tulare' ground, and portions of the 'Lindsay' and the 'Gill Lease' properties, the last-named being worked under a contract by Ed. Cramer. All calcining is done in rotary furnaces at their plant in Porterville (formerly American Refractories Company; also American Magnesite Company a subsidiary of International Magnesite Company). Ore from the Success district is brought in by rail over the branch line of the Southern Pacific Company, and from the others by motor truck.

The National Kellastone Company, of which the Sierra Magnesite Company is an associate (being controlled by the same financial interests), has one of its stucco plants here, where stucco mixtures are prepared for sale to contractors and material dealers. All of the technical control work of the National Kellastone Company is carried on at Porterville in the physical-test and chemical laboratories. Both of these laboratories are especially and completely equipped for such work. Because of the high summer temperatures, there is a below-ground basement room under the physical-testing building for use in the summer months, so that fairly uniform temperatures may be had for testing throughout the year.

Because of their careful technical control a uniform product of guaranteed behavior can be delivered. Their three commercial grades, with approximate chemical analyses are as follows (it being understood that the guaranteed physical tests are of more vital concern than a specific chemical composition):

'Sierra Standard.' White or light gray color when ground; MgO 83%–85%; CaO (under 4% total; 1.5% active); Al_2O_3 & Fe_2O_3 under 1%; SiO_2 up to 8%. Ignition loss 2%. Used for finish-coat stucco.

'Tulare A.' Cream color; MgO 85%–87%; Al_2O_3 & Fe_2O_3 3%; CaO (3% total, 1½% active); SiO_2 5%–6%. Ignition loss 3%. For flooring finish coat; also some for stucco.

'No. 20' or 'Base Coat' (also called 'No. 20 B.C.'). Color varies, dark cream, light brown, etc. MgO 80%; CaO 3%; Al_2O_3 & Fe_2O_3 about 4%; SiO_2 12%–14%. Ignition loss 4%. For base coats, both in stucco and floors.

Fine grinding of the calcined material, in preparation for stucco and plaster mixtures, is accomplished in 12 buhr mills in two banks, so that 85% will pass 200 mesh.

In November, 1923, there were 75 men employed in the mine, and a total of 49 in the plant, laboratories, and office, including 9 in the National Kellastone unit.

OTHER NON-METALLIC MINERALS.

An effort to increase the use of agricultural limestone, gypsum and other so-called mineral fertilizers is evident, and among the new operators in this district are the Mt. Diablo Lime and Marl Co., Walnut Creek, Contra Costa County, and the Mission Lime Marl Co., of Irvington, Alameda Co.

Various colored rocks, when crushed and sized, are used as a 'dash' coat on stucco for exterior finish and for roofing. There is a good demand for hard, bright-colored material. Obsidian was produced for this new use during 1923, the production coming from near St. Helena, Napa County.

The foundry men of America have raised a fund for carrying on detailed tests and research work on samples of sand which are being used or which may be thought suitable for foundry molding use. The tests are being made under the supervision of the Engineering Division of the National Research Council, with the cooperation of State Geologists and the U. S. Geological Survey.

In order that the producers and users of molding sand in California might benefit from this investigation, the State Mining Bureau has cooperated to the extent of collecting samples from all known deposits and reporting upon their character, size, method of working, ownership, etc.

Samples from two producers in the San Francisco field division were procured and included in the total of twelve samples sent from this State. These two were from the deposit of the Del Monte Properties Company, near Carmel, Monterey County, and from the George Small deposit, on the Alameda Creek road, near Decoto, Alameda County. The Del Monte Properties Company produce sand for a variety of uses, but the George Small deposit is strictly molding sand.

A new plant for the recovery and production of various magnesium salts from the bitterns remaining after the precipitation of common salt from sea water was completed in 1923 by the Industrial Chemical Corporation, and is now in operation. The plant is located on the property of the Arden Salt Works near Newark, Alameda County; the bitterns from the Arden Salt Works being taken under contract. E. M. Vail is manager, Newark, California.

Much of the San Francisco division engineer's time is taken up in routine office duties and in replying to written and verbal requests for information relative to all phases of the Mining industry.

After the discontinuance of the monthly publication of 'Mining in California' in April, the service formerly offered 'Producers and Consumers' in this publication was continued by issuing a monthly mimeographed list of current inquiries for deposits and tonnages of minerals 'wanted' and 'for sale,' under the title of Commercial Mineral Notes. Apparently these lists have been of considerable value to those looking for a source of supply and to prospective producers seeking a market, as the State Mining Bureau has been advised of a number of transactions closed through its aid, or under negotiation.

It has also been noted that these listings are closely watched by many large and responsible firms, who form an increasing percentage of those investigating offers. Requests for various minerals come from the manufacturing centers in the eastern states, a few from foreign countries, and many from local firms and individuals. Only deposits in California, or tonnages originating therein, are intended to be listed for sale.

During the year 303 parties seeking a market were listed; there being 88 different products offered by them, and 152 separate 'wants' were listed, which included requests for 102 different mineral products. The larger part of the 'wants' was for non-metallic minerals of the

structural, industrial, fuel and saline groups, with a lesser number of inquiries for gold and other metal mines.

Inquiries for arsenic ores, clay, magnesite, coal, manganese, limestone, montmorillonite, quicksilver, sillimanite, andalusite and cyanite were comparatively frequent. Other minerals wanted included zeolite, lepidolite, gilsonite, flint, epidote, beryl, amblygonite, alunogen, asbestos, molybdenite, jasper, as well as the more common minerals.

With very few exceptions, all of the minerals wanted are known to occur in the State, but as yet some of them have not been found in commercial quantities. In many cases this may be due to lack of knowledge of the valuable non-metallies on the part of prospectors. Sillimanite, for which there is a keen demand, would scarcely attract the attention of one not especially searching for it, as much of it resembles an ordinary worthless rock. The only deposit so far being mined in the United States is in Mono County, California, but it is quite certain that other deposits of commercial size will be found, and, if so, they should prove valuable to the discoverers. Sillimanite is used in the manufacture of high-temperature and high-tension electrical insulators and spark plugs. That produced here at present is being shipped to Detroit, Michigan. It is worth about \$.05 per pound, or \$100 per ton, as mined.

LOS ANGELES FIELD DIVISION.

W. B. TUCKER, Mining Engineer.

Imperial County.

Shipments of pumice are being made from a deposit owned by J. H. When, G. E. Miller, and D. S. Underwood of Niland. The deposit is located near Niland, and it is reported that during the month of August, 1923, seven cars were shipped to Chicago.

Inyo County.

CERRO GORDO DISTRICT.

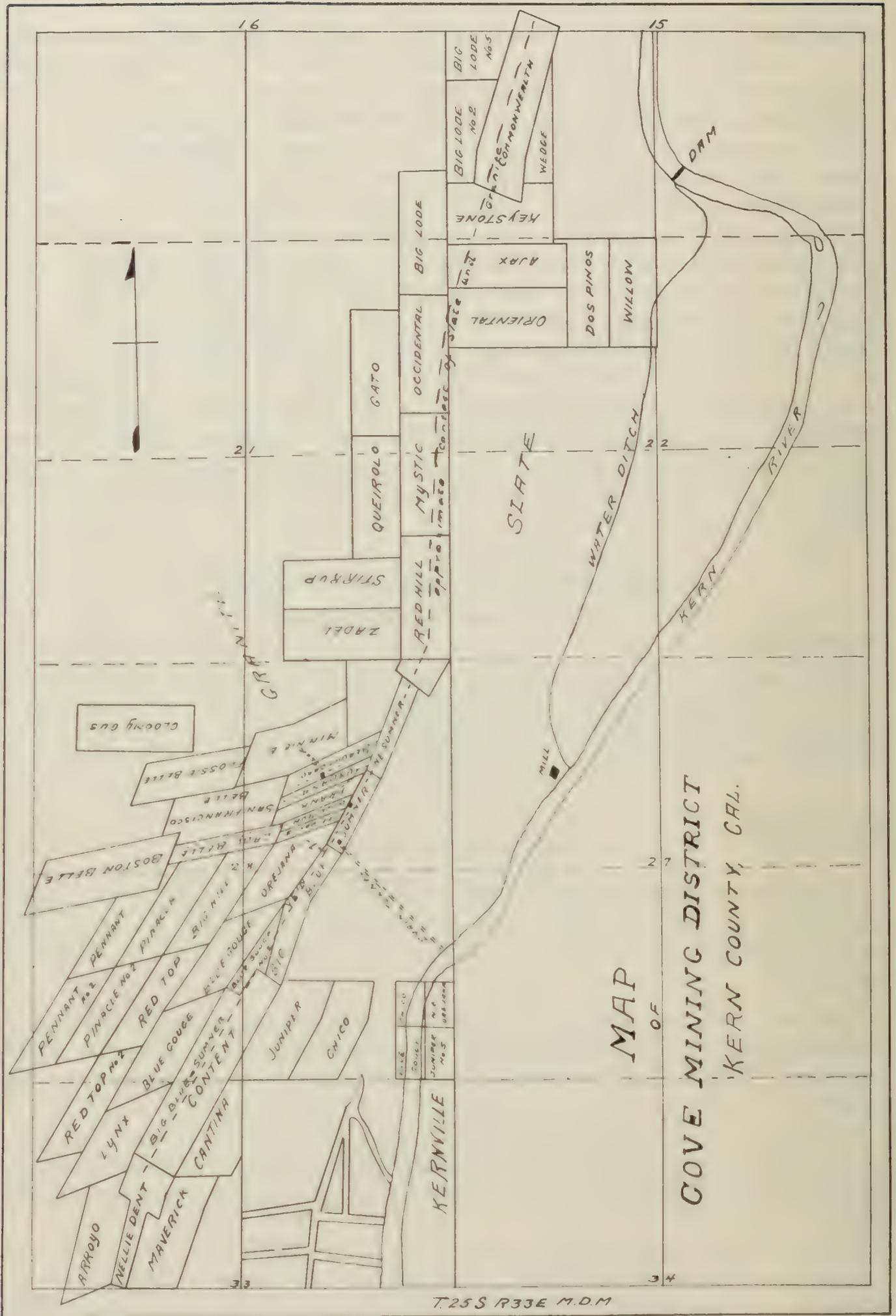
The Cerro Gordo Mines Company reports that a new ore body, carrying high grade silver values, has been encountered at a depth of 1000 feet in the old Union Mine. The vein is said to have a width of four feet.

Queen of Sheba Group of Mines, consists of nine claims located in the eastern slope of the Panamint Range of mountains, about 40 miles northeast of Zabriskie, a station on the Tonopah and Tidewater Railroad.

Owners: *New Southerland Divide Mining Company*, of San Francisco. The property has recently been leased to the *United States Smelting Refining and Mining Company*; main office, 55 Congress Street, Boston, Mass.

The ore occurs as replacement ore bodies in limestone and is rich in galena, lead carbonates and silver sulphides. The ore is said to average 15 per cent lead, and 8 ozs. of silver per ton. It is stated that 6500 tons of sorted ore shipped to the smelter near Salt Lake City averaged 40 per cent lead and 20 ozs. in silver per ton.

It is reported that the United States Smelting, Refining and Mining Company expect to start mining operations at an early date.



Kern County.

COVE MINING DISTRICT.

The Cove Mining District is situated 42 miles north of Caliente, near the town of Kernville. The mines are at an elevation of 2600 to 3000 feet above sea level in the foot hills of the High Sierras. The district is connected by a good mountain road with Caliente, on the Southern Pacific Railroad, which is the nearest railroad point.

History: The first discovery of gold in this region was made by a member of General Fremont's party in 1851, in Greenhorn Gulch. In 1861, Rogers and Old discovered gold on what is known as the Beauregard vein, near Kernville. The discovery of the Beauregard, Jeff Davis, Lady Belle, Bull Run, and other mines of this region, led to the formation of the Cove Mining District.

The Beauregard Company installed a mill of eight wooden stamps, and it is stated that their production was from twelve to fifteen thousand dollars per month. At a depth of 65 feet, the vein was five feet wide, and the ore is said to have milled \$70.00 per ton.

The original claims located on the Jeff Davis, Bull Run, Lady Belle, Frank, Urbana, and Beauregard veins were 200 feet wide by 1200 feet in length. In 1875, the Sumner Gold Mining Company was organized and consolidated the principal claims in the district. A sixteen stamp mill was erected, which was increased later to eighty stamps. This eighty stamp mill operated until 1883. The weight of the stamps was 850 lbs., crushing the ore to about 40 mesh, using straight amalgamation, and no attempt was made to save the concentrates. It is stated that the production of the mill during this period varied from twenty-five to seventy-five thousand dollars per month. At the time of maximum production, the operations were carried on through the Sumner shaft, located on the Big Blue-Sumner vein. This shaft was of six compartments, and equipped with steam driven hoist and cornish pumps. In 1882, a drain tunnel was started from the river level to cut this Sumner shaft at a depth of 260 feet. In 1883, the shaft house, hoist, pump equipment and shaft timbers were destroyed by fire, and the lower levels of the mine flooded. This company completed the drain tunnel over 2000 feet in length to the Big Blue Mine, which drained the upper workings.

After the fire of 1883, ore extraction was confined to stoping above the 240 foot level. The control of the company then passed to the Kern Development Company, who adopted a leasing system.

Up to the time of the organization of the Sumner Company, no definite records of production were kept at the mines. The Sumner Gold Mining Company showed records of production of 151,000 tons, which yielded \$1,250,000 or \$8.27 per ton. Records of later production mainly from leases show over 37,000 tons of ore extracted from which \$13.43 per ton was saved. Total production of the Cove district is estimated as being from \$5,000,000 to \$8,000,000.

Estimated production of the various producing mines of the district is as follows:

Beauregard Mine \$600,000; Urbana and Frank \$200,000; Big Blue \$2,000,000; Blue Gouge \$75,000; Bull Run \$450,000; Jeff Davis \$150,000; Lady Belle \$500,000; Nellie Dent \$100,000; Sumner and North Extension \$600,000.

R. W. Raymond, U. S. Mineral Statistics, in 1875, stated that "the vein on the Nellie Dent mine is 200 feet wide between walls, and carries ore yielding \$10.00 to \$12.00 per ton."

R. W. Raymond, in Seventh Annual Report of the U. S. Commissioner of Mining Statistics, states: "the Sumner produced in 1874, 5000 tons of ore with an average yield per ton of \$40.00, total bullion product being \$200.000—number of stamps, 16; cost of mining per ton, \$2.50; cost of milling, \$2.00; kind of power, water. The lode underground is 80 feet wide between walls, and has been opened up for 1000 feet along the vein for a depth of 160 feet. The average yield was \$18.00 per ton."

From 1883 until 1901, the mines were operated under a series of leases. In 1921, the North Sumner Gold Mines Company acquired the Beauregard, Urbana, Frank, and North Extension Sumner Mines, and Lot No. 1, 33.48 acres of patented ground. The North Sumner Gold Mines Company started development operations on the Beauregard Mine in 1921, which has been in steady progress to date.

Geology and Vein Systems.

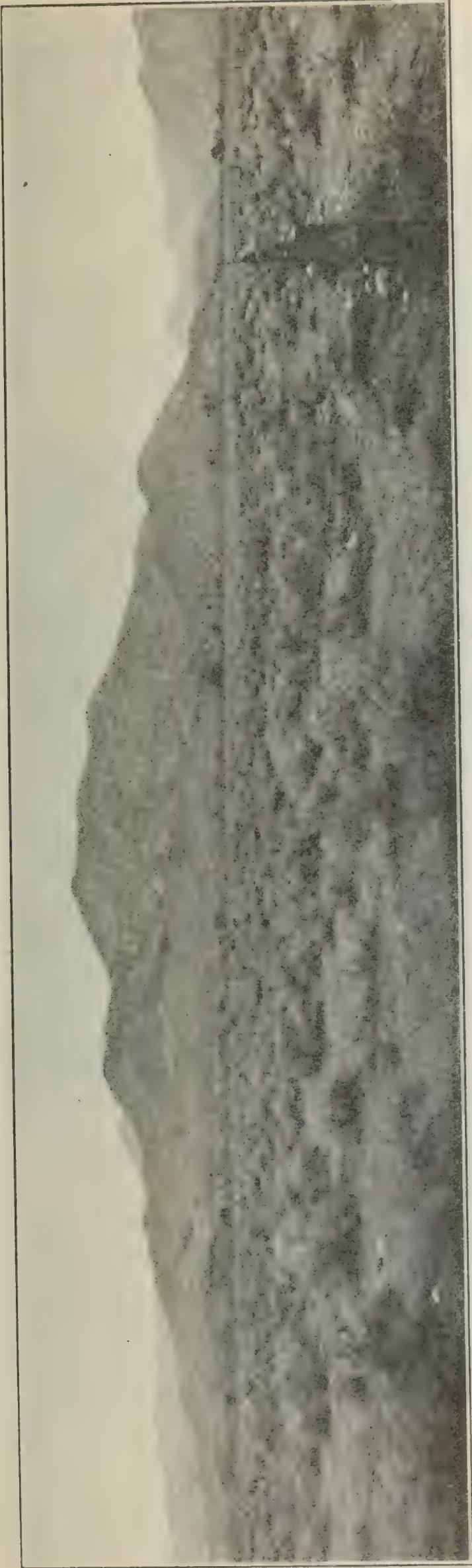
The formations consist of granite, slate and schist, the former predominating. Near Kernville, a narrow bed of slate and schist extends north and south, a distance of about 8 miles, and the Big Blue-Sumner lode occupies the contact. This belt of slates and schist is one to two miles in width and fifteen or more miles in length. The contact with the granite is irregular in outline and the Big Blue-Sumner vein occupies a fault which has broken through the various formations along the contact line. In places the slate and schist does not show for a considerable distance east of the Sumner vein, but notably on the Sumner North Extension, it should be in close contact. In the 2000 foot drain tunnel, we fail to find the slate, as the tunnel is in granite until it strikes the Big Blue vein, where it forms a part of the vein.

The Big Blue-Sumner vein occupies the line of the reverse fault. The vein is of great width, vein matter and quartz showing from 80 to 115 feet or more in width, and this lode is traceable several miles. The main lode has generally been regarded as composed of three veins, called the West Vein, which shows a width of five or six feet, the Middle, or Big Blue vein, which shows a width of about 40 feet, and the East or footwall vein, showing a width of about 5 feet. The filling between these veins is well silicified and somewhat mineralized, and in places the West and Big Blue veins merge.

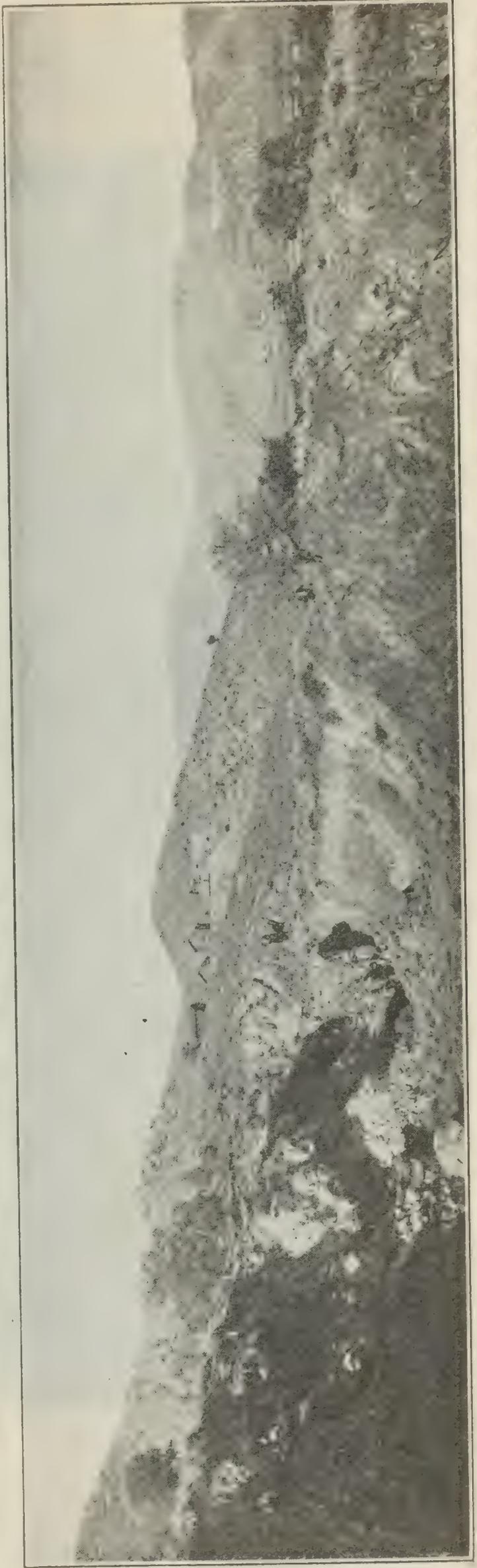
In addition to the main lode, there are a number of veins striking N. 75° E. to N. 40° E., which occur in the granite west of the lode and should form junctions with main lode, probably on the North Extension Sumner claim.

The Beauregard, Frank, Urbana, Jeff Davis and Lady Belle veins were heavy producers in the early days, the ore being of higher value than the main lode.

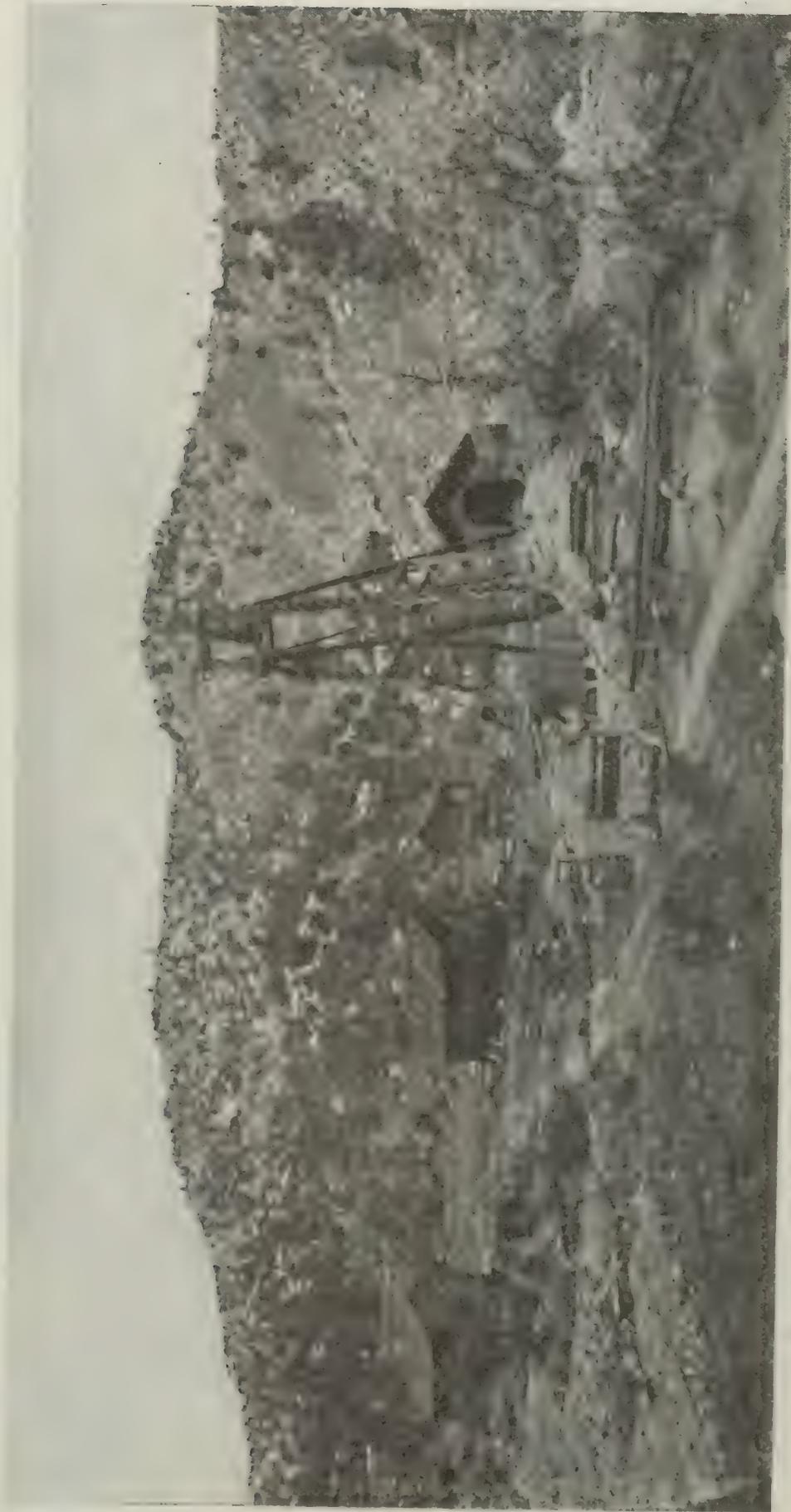
Beauregard Mine is located in Sec. 28, T. 25 S., R. 33 E., M. D. M., in the Sequoia Forest Reserve, and three-quarters of a mile north of Kernville. Elevation 2860 feet. The property consists of one claim, (1200 feet long and 200 feet wide), making a total area of 6 acres, patented in 1882, and is owned by the Kern Development Company.



Cove Mining District, 3½ miles in length. Big Blue and Sumner lode along base of mountains. View from east side of Kern River.



Property of North Sumner Gold Mines, Inc., looking north, and showing open cut on Big Blue Vein. Photos by courtesy of C. S. Long.



Property of the North Sumner Gold Mines, Inc. Photo by courtesy of C. S. Long.

The Beauregard and North Extension Sumner mines are under lease and bond and the Frank and Urbana mines are leased, by the North Sumner Gold mines. The adjoining claims, the Red Hill, Stirrup, Zadel, and Lot 1, consisting of 93 acres, have been deeded to the North Sumner Gold Mines, Inc.—a total area of 115.24 acres. P. V. Long is president; M. S. Baylor, secretary; R. L. Long, general manager. Office, 203 Merchants Exchange Building, San Francisco.

The present company started operations in August, 1921. There are five veins in the hanging wall granite, known as the Beauregard, Urbana, Frank, Lady Belle-Bull Run, and Jeff Davis, which probably form junction with the main fissure (Big Blue-Sumner lode) on the Sumner North Extension claim. The Beauregard vein strikes N. 75° E., dip 85 degrees N. W., average width 4 feet. Pay shoot worked is said to be 600 feet in length, with an average width of 3 feet. Ore is



Big Blue Vein, 240' level—old stope, Big Blue and Sumner Mine. Photo by courtesy of C. S. Long.

free, and plates \$35.00 per ton, concentrates are said to have an average of \$150.00 per ton. This shoot of ore was worked to a depth of 200 feet. Workings consist of seven shafts from 100 to 300 feet deep, three levels, 2500 feet of drifts, and six stopes. The Urbana vein strikes N. 50° E., dips 75 degrees N. W., average width of 18 inches. Pay shoot is said to have been 600 feet long and 18 inches wide, free milling ore. Workings consist of five shafts from 50 to 180 feet deep, drifts and stopes. The Frank vein strikes N. 40° E., dip 77 degrees N. W., the vein forms a junction with the Urbana vein about 200 feet northeast of the Beauregard shaft, and also merges with the Beauregard vein on dip and strikes to the northeast.

The company has cleaned out and retimbered the Beauregard shaft, and is sinking this shaft to the 300 foot level. On the 200' level, the vein was found stoped 300 feet northeast of the shaft. This level has

been extended 350 feet northeast on the vein, to a point where the main north and south fault cut the vein off, and this fault was drifted on 200 feet to the northeast. A crosscut was also driven east 200 feet into slate footwall, cutting through the Big Blue-Summer vein. Water is secured from the Kern River through a ditch $3\frac{1}{2}$ miles long.

Equipment consists of Ingersoll-Sargent compressor, capacity: 650 cu. ft., driven by water turbine. Single drum hoist, driven by air and air drills, two Cameron pumps, assay office, ore bins and cars. Ten stamp mill, 850 lb. stamps.

Fifteen men employed.

Bibl.: Report XIV of State Mineralogist, pp. 487 and 488.

Big Blue and Summer, owned by *Kern Development Company*, C. S. Long, president and manager, Hayward, California; C. C. Hamilton, secretary. Office, 102 Exchange Building, Portland, Maine. Holdings consist of 30 acres, patented in 1872, and 1874, located in Sec. 28, T. 25 S., R. 33 E., M. D. M., about $\frac{1}{2}$ mile north of Kernville. Elevation, 2850 ft. There are three parallel veins, known as East, West and Middle, which have an average width of 40 feet, strike N. 30° E., dip 70 degrees west. These veins form what is locally known as the Big Blue-Summer lode. The pay shoot on west vein is said to have been 1400 feet in length, with an average width of 6 feet, and where this vein merged with the middle vein, it is stated that the lode was 80 feet in width between walls. The mine was developed to a depth of 400 feet. Workings caved and inaccessible. Idle.

Bibl.: VIII and XIV State Mineralogist Reports, VIII, p. 313; XIV, pp. 488-489, 511. Raymond, Seventh Report, U. S. Commissioner of Mining Statistics.

Blue Gouge Group of Mines, consists of 350 acres, located in Sec. 28 and 33, T. 25 S., R. 33 E., 2 miles north of Kernville. Elevation—3600 feet.

Owners: *Orejana Mining Company*, C. S. Long, president; C. C. Hamilton, secretary. Home office: Hayward, California.

Eight parallel veins occur on this group of claims in the granite, strike northeast and southwest, dip 68 degrees to northwest. Average width of these veins is from 4 to 5 feet. The Blue Gouge vein was developed by tunnel about 1000 feet in length, and shaft 200 feet in depth. Idle.

Bibl.: State Mineralogist Report XIV, p. 489.

Bull Run and Lady Belle Group consists of the following claims: Bull Run, Boston Belle, Jeff Davis and Lady Belle, located in Sec. 28, T. 25 S., R. 33 E., $\frac{1}{2}$ mile north of Kernville. Elevation 2980 feet.

Owners: *Lady Belle Mining Company*, of Portland, Maine. C. S. Long, manager, Hayward, California.

The Lady Belle-Bull Run vein occurs in the granite, and has an average width of 3 feet. Strike N. 75° E., dip 62 degrees north. The vein is cut by a fault striking north and south about 200 feet west of Lady Belle shaft. This fault evidently cut off the Lady Belle ore shoot to the southwest. The vein has been developed on the Lady Belle claim by a shaft 380 feet deep sunk on the vein. Four levels driven

east and west on the vein, amounting to several thousand feet, and three stopes 200 feet long. The ore shoot developed is reported to have been 250 feet long with an average width of 3 feet. The last operations conducted from the Lady Belle shaft was in 1914, when ore extracted from the 300 foot level is reported to have plated \$40 per ton. On the Bull Run claim, there is an incline shaft 360 feet deep, seven levels, several thousand feet of drifts and crosscuts, and one stope 900 feet long.

On the Jeff Davis claim, a vein of quartz twelve inches wide occurs in the granite, and is parallel to the Bull Run-Lady Belle vein. Strike N. 75° E., dip 70 to 75 degrees north. Workings consist of shaft 200 feet deep. It is reported that the ore shoot was 550 feet in length, and had an average width of 12 inches—stoped from 150 foot level to surface. Idle.

Bibl.: State Mineralogist Report, XIV, pp. 490, 498, and 501.

Commonwealth, owned by the *Kern Development Company*, C. S. Long, president; C. C. Hamilton, secretary. Offices: Portland, Maine. Consists of 32.4 acres, patented, in Sec. 15, T. 25 S., R. 33 E., about 2 miles north of Kernville. Prospect. Idle.

Bibl.: State Mineralogist Report, XIV, p. 491.

Nellie Dent and Content: consists of 54.3 acres, patented, in Sec. 28 and 33, T. 25 S., R. 33 E., about ½ mile west of Kernville.

Elevation: 3000 feet.

Owners: *Kern Development Company* of Portland, Maine. C. S. Long, president and manager, Hayward, California; C. C. Hamilton, secretary, Kernville.

The vein is reported to be from 40 to 100 feet in width, between granite walls. Strike N. 30° E., dip 68 degrees west. Massive outcrop of quartz occurs on both the Content and Nellie Dent claims, which is about 50 feet in width. Workings on Nellie Dent claim consist of shaft 150 feet deep, in which it is reported that the shoot of ore worked was 450 feet long. Workings caved. Idle.

Bibl.: State Mineralogist Report, XIV, p. 505. Raymond, U. S. Commissioner of Mineral Statistics, 1875.

Zenda Mine, consists of 180 acres located in Sec. 30, T. 30 S., R. 33 E., M. D. M., in the Amalie Mining district, 14 miles northeast of Caliente, in the Sequoia Forest Reserve, at an elevation of 3000 to 3500 feet.

Owner: *Zenda Gold Mining Company*. Frank Counen, president; Arthur D. Storke, general manager; B. D. Abbott, superintendent. Offices, 120 Broadway, New York City.

Since the last report on the mine, contained in the XIV Report of the State Mineralogist, the property was acquired by the above mentioned company, in 1922, and operated from October, 1922, to April, 1923, when the mine suspended operations, pending the remodelling of the 150 ton cyanide plant. The new mill has been under continuous operation from August 1, 1923. The vein occurs as a massive outcrop of quartz in quartz-porphry, strike northeast and southwest, dip 35 degrees north. The width varies from 30 to 50 feet, and where exposed

in the glory hole, it has a width of 50 feet. The known pay shoot is 300 feet in length, with an average width of 30 feet. Workings consist of a number of tunnels from 150 to 600 feet in length, and two glory holes. The ore is mined from a glory hole on top of the ridge, at an elevation of 3550 feet. At an elevation of 3000 feet, the main haulage tunnel is driven N. 30° W., about 350 feet, from which point an upraise connects with glory hole. The ore is trammed in four 1½ ton cars from ore shoots to ore bins, at head of mill. The ore as mined from glory hole runs \$3.00 per ton, of which the values are .07 to .08 ozs. in gold, and 3.5 ozs. in silver. Mine equipment consists of Ingersoll Rand Imperial type (13" x 12") (7½" x 12") compressor, driven by 60 h.p. motor, 60 h.p. electric hoist, air drills and blacksmith shop.

Mill: 150 ton ore bins, 10" x 20" Blake crusher, where ore is crushed to pass 1" ring, then to Hardinge ball mill in closed circuit with Dorr Simplex classifier, and ground to pass through 80 mesh. The pulp is then treated by Dorr decantation method. Cyanide plant consists of 10' x 40' solution tank, 5 Parral agitation tanks and 6 cyanide vats and three zinc boxes. The recovery made is said to be 85% of silver, and 99% of gold, 0.8 of pound of cyanide consumed per ton of ore, and 8 lbs. of lime per ton of ore. Electric power is secured from the Southern California Edison Company, and water is pumped from Caliente Creek, a distance of ½ mile to plant.

Twenty-five men employed.

Los Angeles County.

COPPER AND GOLD.

Indicator Mine, formerly owned by the *Denver Mining and Milling Company* of San Fernando, has been recently acquired by J. W. Gates of Los Angeles. The property is located in Pacoima Canyon, 12 miles northeast of San Fernando. Elevation 2600 feet. The principal claims are known as: Denver, Chance, Fenner, Indicator and Red Ledge. There are a series of parallel quartz veins traversing a country rock of schist and gneiss, striking N. 80° E., dipping 60 to 80 degrees south. The veins vary in width from two to four feet. The ore is a complex sulphide, carrying massive pyrrhotite, chalcopyrite, galena, sphalerite, also stated to carry traces of nickel, cobalt and antimony, and said to carry values in gold and silver. These sulphides occur in lenticular masses in the different quartz veins.

Developments consist of a number of shallow shafts and tunnels on the different veins. Several men employed on development work.

Champion Group of Mines, consists of 15 claims, totaling 300 acres, in Sec. 28, T. 5 N., R. 14 E., in the San Fernando Mining District, about 4 miles northeast of Saugus, in the Santa Barbara Forest Reserve, at an elevation of 2000 feet.

Owners: S. B. Drum, 147 North Los Angeles Street, Los Angeles. Five veins: four parallel, have an average width of 4 feet, diorite foot-wall and porphyry hangingwall, strike east and west, dip 80 degrees south. There is one cross vein, having a width of 2 feet, which strikes north and south. The ore is oxidized gold quartz for a depth of 50 feet, where the sulphide zone is encountered.

Developments consist of a number of tunnels and prospect shafts on the different veins. The most extensive is on one of the east and west

veins; here a tunnel is driven 640 feet on the vein, and at 300 feet from portal cut ore shoot 80 feet long, average width of 3 feet, and ore is said to average \$11.00 in gold, per ton.

Winze sunk on ore shoot to depth of 30 feet, and drift driven 128 feet east on vein. There is another tunnel driven on No. 3 vein, 290 feet. On this group of claims, there is also a large blow out of white quartz, free from iron, that should be of some value on account of high silica content.

Equipment consists of cars, track and blacksmith shop. Idle.

CLAY.

Tropico Potteries, Inc., plant located at Tropico, has been recently acquired by *Gladding, McBean and Company* of San Francisco. The plant was formerly operated by the Pacific Minerals and Chemical Company, with L. Lindsey, president, but in 1920 was incorporated by B. M. Wotgas as the Tropico Potteries, Inc. The principal products manufactured by the company are architectural terra cotta, vitrified clay, sewer pipe, ornamental tile. The company owns clay deposits in Riverside and San Bernardino counties. The new owners are planning to increase the capacity of the present plant.

IRON AND STEEL.

Pacific Coke and Coal Company has recently been incorporated, capitalized at \$7,500,000, under the laws of Delaware, with \$2,500,000 in preferred, and \$50,000 shares of no par value common stock. The company is said to be a subsidiary of the Pacific Coast Steel Corporation, to take over the properties of the Pacific Coast Steel Company, with plants at San Francisco, Portland and Seattle. This corporation has acquired 230 acres of harbor land, lying between Long Beach and Los Angeles Harbor, and plans to erect the first unit of a blast furnace, capable of producing 600 tons of pig iron per day.

The company, besides owning coal and iron deposits in Utah, has also acquired the *Vulcan Iron Deposits*, located in the Providence Mountains, 4 miles east of Kelso, a station on the Salt Lake Railroad. The holdings, consisting of 260 acres, are in the southeast corner of T. 10 N., R. 13 E., San Bernardino County. The ore is a semi-hard red hematite, and is a replacement of limestone near its contact with monzonite. Average analysis of the iron ore is as follows: Iron, 64.82%; Phosphorus, 0.044%; silica, 3.04%; manganese, 6.278%; alumina, 0.568%; lime, 0.444%; sulphur, 0.059%; volatile, 1.85%. They have also acquired a large deposit of limestone near Victorville, San Bernardino County.

The officers of the Pacific Coke and Coal Company are: E. M. Wilson, president; T. F. C. Gregory, vice president; Wallace Sheehan, secretary.

Orange County.

Blue Light Mine. This property, which was formerly known as the Silverado Mine, is located on the west slope of the Santa Ana Mountains, in Silverado Canyon, 20 miles east of Orange, Secs. 11, 14, T. 5 S., R. 7 W. Elevation 2650 to 2950 feet. The property was discovered in 1894. Operated by the Western Zinc Mining Company from 1906 to 1908, who installed a mill and produced six cars of lead and zinc

concentrates. The property was idle until 1913 when acquired by W. H. Thorpe of Los Angeles, who installed 50 ton flotation plant, and operated the property until 1919. In 1919, the property was purchased by the *Blue Light Silver Mines Company*, Mr. Egabroad, president; C. S. Chapman, vice president and managing director; S. L. Collins, secretary; O. H. Pember, superintendent. Offices, F. & M. Building, Fullerton. The company have been developing the property to date. Claims: Dunlap-Blue Light, Harvey-Blue Light, Flannagan-Blue Light, Iron Clad No. 1, No. 2, No. 3, No. 4, Blue Light Extension No. 1, No. 2, No. 3, No. 4, and No. 5. Total holdings amount to 269 acres, of which 60 acres is patented.

The mineral belt in vicinity of Silverado Canyon is two miles wide, and extends nearly north and south for a distance of 8 miles. The country is formed to a great extent of dikes of greenish to blackish rocks, often showing distinct hornblende crystals. The mines south of the canyon are in a feldspathic rock, which is probably an intrusive porphyry. The crystalline rocks of this region are of the Cretaceous age. Two parallel lodes, known as Blue-Light lode and Dike vein, occur in the metamorphic rocks. The former having proved the most productive, has been extensively developed along its outcrop for a considerable distance. The veins have widths of 2 to 6 feet. The ore is silver bearing galena, associated with zinc-blende and pyrite. Irregular lenses of complex lead-zinc sulphide ore occur in these two lodes. Seven known ore bodies have been developed on the Blue Light lode, in the north and south workings from No. 3 tunnel on the Blue Light Mine.

The Blue Light vein strikes N. 16° E., dip 30 degrees to east, and has been proven on the surface for a distance of 4500 feet. Average width of vein being 4 feet. The vein has been developed by seven tunnels. At elevation of 3000 feet, No. 2 tunnel is driven on the vein 350 feet. No. 3 tunnel, which is 50 feet below No. 2 tunnel, is a crosscut tunnel for 200 feet to vein, then driven 470 feet south on vein, this tunnel is connected by upraises and stopes with No. 2 workings. No. 4 tunnel, which is located south of these workings, is a crosscut tunnel driven 900 feet east, cutting the vein at 540 feet from portal; no ore was found at this point and the vein was not drifted on either to the north or south.

The most recent development has been in driving No. 7 tunnel, which is located north of No. 3 workings and at a vertical elevation of about 400 feet below No. 3 workings, in Pine Canyon. The tunnel is driven 50 feet southwest, then crosscut 110 feet east to vein, with drift south 500 feet on the vein, with the expectation of developing the known ore shoots worked in upper workings. It is reported that 8000 tons of ore have been developed above No. 3 tunnel level that has an average value of .06 ozs. gold, 25 ozs. silver, 4% lead and 13% zinc.

Equipment: 14" x 8" x 8" Clayton compressor, driven by semi-Diesel Y-type gas engine, air drills, blacksmith shop, cars and track.

Mill: 50-ton flotation plant, two 9" x 15" Blake jaw crushers, driven by 30 h.p. West Coast gas engine, Challenge ore feeder, 5' x 4' ball mill in closed circuit with Dorr classifier, one 12' K. & K. flotation machine, two 6' K. & K. flotation machines, one Wilfley, one Overstrom and one

Cottrell table, two Dorr thickeners and one Denver filter, flotation plant driven by 100 h.p. Fairbanks-Morse semi-Diesel gas engine.

Product: produced in 50-ton flotation plant:

5 cars shipped in 1917 by W. H. Thorpe.

Lead concentrates:

Au. = 0.25 ozs.; Ag. = 303.8 ozs.; Pb. = 15%; Zn. = 14.4%; Fe. = 19.8%.

Zinc concentrates:

Au. = .08 ozs.; Ag. = 21 oz.; Pb. = 2.28%; Zn. = 45%; Fe. = 8.6%.

Iron concentrate:

Au. = .02 ozs.; Ag. = 4.3 ozs.; Zn. = 0.5%; Fe. = 43.5%; S. = 40%.

During 1922, shipped to Selby smelters: 52,280 lbs. of lead concentrates, assaying: Au. = 0.29 ozs.; Ag. = 207.20 ozs.; Pb. = 19.9%; Zn. = 31%; S. = 26.1%; Fe. = 6.2%.

29,120 lbs. of lead concentrates, assaying: Au. = 0.22 ozs.; Ag. = 104 ozs.; Pb. = 14.7%; Zn. = 21.7%; Fe. = 6.2%; S. = 21%.

Also produced a zinc product, assaying: Zn. = 45%, and carrying 30 ozs. silver, which was stored at plant, and a clean iron product, assaying: Au. = 0.02 ozs.; Ag. = 4.3 ozs.; Zn. = 0.5%; Fe. = 42%; S. = 40%, which was also stored at plant.

The company plans to increase the capacity of its present experimental flotation plant, as soon as the present plan of development work on No. 7 tunnel level is completed. Ten men are employed.

Riverside County.

CRUSHED ROCK.

Temescal Rock Quarry. The quarry was formerly owned by the *Temescal Rock Company*, now operated by the *Blue Diamond Materials Company*, 2200 E. 16th Street, Los Angeles.

The company's holdings cover 1100 acres of mountain land lying in T. 4 S., R. 6 W., S. B. M. The quarry is located in Temescal Canyon, 4 miles southeast of Corona. The material that is being crushed is a rhyolitic porphyry and is very hard and sharp. The mountain side where the rock is quarried slopes steeply, and has an elevation of 1000 to 1200 feet above the canyon. The bench now being quarried is approximately 350 feet high and 1200 feet long. The present production of the rock crushing plant is 5000 tons per day.

John Schreiner, manager; George Haines, superintendent.

Description of the crushing plant is contained in XVth Report of the State Mineralogist, pp. 586-587, and a more recent description is found in the *Engineering and Mining Journal Press*, November 24, 1923.

GOLD.

White Mines Corporation, John M. White, president. Offices: 440 Wilcox Building, Los Angeles, is developing a group of claims, located 35 miles north of Indio. The company owns six claims, on which it has a shaft 150 feet deep, and a tunnel driven on the vein 300 feet. The vein has an average width of 3 feet and is said to have an average value of \$12.00 per ton in gold. Three men employed.

TIN.

Temescal Tin Mine, located four miles southeast of Corona, on the old Spanish grant, known as the El Sobrante de San Jacinto, has recently been taken over under lease and bond by J. O. Stewart and associates of Los Angeles. The property was operated in 1887 by the *San Jacinto Tin Company*, an English corporation. The developments consisted of two incline shafts, 272 feet apart, located on Cajalco Hill, which were sunk on a vein which strikes N. 45° E., dip 65 degrees northwest, and is said to have had an average width of 6 feet. A tunnel was driven on this vein which intersected one of these shafts at a depth of 45 feet, and the other shaft at a depth of 100 feet. A number of parallel veins occur in hornblende-biotite granite, having a general course of northeast and southwest. The belt in which these veins occur, carrying values in tin, is about 4 miles in length, and about 2 miles in width, the deposits being confined to the granitic rocks in this area. Two varieties of tin ore occur in the district. The yellow, occurring in thin layers in an uncrystalline form, and the brown oxide of tin.

The deposit is fully described in the XIth Report of the State Mineralogist, by H. W. Fairbanks, and also in the XVth Report, pp. 547-550, by F. J. H. Merrill.

MOLDING SAND.

Jurupa Molding Sand Deposit is situated in Sec. 29, T. 2 S., R. 5 W., on the Evans Ranch, about one quarter of a mile northwest of Jurupa Station on the Salt Lake Railroad, and on the south bank of the Santa Ana River, within the city limits of Riverside. The deposit is being developed by H. E. Blood, of 917 Citizens National Bank Building, Los Angeles, who has a lease on 20 acres.

The deposit is a fine-grained, sandy loam, and is from 6 to 20 feet thick, covering an area of 20 acres. It is stated that 90% of the sand will pass through 100 mesh screen.

Equipment consists of 18" belt conveyor, 20 feet long, and $\frac{1}{2}$ mesh shaking screen. About ten cars of screened sand is being shipped to Los Angeles. Two men are employed.

San Bernardino County.

CLAY.

Pacific Clay Deposit is located in Hart Mining District, which is situated in the extreme northeast corner of San Bernardino County, near the Nevada-California line. The deposit is being developed by the *Pacific Sanitary Manufacturing Company* of San Francisco.

GOLD.

Belmont Mine is located in the Goldstone Mining district, 34 miles N. E. of Barstow. Elevation, 3700 feet.

Owners: *Belmont Mining Company*, Dr. W. W. Ramsey, president; George I. Drumm, secretary; Morgan Berggreen, superintendent.

Holdings consist of 21 claims, totaling 240 acres. The present development work is confined to the Belmont group, consisting of five claims.

Two parallel quartz veins occur in shales and schist, strike N. 60° W., dip 35 degrees to northeast. These veins vary in width from 12 inches to 3 feet. The ore is free milling with some pyrite and chalcopyrite.

Developments consist of a number of shafts sunk to depths of 50 to 300 feet on the different veins. The main shaft is 300 feet deep, sunk on incline of 35 degrees. Drifts have been driven on the vein for a short distance on the 100', 200' and 300' levels. Present work confined to drifting on the vein on the 300 foot level; here the vein is 3 feet wide, and is said to average \$20.00 per ton. Some high grade ore was shipped from the property during 1916 and 1917.

Equipment consists of 15-h.p. Fairbanks-Morse gas engine hoist (7½" x 6"), Chicago pneumatic compressor, air drills, blacksmith shop and cars. The property adjoins the Goldstone Mining Company property, on the southeast. Three men employed.

Goldstone Mine is situated in the Goldstone Mining District, 33 miles northeast of Barstow. Elevation, 3600'.

Owners: *Goldstone Mining and Milling Company*, J. M. Schofield, president; G. Marston Leonard, secretary, Boston, Mass.

Holdings of the company consist of 22 claims, divided into five groups known as Goldstone, Golden State, Gold Dollar, Big Drum and Lucky Find. A vein of quartz occurs on the contact of crystalline limestone and shale. The vein has a course of north and south to northwest and southeast. Dip 40 degrees west. Average width of 4 feet. Ore shoot developed was 150 feet in length and 4 feet wide. Since XVth Report of the State Mineralogist, the company sunk a 2-compartment vertical shaft to depth of 300 feet, at 50 feet below the collar, cut the vein, and for the remaining distance the shaft is in the limestone footwall. No crosscuts were run to intersect the vein from this shaft. A number of incline shafts were sunk along the outcrop to depths of 40 feet, south of the main shaft. An open cut 150 feet in length was also made on the vein. Most of the ore mined came from this open cut. 100 tons of ore milled is said to have averaged \$40.00 per ton. One car of ore shipped by the company to Selby Smelter averaged \$70.00 per ton.

The property was operated from 1916 to 1918, when operations were suspended.

Equipment consists of 25-h p. single drum gas engine hoist, 12" x 12" Fairbanks-Morse compressor, driven by 50-h.p. gas engine, headframe, blacksmith shop, assay office and buildings. Two men employed.

Bibl.: State Mineralogist Report XV, pp. 805-806.

Massen Group of Mines, consists of 87 claims, located on the northwest slope of the Alvord Range of mountains, in Sec. 26-35, T. 12 N., R. 3 E., 32 miles northeast of Barstow.

Elevation, 2400 to 3100 feet.

Owner: J. H. Massen and associates of Barstow.

A number of roughly parallel narrow quartz veins occur in the granite. These veins have a general course of northwest and southeast, with dips varying from 40 to 60 degrees to southwest. The veins vary in width from 2 inches to 2 feet. These narrow veins of quartz usually occur along fault fractures in the granite, and as a rule the fracture is filled with a diorite-porphry, with quartz occurring either

on the hanging or footwall of the fissure. The ore is oxidized quartz, showing free gold.

Developments consist of a number of shallow shafts and tunnels on the different veins. It is stated that ore shipped from the Gem State Group averaged \$50.00 per ton. Two men employed.

Olympus Mine, situated on the south slope of the Paradise Range of mountains, at elevation of 2400 feet, 22 miles north of Daggett.

Owner: *Olympus Gold Mining Company*, S. E. Bagley, president; M. W. H. Williams, secretary; H. Galerone, superintendent. Offices: 508 Alvarado Street, Redlands, California.

Since the data in XVIIth Report of the State Mineralogist was published, the company has been driving a crosscut tunnel to cut the vein at 200 feet below the collar of the incline shaft. At an elevation of 2200 feet, the tunnel has been driven 75 feet northwest, then 325 feet west to vein, with a drift north on the vein 100 feet. In this north drift, the vein has a width of $\frac{1}{4}$ feet. The vein filling being quartz and porphyry, which pans well in free gold. The company proposes to continue drifting on the vein until shoot of ore encountered in upper workings is developed. Four men are employed.

SILVER.

Rand District.

California Rand Silver, Inc. The company's report of operations for the year ending September 1, 1923, states that the outstanding feature of the mining enterprise today is the practical demonstration that the property can be operated with the market price of silver from 60 to 65 cents per oz. The company has been able to pay its regular monthly dividends of two cents a share, requiring a distribution of \$25,600, and has at the same time increased its surplus by \$135,000.

The original mill, with a capacity of 150 tons, was enlarged during the year to 400 tons capacity. For the year, there were 16,161 feet of underground development. Up to September 1, 1923, a total of 44,455 feet, or 8 miles of underground development work has been done since the opening of the mine. Aside from development work on other shafts, shaft No. 1 and No. 2 produced 134,000 tons of rock during the year, segregated as follows:

Shipping ore -----	8,830 tons
Milling ore -----	80,790 tons
Waste -----	44,380 tons
Total -----	134,000 tons

Total Production.

Recapitulation of all production to August 1, 1923:

<i>From Ore</i> —	<i>Gold, ozs.</i>	<i>Silver, ozs.</i>
Prior to September 1, 1922 -----	10,084,253	4,232,241.73
September 1, 1922–August 1, 1923-----	1,625,658	923,563.35
<i>From Concentrates</i> —		
Prior to September 1, 1922-----	1,176,853	363,695.44
September 1, 1922–August 1, 1923-----	5,147,982	1,471,451.97
Grady Lease -----	5,429,989	1,487,742.11
Totals -----	23,464,735	8,478,694.60

<i>Values from Ore—</i>	<i>Gold</i>	<i>Silver</i>
Prior to September 1, 1922-----	\$4,602,650.17	\$3,312,908.33
September 1, 1922–August 1, 1923-----	927,652.88	689,357.14
<i>Values from Concentrates—</i>		
Prior to September, 1922-----	388,020.99	323,086.75
September 1, 1922–August 1, 1923-----	1,412,126.87	1,192,587.70
Grady Lease -----	1,599,979.98	1,099,119.70
Totals-----	\$8,930,430.89	\$6,617,059.62

The mill has treated 90,363 tons of ore in 332 days, which is an average of 272.17 per day. There were 27½ days lost time, of which 50 per cent was due to delays, such as water shortage, ore shortage, or power interruptions. The running time efficiency was 91.72 per cent. The running time tonnage averages 296.75 tons per day.

The average gold heads were \$1.93; average gold tails were \$0.528; average gold extraction was 72.64 per cent. The average silver heads were \$15.00; average silver extraction was 90 per cent. The total average heads was \$16.93; total average tails were \$2.02; total average extraction was 88.50 per cent. The recovery per ton was \$14.91; total recovery on 90,363 tons, \$1,347,312.33; average concentrate value was \$307.29; tons of concentrates shipped 4,595.414; gross value of concentrates shipped \$1,412,126.87; net value of concentrates shipped, \$1,192,587.70. Cost of marketing 4,595.414 tons of concentrates was \$219,539.17, or \$47.77 per ton.

After payment of the dividends of September 4, 1922, the company had on hand a balance of \$319,200.

Revenue from the smelter for ore and concentrates for the year was \$1,881,944.84, to which is added bullion sold, interest earned, and sundry receipts, totaling \$17,624.87, making a total revenue of \$1,899,569.71.

Principal items of disbursement were:

Labor -----	\$517,909.90
Materials, supplies, power development, litigation, insurance and incidentals -----	484,128.54
Taxes -----	147,268.60
	\$1,149,307.04

The company paid in dividends to stockholders, including the September, 1923, dividend, \$819,200 and had on hand September 4, 1923, a balance of \$589,841.28, an increase of \$270,641 over the balance at this time last year.

In the four years and two months of operation of the mine, there have been distributed in dividends as follows:

An initial dividend of 7½ cents per share, forty-four regular dividends at two cents per share, and eleven extra dividends at 10 cents per share, making a total of \$2.05½ per share or \$2,630,400.

San Diego County.

GEMS.

Himalaya Gem Mine, located in Sec. 17, T. 11 S., R. 2 E., near Mesa Grande, is being operated by Fred Rynerson of San Diego. The property was formerly operated by the *Himalaya Mining Company* of

New York. A pegmatite dike having a general north-western direction, occurs in a dark green gabbro. The average width of dike is about 4 feet. The tourmaline and other gem material occur imbedded in clay, in cavities and pockets in the coarse pegmatite dike. A new tunnel is being driven to cut the vein at a greater depth than was attained in the old workings and the present operator expects to open up important deposits of gem tourmaline with this deeper development.

A. B. C. Gem Mine, located in Sec. 8, T. 13 S., R. 2 E., near Ramona, is being developed by C. A. Seay, and L. B. Spalding of Ramona. It is reported that some new pink beryl deposits have been encountered. The gem material occurs in pegmatite dikes in granite. The mine has been worked at intervals since 1907, and is reported to have produced a large amount of pink beryl. The largest production came from what is known as the old Daggett stope, a narrow, irregular working, which followed the vein on its dip for something over 100 feet. Recently, a new shoot of gem-bearing clay has been found north of the Daggett stope.

GOLD.

North Star Mines, located in Sec. 31, T. 14 S., R. 5 E., in Deer Park Mining district, 7 miles northeast of Descanso, was recently purchased by Francis Gage and associates of Los Angeles, from J. H. Schook of Descanso. It is reported that the new owners will start active development work on the property, and also plan to install a 5-stamp mill. The ore is stated to have an average value of \$25.00 per ton.

NICKEL.

Friday Copper Mine, consists of the following claims: Sterne, Copper Queen, Uncle Sam, Cobalt King, and Nickel King, located in Sec. 15, T. 13 S., R. 4 E., 4 miles south of Julian.

Elevation: 4400 feet.

Owner: *Friday Copper Mining Company*, Frank H. Brown, president; Beecher Stern, secretary. Offices, American National Bank Building, San Diego.

The property has recently been taken over under lease and bond by Allen R. Partridge of Los Angeles.

On the surface, the outcrop of the vein is an iron gossan, consisting chiefly of limonite, striking east and west, with a width of 25 to 50 feet. The ore occurs near the contact of gabbro and schist and in places is enclosed in gabbro. The ore consists mainly of pyrrhotite, but contains pyrite, and an iron nickel sulphide, and is accompanied by small quantities of amphibole and calcite. Analysis of ore shows 4% nickel, 2% cobalt, and 6% arsenic.

Developments consist of shaft 175 feet deep, with two levels, one at a depth of 130 feet, the other at a depth of 175 feet. The ore body developed is 60 feet long by 20 feet in width.

The mine is being unwatered, and an extensive plan of development has been planned. Joseph Hartley, superintendent.

Bibl.: State Mineralogist Reports XIV, pp. 666-667; XVII, pp. 380-381. U. S. Geol. Survey Bull. 640 D.

OIL FIELD DEVELOPMENT OPERATIONS.

By R. D. BUSH, State Oil and Gas Supervisor.

FEATURES OF 1923 PRODUCTION.

California again broke all previous records in its production of petroleum by producing 263,729,000 barrels in 1923. This is about 36 per cent of the amount produced in the entire United States, and almost double the amount produced by California in 1922, which was a record year. This great increase was due to the intensive and rapid development of the Huntington Beach, Santa Fe Springs and Long Beach fields, where initial productions of nearly all the wells were large. These three fields produced 69.4 per cent of the State's production in 1923. This tremendous production taxed the storage capacity and marketing facilities of the large companies, and caused new markets for California crude oil to be opened. About 92,000,000 barrels of crude was in storage at the end of 1923, as compared with 61,380,000 barrels at the beginning of the year, and notwithstanding about 54,455,000 barrels was shipped through the Panama Canal to eastern refineries.

During September, 1923, production reached its maximum, and then declined, this decline continuing to the end of the year, in spite of the fact that production was resumed in some of the San Joaquin Valley fields where it had been shut in. In December, 1923, for the first time since December, 1920, storage decreased, or, in other words, consumption, which includes oil shipped to eastern ports through the Panama Canal, was greater than the December production, which averaged daily 706,000 barrels. The indicated consumption of oil increased during the year from 451,613 barrels in December, 1922, to 711,459 barrels in December, 1923.

There were three reductions in the price of oil in 1923: the first reduction was made on January 6, when all grades, including 20 degrees Baumé, and above, were reduced, the highest gravity (35 degrees and above) being reduced 53 cents. The next reduction, on April 10, for the refinable oils, amounted to 41 cents for the highest grade. The third reduction, amounting to 18 cents on the highest grade, was made on October 9. Fuel oil, or the grades below 20 degrees Baumé, remained stationary during the year.

A total of 1400 new wells was started in 1923, as compared with 1439 in 1922. During the year, 980 producing wells were completed.

At the close of the year with the Santa Fe Springs, Huntington Beach and Long Beach fields almost completely developed, activity in the Los Angeles Basin centered in Torrance field, but this field does not give promise of being as prolific, or of developing as rapidly, as the above mentioned fields, since most of the acreage is held in comparatively large leases by the larger companies. Activity is also gradually increasing in the older fields of the San Joaquin Valley, and the outlook for the petroleum industry for the year 1924 looks bright at the present time. The year started out with an increase in the price of all grades of oil amounting to 25 cents, effective January 22, and the prospect of additional increases during the year is good.

From September 8, 1923, to and including December 29, 1923, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
COLUSA COUNTY:					
S. H. Keoughan, Trustee.....	31	18	4	1	
CONTRY COSTA COUNTY:					
Elsinore Oil Co. of Nevada.....	19	2	1	1	
FRESNO COUNTY:					
General Petroleum Corp.....	22	21	15	1	
KERN COUNTY:					
Elk Hills Central Oil Co.....	14	31	24	2	Elk Hills
Elk Hills Development Co.....	14	30	22	1	Elk Hills
Pacific Oil Co.....	27	30	24	57	Elk Hills
Pacific Oil Co.....	35	30	24	80	Elk Hills
Pacific Oil Co.....	35	30	24	227	Elk Hills
Pacific Oil Co.....	35	30	24	73	Elk Hills
Pan American Petroleum Co.....	6	31	24	1	Elk Hills
Pan American Petroleum Co.....	3	21	24	Crampton 6-K	Elk Hills
Pan American Petroleum Co.....	2	31	24	Crampton 13-F	Elk Hills
Pan American Petroleum Co.....	2	31	24	Crampton 12-F	Elk Hills
Pan American Petroleum Co.....	1	31	24	Crampton 8-E	Elk Hills
Gray Heirs.....	3	29	28	42	Kern River
Gray Heirs.....	3	29	28	43	Kern River
Kern River Oilfields of Cal. Ltd.....	35	28	28	1-13B	Kern River
Cymrie Oil Co.....	26	29	21	3	McKittrick
Bell Evans Oil Co. Inc.....	35	32	23	1	Midway
Bell Evans Oil Co. Inc.....	35	32	23	2	Midway
Bell Evans Oil Co. Inc.....	35	32	23	3	Midway
Berry & Ewing.....	31	32	24	17	Midway
Berry & Ewing.....	31	32	24	18	Midway
Big Ten Oil Co.....	36	32	23	4	Midway
C. C. M. O. Co.....	27	31	22	2	Midway
C. C. M. O. Co.....	22	31	22	28	Midway
C. C. M. O. Co.....	26	31	22	5	Midway
C. C. M. O. Co.....	25	31	22	19	Midway
C. C. M. O. Co.....	22	31	22	33	Midway
C. C. M. O. Co.....	25	31	22	15	Midway
C. C. M. O. Co.....	9	32	23	40	Midway
Formax Oil Co.....	36	32	23	9	Midway
Formax Oil Co.....	36	32	23	10	Midway
Formax Oil Co.....	36	32	23	11	Midway
General Petroleum Corp.....	32	31	24	7	Midway
Honolulu Consolidated Oil Co.....	6	32	24	68	Midway
Honolulu Consolidated Oil Co.....	6	32	24	58	Midway
Honolulu Consolidated Oil Co.....	8	32	24	13	Midway
Kendon Petroleum Co.....	35	32	23	2	Midway
Lawrence Santa Fe Oil Co. Inc.....	13	32	23	7	Midway
Mascot Oil Co.....	36	32	23	3	Midway
North American Oil Cons.....	30	31	24	5	Midway
Olympia Oil Co.....	36	32	23	1	Midway
Pacific Oil Co.....	25	31	23	69	Midway
Pacific Oil Co.....	25	31	23	1	Midway
Pacific Oil Co.....	3	32	24	1	Midway
Pacific Oil Co.....	31	31	24	25	Midway
Pacific Oil Co.....	15	32	24	52	Midway
Section Two Oil Co.....	2	31	22	3	Midway
Seven States Oil Co.....	22	32	23	1	Midway
Stabler Oil Co.....	28	31	24	1	Midway
Vivian B. Oil Co.....	35	32	23	5	Midway
C. J. Berry.....	34	12	24	Hillside 26	Sunset
Havenstrite & Baker.....	17	11	23	1	Sunset
E. G. Lewis.....	10	11	23	Hauchen 1	Sunset
E. G. Lewis.....	19	11	23	Boss 1	Sunset
E. G. Lewis.....	6	11	23	8	Sunset
Transport Oil Co.....	4	11	23	2	Sunset
United Oil Co.....	10	11	23	1	Sunset
General Petroleum Corp.....	28	11	20	2	Wheeler Ridge
Midland Oilfields Co. Ltd.....	22	11	20	1	Wheeler Ridge
Standard Oil Co.....	28	11	20	Kern Co. Lease 27	Wheeler Ridge
Standard Oil Co.....	28	11	20	Kern Co. Lease 26	Wheeler Ridge
Standard Oil Co.....	28	11	20	Kern Co. Lease 28	Wheeler Ridge
Standard Oil Co.....	28	11	20	Kern Co. Lease 29	Wheeler Ridge
Pearson & Phillips.....	35	26	18	1	
T. A. Piper.....	2	27	28	Piper 2	
KINGS COUNTY:					
California Oil Co.....	2	23	19	1	
California Oil Co.....	7	23	20	1	

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY:					
Acme Petroleum Corp.	19	4	12	Damron 4	Long Beach
Bartholomae Oil Corp.	24	4	13	4	Long Beach
Big Bear Oil Co.	24	4	13	1	Long Beach
Bonded Oil Syn.	24	4	13	1	Long Beach
California Co-Operative Oil Syn.	24	4	13	2	Long Beach
California Oil Producers, Inc.	24	4	13	1	Long Beach
Cook & Harpster, Inc.	24	4	13	1	Long Beach
Davis & Macmillan Co.	29	4	12	7	Long Beach
Walter H. Fisher	30	4	12	7	Long Beach
Fred B. Foster & Co.	19	4	12	70	Long Beach
George F. Getty	20	4	12	L. B. 5-A	Long Beach
George F. Getty	19	4	12	L. B. 10	Long Beach
Henderson Petroleum Syn.	19	4	12	Hoover 2	Long Beach
Hope Oil Co.	30	4	12	May Richards 1-A	Long Beach
R. E. Ibbetson Drilling Co.	19	4	12	2	Long Beach
Industrial Oil Syn.	19	4	12	23	Long Beach
A. T. Jergins Trust	19	4	12	9	Long Beach
Laddie Boy Nos. 1 & 2	24	4	13	2	Long Beach
Lang-Wall, Inc.	24	4	13	3	Long Beach
Carl Maier	19	4	12	2	Long Beach
Marine Oil Corp.	19	4	12	12	Long Beach
Meserve-Knight-Fyfe, Trustees	24	4	13	1	Long Beach
Meserve-Knight-Son	19	4	12	1	Long Beach
Meserve-Knight-Son	24	4	13	2	Long Beach
Mission Bell Oil Co.	19	4	12	1-A	Long Beach
Mission Bell Oil Co.	19	4	12	2	Long Beach
Monrovia Oil Co.	29	4	12	2	Long Beach
Nevada Signal Hill Oil Co.	24	4	13	1	Long Beach
Pan American Petroleum Co.	30	4	12	Chainey 1	Long Beach
Pan American Petroleum Co.	29	4	12	McKeon 1	Long Beach
Pan American Petroleum Co.	29	4	12	McKeon 2	Long Beach
E. A. Parkford	19	4	12	Richardson 1	Long Beach
E. A. Parkford	19	4	12	Richardson 2	Long Beach
Petroleum Midway Co. Ltd.	19	4	12	Davidson 3	Long Beach
Petroleum Midway Co. Ltd.	19	4	12	Davidson 4	Long Beach
Petroleum Midway Co. Ltd.	19	4	12	Foster One 3	Long Beach
Petroleum Midway Co. Ltd.	19	4	12	Bauman 2	Long Beach
Petroleum Midway Co. Ltd.	29	4	12	Rosenfield 2	Long Beach
Petroleum Midway Co. Ltd.	19	4	12	Walker 2	Long Beach
Petroleum Midway Co. Ltd.	19	4	12	O'Neill 2	Long Beach
Pomona Oil Co.	24	4	13	Pomona 2	Long Beach
W. R. Ramsey	29	4	12	2A-B	Long Beach
V. E. Sack & Co.	24	4	13	1	Long Beach
San Martinez Oil Co.	29	4	12	Fry 2	Long Beach
Shell Co.	28	4	12	Alamitos 10-A	Long Beach
Shell Co.	29	4	12	Wells 2	Long Beach
Shell Co.	29	4	12	Nicholson 4	Long Beach
Shell Co.	29	4	12	Kent-Garth 3	Long Beach
Shell Co.	29	4	12	Babb & Tucker 1-A	Long Beach
Shreve Oil Syn.	13	4	13	1	Long Beach
Special Delivery Oil Syn.	24	4	13	4	Long Beach
St. Louis Oil Co.	24	4	13	1	Long Beach
The United Oil Co.	29	4	12	Denni 1-A	Long Beach
The United Oil Co.	30	4	12	Hass 10	Long Beach
The United Oil Co.	30	4	12	Hass 5	Long Beach
United States Royalties Co.	24	4	13	14	Long Beach
United States Royalties Co.	19	4	12	8	Long Beach
Wigle & McBride, Inc.	29	4	12	1-A	Long Beach
Rapetto Hills Petroleum Corp.	34	1	12	1	Montebello
Amazon Drilling Corp.	6	3	11	S. P. 1	Santa Fe Springs
Associated Oil Co.	1	3	12	Clarke 4	Santa Fe Springs
Associated Oil Co.	33	2	12	Clarke 9	Santa Fe Springs
Associated Oil Co.	1	3	12	Clarke 10	Santa Fe Springs
Associated Oil Co.	1	3	12	Clarke 7	Santa Fe Springs
Bandini Petroleum Co.	6	3	11	Off 3	Santa Fe Springs
Equitable Oil Syn. No. 1	17	3	11	1-A	Santa Fe Springs
General Petroleum Corp.	6	3	11	Jalk 10	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 18	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 37-A	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 19	Santa Fe Springs
General Petroleum Corp.	5	3	11	Santa Fe 17	Santa Fe Springs
Mohawk Oil Co.	6	3	11	Batson 4	Santa Fe Springs
Petroleum Midway Co. Ltd.	31	2	11	Matern One 3	Santa Fe Springs
Petroleum Midway Co. Ltd.	6	3	11	Patterson 9	Santa Fe Springs
Petroleum Midway Co. Ltd.	6	3	11	Standlee 3	Santa Fe Springs
Petroleum Midway Co. Ltd.	31	2	11	Matern One 4	Santa Fe Springs
Shell Co.	31	2	11	Thompson 4	Santa Fe Springs
Shell Co.	31	2	11	Thompson 5	Santa Fe Springs

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued.					
Shell Co.	31	2	11	GHN 12	Santa Fe Springs
Shell Co.	6	3	11	Slusher 6-A	Santa Fe Springs
C. C. Stall Oil Assn.	35	2	12	C. C. Stall 1	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 9	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 11	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 10	Santa Fe Springs
Standard Oil Co.	6	3	11	Weisel 12	Santa Fe Springs
Standard Oil Co.	1	3	12	Orr 1	Santa Fe Springs
Standard Oil Co.	36	2	12	A. O. Houghton 1	Santa Fe Springs
Standard Oil Co.	1	3	12	Orr 2	Santa Fe Springs
Standard Oil Co.	6	3	11	S. G. & J.	Santa Fe Springs
Standard Oil Co.	35	2	12	L. W. Houghton 1	Santa Fe Springs
Standard Oil Co.	35	2	12	W. L. Houghton 2	Santa Fe Springs
Standard Oil Co.	1	3	12	Orr 3	Santa Fe Springs
Standard Oil Co.	36	2	12	Jordan 5	Santa Fe Springs
Standard Oil Co.	5	3	11	S. Whittier Com. 16	Santa Fe Springs
Standard Oil Co.	31	2	11	Wolfskill 3	Santa Fe Springs
Standard Oil Co.	31	2	11	Santa Gertrudes 7	Santa Fe Springs
Standard Oil Co.	36	2	12	Santa Gertrudes 8	Santa Fe Springs
Standard Oil Co.	31	2	11	Santa Gertrudes 9	Santa Fe Springs
Standard Oil Co.	5	3	11	S. Whittier Com. 13	Santa Fe Springs
Standard Oil Co.	5	3	11	S. Whittier Com. 15	Santa Fe Springs
Union Oil Co.	31	2	11	Howard 7	Santa Fe Springs
Associated Oil Co.	14	4	14	Torrance 1	Torrance
Bankline Oil Co.	23	4	14	Bethune 1	Torrance
Beaver State Oil Co.	23	4	14	Torrance 1	Torrance
Beaver State Oil Co.	23	4	14	Torrance 2	Torrance
Betridge Oil Co.	14	4	14	Torrance Div. 1	Torrance
Geo. B. Bush	14	4	14	2	Torrance
Bush-Voorhis Oil Co.	14	4	14	1	Torrance
Bush-Voorhis Oil Co.	23	4	14	3	Torrance
Bush-Voorhis Oil Co.	23	4	14	2	Torrance
Bush-Voorhis Oil Co.	23	4	14	4	Torrance
C. H. and D. C. Trust	23	4	14	Victoria 1	Torrance
California Drilling Co.	23	4	14	Black Diamond 1	Torrance
T. J. Cannon Drilling & Supply Co.	23	4	14	1	Torrance
C. C. M. O. Co.	14	4	14	Torrance 20	Torrance
C. C. M. O. Co.	14	4	14	Torrance 22	Torrance
C. C. M. O. Co.	14	4	14	Torrance 19	Torrance
C. C. M. O. Co.	14	4	14	Torrance 23	Torrance
C. C. M. O. Co.	23	4	14	Kettler 1	Torrance
C. C. M. O. Co.	14	4	14	Torrance 21	Torrance
C. C. M. O. Co.	10	4	14	Torrance 25	Torrance
C. C. M. O. Co.	14	4	14	Torrance 27	Torrance
C. C. M. O. Co.	14	4	14	Kettler 2	Torrance
C. C. M. O. Co.	16	4	14	Del Amo 9	Torrance
C. C. M. O. Co.	15	4	14	Torrance 29	Torrance
C. C. M. O. Co.	14	4	14	Torrance 31	Torrance
C. C. M. O. Co.	14	4	14	Kettler 4	Torrance
C. C. M. O. Co.	14	4	14	Kettler 3	Torrance
C. C. M. O. Co.	15	4	14	Torrance 28	Torrance
Checot Trust No. 1	23	4	14	1	Torrance
Consolidated Mutual Oil Co.	14	4	14	1	Torrance
Consolidated Mutual Oil Co.	14	4	14	2	Torrance
Consolidated Mutual Oil Co.	14	4	14	3	Torrance
Consolidated Mutual Oil Co.	19	4	14	Oakley 1	Torrance
Consolidated Mutual Oil Co.	19	4	13	1	Torrance
Cook Drilling Corp.	14	4	14	1	Torrance
Cook Drilling Corp.	23	4	14	2	Torrance
Cook Drilling Corp.	14	4	14	3	Torrance
Cunningham & Kyle	23	4	14	1	Torrance
Dabney & Delaney	23	4	14	Lomita 1	Torrance
Doruth Oil & Investment Co.	23	4	14	1	Torrance
Federal Drilling Co.	23	4	14	Huyek 1	Torrance
Federal Drilling Co.	23	4	14	Heyman 2	Torrance
Federal Drilling Co.	23	4	14	Barrone 1	Torrance
Federal Drilling Co.	23	4	14	Gerner 2	Torrance
Fisher-Gregg Syn. Extension	14	4	14	1	Torrance
Fortuna Oil Co. Inc.	23	4	14	Clarke 1	Torrance
Fred B. Foster & Co.	10	4	14	66	Torrance
Fred B. Foster & Co.	10	4	14	67	Torrance
Fred B. Foster & Co.	23	4	14	68	Torrance
Fred B. Foster & Co.	14	4	14	69	Torrance
Geo. F. Getty	15	4	14	Torrance 4	Torrance
Geo. F. Getty	8	4	14	Torrance 5	Torrance
Geo. F. Getty	10	4	14	Torrance 6	Torrance
Geo. F. Getty	15	4	14	Torrance 7	Torrance
Geo. F. Getty	15	4	14	Torrance 8	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued.					
Geo. F. Getty	14	4	14	Torrance 9	Torrance
Geo. F. Getty	14	4	14	Torrance 10	Torrance
Geo. F. Getty	14	4	14	Torrance 11	Torrance
Geo. F. Getty	23	4	14	Torrance 12	Torrance
Geo. F. Getty	14	4	14	Torrance 13	Torrance
Geo. F. Getty	14	4	14	Torrance 14	Torrance
Geo. F. Getty	14	4	14	Torrance 15	Torrance
Geo. F. Getty	14	4	14	Torrance 16	Torrance
Gilmore Oil Co.	23	4	14	4	Torrance
Gilmore Oil Co.	14	4	14	3	Torrance
Grunwell Oil Corp.	23	4	14	1	Torrance
Hackworth & Brunwin	23	4	14	Hamlin 1	Torrance
Hub Oil Co.	14	4	14	Stachowicz 2	Torrance
Hub Oil Co.	14	4	14	B & C 2	Torrance
Hub Oil Co.	14	4	14	Hutslar 1	Torrance
Hub Oil Co.	14	4	14	Stachowicz 1	Torrance
International Drilling & Eng. Co.	23	4	14	1	Torrance
Huntington Signal Oil Co.	23	4	14	Barto 1	Torrance
Julian Petroleum Corp.	26	4	14	Splitzdoser 1	Torrance
Julian Petroleum Corp.	15	4	14	Mueller 3	Torrance
Julian Petroleum Corp.	23	4	14	Bell-Johnson 4	Torrance
Julian Petroleum Corp.	23	4	14	Cook 2	Torrance
Keefe Risdan Co.	23	4	14	1	Torrance
Lacal Oil Co.	31	4	14	2	Torrance
Lang-Wall, Inc.	23	4	14	4	Torrance
Leonard Wells, Inc.	23	4	14	Leonard 11	Torrance
Fred R. Letcher	14	4	14	Higgs 1	Torrance
Lora J. Oil Co.	23	4	14	2	Torrance
McDonnell Corp.	23	4	14	1	Torrance
McDonnell Corp.	14	4	14	2	Torrance
McDonnell Corp.	14	4	14	3	Torrance
McKeon Drilling Co.	22	4	14	Torrance 1	Torrance
J. F. McMahon	23	4	14	1	Torrance
Midway Northern Oil Co.	15	4	14	2	Torrance
Midway Northern Oil Co.	14	4	14	3	Torrance
James F. Nugent Oil Co.	23	4	14	Community 1	Torrance
Painted Hills Oil Assn.	23	4	14	1-L	Torrance
Pan American Petroleum Co.	15	4	14	Lomita 1	Torrance
A. M. Parsons & Fred H. Hammer	15	4	14	1	Torrance
H. H. Patton	14	4	14	1	Torrance
H. H. Patton	14	4	14	2	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Stock Com. 1	Torrance
Petroleum Midway Co. Ltd.	23	4	14	Webster Com. 1	Torrance
Petroleum Midway Co. Ltd.	14	4	14	De Witt 1	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Wilson Com. 2	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Wilson Com. 3	Torrance
Petroleum Midway Co. Ltd.	23	4	14	Deitrick 1	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Stock Com. 2	Torrance
Petroleum Midway Co. Ltd.	14	4	14	Walker Nuckles 1	Torrance
Petroleum Midway Co. Ltd.	23	4	14	Thornburg 1	Torrance
Petroleum Midway Co. Ltd.	14	4	14	Post Houts 2	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Wilson Com. 5	Torrance
Petroleum Midway Co. Ltd.	14	4	14	Wilson Com. 4	Torrance
Petroleum Midway Co. Ltd.	14	4	14	Mitchell 1	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Wilson Com. 7	Torrance
Petroleum Midway Co. Ltd.	15	4	14	Wilson Com. 6	Torrance
Petroleum Securities Co.	15	4	14	2	Torrance
Petroleum Securities Co.	15	4	14	3	Torrance
Petroleum Securities Co.	15	4	14	4	Torrance
Petroleum Securities Co.	15	4	14	5	Torrance
Petroleum Securities Co.	22	4	14	6	Torrance
Petroleum Securities Co.	15	4	14	8	Torrance
Petroleum Securities Co.	15	4	14	9	Torrance
Petroleum Securities Co.	15	4	14	10	Torrance
Petroleum Securities Co.	22	4	14	7	Torrance
Ring Petroleum Corp.	23	4	14	1	Torrance
Barnett Rosenberg	14	4	14	1	Torrance
Barnett Rosenberg	23	4	14	Arline 1	Torrance
Barnett Rosenberg	14	4	14	Gladys 2	Torrance
Sanita Petroleum Co.	23	4	14	1	Torrance
Security Oil Syn. No. 2	23	4	14	Eason 1	Torrance
Selby & Root Co.	14	4	14	2	Torrance
Selby & Root Co.	23	4	14	3	Torrance
Sentinel Oil Co.	15	4	14	Martin 1	Torrance
Sentinel Oil Co.	23	4	14	Hunter 1	Torrance
Sentinel Oil Co.	24	4	14	Joughin 2	Torrance
Shell Co.	13	4	14	Keystone Com. 1	Torrance
Shell Co.	24	4	14	March 1	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued.					
Shell Co.-----	13	4	14	March 2	Torrance
Sherman Oil Co.-----	23	4	14	Torrance 1	Torrance
Southern California Drilling Co.-----	23	4	14	1	Torrance
Southern California Drilling Co.-----	23	4	14	2	Torrance
Southern California Drilling Co.-----	23	4	14	3	Torrance
Southwestern Development Co.-----	23	4	14	Ruddock 1	Torrance
Sprague Oil Co.-----	23	4	14	Hugh 1	Torrance
Standard Oil Co.-----	23	4	14	Kettler 1	Torrance
Standard Oil Co.-----	8	4	14	Kirk Com. 5	Torrance
Star Petroleum Co.-----	23	4	14	G & A 1	Torrance
Star Petroleum Co.-----	11	4	14	B & R 1	Torrance
Superior Oil Co.-----	14	4	14	Torrance 7	Torrance
Superior Oil Co.-----	14	4	14	Torrance 8	Torrance
Superior Oil Co.-----	14	4	14	Torrance 10	Torrance
Superior Oil Co.-----	14	4	14	Torrance 14	Torrance
Superior Oil Co.-----	14	4	14	Torrance 13	Torrance
Superior Oil Co.-----	14	4	14	Torrance 11	Torrance
Superior Oil Co.-----	14	4	14	Torrance 12	Torrance
United States Royalties Co.-----	14	4	14	10	Torrance
United States Royalties Co.-----	10	4	14	16	Torrance
United States Royalties Co.-----	14	4	14	11	Torrance
United States Royalties Co.-----	10	4	14	15	Torrance
United States Royalties Co.-----	23	4	14	18	Torrance
United States Royalties Co.-----	23	4	14	13	Torrance
Universal Cons. Oil Co.-----	23	4	14	Moore 2	Torrance
Universal Cons. Oil Co.-----	23	4	14	Moore 5	Torrance
Universal Cons. Oil Co.-----	23	4	14	Moore 6	Torrance
Universal Cons. Oil Co.-----	23	4	14	Moore 3	Torrance
Universal Cons. Oil Co.-----	23	4	14	Moore 4	Torrance
Universal Cons. Oil Co.-----	23	4	14	Moore 7	Torrance
Universal Cons. Oil Co.-----	23	4	14	Jones 1	Torrance
Universal Cons. Oil Co.-----	22	4	14	Moore 8	Torrance
Van Alen Oil Co.-----	23	4	14	1	Torrance
Van Alen Oil Co.-----	23	4	14	2	Torrance
Van Alen Oil Co.-----	14	4	14	3	Torrance
Wm. Vurpillat-----	23	4	14	1	Torrance
White Star Oil & Refining Co.-----	23	4	14	Whitney 1	Torrance
W. C. Bramham-----	17	1	11	1	-----
L. B. Chase Oil Co.-----	32	3	13	1	-----
Davis & Macmillan Co.-----	29	3	13	8	-----
R. R. Edwards, Trustee-----	16	1	15	Van Nuys Com. 1	-----
General Petroleum Corp.-----	28	3	13	Gardena 1	-----
General Petroleum Corp.-----	29	3	13	Samuel J. White 1	-----
General Petroleum Corp.-----	29	3	13	Austin 1	-----
Globe Petroleum Corp.-----	19	3	12	Vallecinto 1	-----
Golden Gate Oil Co.-----	23	1	16	2	-----
Geo. W. Hoyt-----	3	1	18	1	-----
Huntington-Downey Oil Co.-----	17	3	12	2	-----
Magnolia Petroleum Syn. No. 1-----	1	3	13	1	-----
Marblehead Land Co.-----	7	2	18	1	-----
Petroleum Midway Co. Ltd.-----	34	3	14	Lewis 1	-----
Petroleum Midway Co. Ltd.-----	28	3	11	Neal One 1	-----
Rancho de la Puente Oil Co.-----	34	1	10	1	-----
Barnett Rosenberg-----	35	3	14	1	-----
Shell Co.-----	33	3	13	Reyes 1	-----
Standard Oil Co.-----	27	2	14	Farrell 1	-----
Union Oil Co.-----	33	3	13	Carson 1	-----
Union Oil Co.-----	33	3	13	Hellman 1	-----
MONTEREY COUNTY:					
W. Harriman Jones-----	20	19	6	1	-----
NAPA COUNTY:					
Napetro Producers Syn.-----	21	8	3	2	-----
ORANGE COUNTY:					
Union Oil Co.-----	18	3	9	Graham & Loftus 55	Coyote Hills
Carmen F. Carlson-----	30	5	11	1	Huntington Beach
John I. Carlson-----	30	5	11	1	Huntington Beach
Central Oil Co. of L. A.-----	2	6	11	Community 3	Huntington Beach
Down East Co.-----	27	5	11	2	Huntington Beach
Petroleum Midway Co. Ltd.-----	35	5	11	Plavan 2	Huntington Beach
Petroleum Midway Co. Ltd.-----	11	6	11	Brown 3	Huntington Beach
Standard Oil Co.-----	34	5	11	Bolsa 14	Huntington Beach
Standard Oil Co.-----	34	5	11	Hunt. C. 1-A	Huntington Beach
Standard Oil Co.-----	34	5	11	Bolsa 15	Huntington Beach
Standard Oil Co.-----	27	5	11	Orange Co. Title Co. 1-A	Huntington Beach
Union Oil Co.-----	35	5	11	Copeland 22	Huntington Beach
Union Oil Co.-----	34	3	9	Yorba Linda Group 10	Richfield

Company	Sec.	Twp.	Range	Well No.	Field
ORANGE COUNTY—Continued.					
Union Oil Co.-----	33	3	9	Yorba Linda	
				Group 11	Richfield
Union Oil Co.-----	34	3	9	Yorba 2	Richfield
Charles T. B. Jones-----	16	4	11	1	-----
Orange Community Oil Assn.-----	29	4	9	1	-----
Penn Drilling Co.-----	28	4	9	1	-----
Superior Oil Co.-----	7	4	10	Brookhurst 1	-----
SAN BERNARDINO COUNTY:					
Marker & Collier-----	31	2	7	Ranger 1	-----
San Bernardino & Colton Oil Co.-----	16	1	4	2	-----
SAN MATEO COUNTY:					
Guarantee Oil Co.-----	15	6	5	4	-----
SONOMA COUNTY:					
Alexander Valley Oil Co.-----	8	9	8	2	-----
TULARE COUNTY:					
Pixley Development Co.-----	22	23	25	1	-----
VENTURA COUNTY:					
G. W. Short-----	4	1	20	1	Conejo
Trinitas Oil Co.-----	4	1	20	1	Conejo
Trinitas Oil Co.-----	4	1	20	2	Conejo
Trinitas Oil Co.-----	4	1	20	3	Conejo
Trinitas Oil Co.-----	4	1	20	4	Conejo
G & E Oil Co.-----	13	4	19	1	Piru
Oak Ridge Oil Co.-----	13	3	21	Harvey 12	South Mountain
General Petroleum Corp.-----	28	3	23	Barnard 3-A	Ventura
R. L. Hinckley-----	33	4	23	16	Ventura
King & Morris-----	19	4	19	K & M 1	-----
Johnson-Thompson et al.-----	17	2	19	1	-----
Glen A. Martin-----	28	4	18	1	-----
Oak Ridge Oil Co.----- Lot 43		2	21	McFarland 1	-----
Sespe Oil Co.-----	33	4	20	Dudley 2	-----

ADMINISTRATIVE DIVISION.

WALTER W. BRADLEY, Deputy State Mineralogist.

New Publications.

During the period covered by this issue (September 15, 1923–January 15, 1924), the following Bureau publications have been made available for distribution:

Bulletin No. 93, "California Mineral Production for 1922," by Walter W. Bradley. For free distribution.

Summary of Operations, California Oil Fields, Vol. 8, No. 12, June, 1923; Vol. 9, Nos. 1, 2, and 3, July, August, and September, 1923, respectively.

Mining in California, September, 1923, Vol. 19, No. 4.

Commercial Mineral Notes: Nos. 6 to 9 (inc.), September to December, respectively.

As the timeliness of publication is important in the case of the lists of 'mineral deposits wanted' and 'minerals for sale,' this information is issued in the form of a mimeographed sheet once a month since the change to a quarterly status of 'Mining in California.' This list is mailed, free of charge, to those on the mailing list for the quarterly.

In connection with the monthly 'Commercial Mineral Notes,' it has been gratifying to receive the many congratulatory letters and statements telling of its value and the practical results obtained from it. We have been informed of actual business and of sales directly traceable to the data thus disseminated.

Mails and Files.

The Bureau maintains, in addition to its correspondence file, a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the period of July 1, 1923, to January 15, 1924, there were 3750 letters received and answered at the San Francisco office alone, covering almost every conceivable phase of prospecting, mining and developing mineral deposits, reduction problems, and marketing of refined products.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Deputy State Mineralogist.

STATISTICS.

Estimate of 1923 Output.

The total value of the mineral production of California for the year 1923 is conservatively estimated to have been approximately \$270,472,000. This is, in part, detailed in the tabulation below; but, as there are more than fifty mineral substances on California's commercial list, it is impractical at this early date to obtain anything approaching definite figures on other than the more important items. The blank report forms are being mailed out to the operators in all mineral lines, and the date of publication of the final and complete report will depend upon the promptness of their replies. The State Mining Bureau urges the hearty cooperation of all concerned, to the end that the results may be made known early.

This estimated total of \$270,472,000 is an increase of over \$25,000,000 above the 1922 production and surpasses by more than \$2,000,000 the previous record value of \$268,157,472 of the year 1921. This increase in value is due principally to petroleum, which shows a new record quantity for 1923, which is nearly double the previous record figure of the year 1922 in number of barrels. Even with the resultant lower prices prevailing, it is estimated that the 1923 petroleum yield will show an increase of approximately \$22,000,000 in total value over that of 1922.

Though reports from a number of the gold mining districts have been indicative of renewed interest and renewing operations, receipts of bullion at the mint and smelters show a decrease for the year. Apparently some of the larger lode mines have not operated to their full capacity. There has been considerable activity in the Alleghany district, Sierra County, and in the Grass Valley district, Nevada county. Smelter reports give increased quantities for copper and lead, and as a consequence a larger amount of silver, though the last named will show a lessened total value owing to cessation after June of \$1 per ounce purchases by the Government under the Pittman Act.

As the demand for building materials continued active during 1923, nearly all items of the structural group will show increased quantities and total values, especially cement, brick, hollow building tile, crushed rock, sand and gravel. Magnesite shipments increased about 25 per cent. The demand for this material for stucco and other plastic purposes is showing a healthy growth. There were no notable changes in the general status of the miscellaneous 'industrial' group, nor among the salines, except pottery clays and borax. Demand for architectural terra cotta and tile has caused increased shipments of pottery clays of all grades. Reports from the borax producers indicate a 50 per cent increase in borate minerals for 1923.

The estimated quantities and values for 1923 are tabulated as follows:

\$13,250,000	gold.
2,771,000	(3,400,000 fine oz.) silver.
3,942,000	(27,000,000 lb.) copper.
605,000	(8,400,000 lb.) lead.
20,000	iron and manganese ores.
409,000	(6,200 flasks) quicksilver.
100,000	(800 fine oz.) platinum.
195,000.000	(262,000,000 bbl.) petroleum.
7,475,000	(115,000,000 M. cu. ft.) natural gas.
17,000,000	(10,000,000 bbl.) cement.
12,000,000	crushed rock, sand and gravel.
9,000,000	brick and hollow building tile.
840,000	(70,000 tons) magnesite.
1,500,000	other structural materials, including granite, lime, marble et al.
3,000,000	miscellaneous 'industrial' minerals (including asbestos, barytes, pottery clays, dolomite, feldspar, gems, graphite, diatomaceous earth, limestone, lithia, mineral water, shale oil, silica, talc, et al.).
3,560,000	salines (including borates, calcium and magnesium chlorides, potash, salt, soda).
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\$270,472,000	total value.

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections in North America; and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well.

Mineral specimens suitable for exhibit purposes are solicited, and their donation will be appreciated by the State Mining Bureau as well as by those who utilize the facilities of the collection.

The exhibit is daily visited by engineers, students, business men, and prospectors, as well as tourists and mere sightseers. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the State and to San Francisco.

LABORATORY.

FRANK SANBORN, Mineral Technologist.

The State Mining Bureau since its organization has supplied the necessary identification of minerals, without cost, to thousands of individuals, and has been largely instrumental in bringing to light those of commercial importance in California.

At irregular intervals new uses are found for minerals; as a result, the market for the particular mineral is stimulated or created, and the prospector adds a new name to his list of commercial products.

Recently the aluminum silicates sillimanite, andalusite, and cyanite have been in demand. These minerals are not easily identified in the

field, therefore prospectors who have made inquiry at this Bureau for a description of the silicates have been supplied with small samples. Counties in which some or all of these minerals are known to occur are: Mono, Riverside, Inyo, Imperial, and San Bernardino.

During the four months' period, September 15, 1923, to January 15, 1924, 1223 samples were received and determined at the laboratory.



LIBRARY.

FOREST L. CAMPBELL, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey:

Annual Report, 44th, of the Director to the Secretary of the Interior for the fiscal year ending June 30, 1923.

Bulletin No. 78—The Twentymile Park District of the Yampa Coal Field, Routt Co., Colorado. By Marius R. Campbell.

Bulletin No. 755-A—The Alaskan Mining Industry in 1922. By Alfred H. Brooks and Stephen R. Capps.

Bulletin No. 755-B—The Metalliferous Deposits of Chitina Valley, Alaska. By Fred H. Moffit.

Bulletin No. 760-A—Pedestal Rocks in the Arid Southwest. By Kirk Bryan.

Bulletin No. 749—Geology of the Tullock Coal Field. By G. S. Rogers.

Prof. Paper No. 132-B—A New Fauna from the Colorado Group of Southern Montana. By John B. Reeside, Jr.

Prof. Paper No. 133—The Correlation of the Vicksburg Group. By C. Wythe Cooke; and The Foraminifera of the Vicksburg Group. By Joseph A. Cushman.

Prof. Paper No. 132-C—Notes on the Geology of Green River Valley between Green River, Wyoming, and Green River, Utah.

Water Supply Paper No. 527—Surface Water Supply of the United States, 1921. Part VII. Lower Mississippi River Basin. By Nathan C. Grover.

Water Supply Paper No. 520-A—A Variation in Annual Run-off in the Rocky Mountain Region. By Robt. Follansbee.

Water Supply Paper No. 528—Surface Water Supply of the United States, 1921. Part VIII. Western Gulf of Mexico Basin.

Water Supply Paper No. 502—Part II. South Atlantic Slope and Eastern Gulf of Mexico Basins.

- Water Supply Paper No. 515—Surface Water Supply of Hawaii in 1919. By N. C. Grover.
- Water Supply Paper No. 506—Surface Water Supply of the United States, 1919–1920. Part VI. Missouri River Basin.
- Water Supply Paper No. 494—Outline of Ground-Water Hydrology. By Oscar E. Meinzer.
- Water Supply Paper No. 505—Surface Water Supply of the United States. Part V. Hudson Bay and Upper Mississippi River Basins. By N. C. Grover et al.
- Water Supply Paper No. 524—Part IV. St. Lawrence River Basin. By N. C. Grover et al.
- Mineral Resources of the United States:
- Potash in 1922. By George R. Mansfield.
- Platinum and Allied Minerals in 1922. By J. N. Hill.
- Clay in 1922. By Jefferson Middleton.
- Tin in 1922. By B. L. Johnson.
- Talc and Soapstone in 1922. By Edward Sampson.
- Silver, Copper, Lead and Zinc in the Central States in 1922. By J. P. Dunlop and F. Begeman.
- Fuller's Earth in 1922. By Jefferson Middleton.
- Arsenic in 1922. By V. C. Heikes and G. F. Loughlin.
- Magnesium and Its Compounds in 1922. By J. M. Hill.
- Quicksilver in 1922. By F. L. Ransome.
- Strontium in 1922. By George W. Stose.
- Graphite in 1922. By Arthur H. Redfield.
- Nitrates in 1922. By George R. Mansfield.
- Asbestos in 1922. By Edward Sampson.
- Coal in 1919, 1920, 1921. By F. G. Tryon and Sydney A. Hale.
- Phosphate Rock in 1922. By G. R. Mansfield.
- Gypsum in 1922. By K. W. Cottrell.
- Slate in 1922. By G. F. Loughlin and A. T. Coons.
- Barytes and Barium Products in 1922. By G. W. Stose.
- Secondary Metals in 1922. By J. P. Dunlop.
- Sulphur and Pyrites in 1922. By H. A. C. Jenison and H. M. Meyer.
- Mica in 1922. By B. H. Stoddard.
- Gold, Silver, Copper and Lead in South Dakota and Wyoming in 1922. By C. W. Henderson.
- Lime in 1922. By G. F. Loughlin and A. T. Coons.
- Silica in 1922. By Frank J. Katz.
- Gold, Silver, Copper, Lead and Zinc in Idaho and Washington in 1922. By C. N. Gerry.
- Sand and Gravel in 1922. By L. M. Beach.
- Mineral Waters in 1922. By W. D. Collins.
- Abrasive Materials in 1922. By L. M. Beach and A. T. Coons.
- Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1922. By Chas. W. Henderson.
- Cement in 1922. By E. F. Burchard and B. W. Bagley.
- U. S. Coast and Geodetic Survey:
- Annual Report of the Director to the Secretary of Commerce for the year ending June 30, 1923.
- Serial No. 240—Special Publication No. 95—Precise Leveling in Georgia. By Henry G. Avers.
- U. S. Bureau of Mines:
- Annual Report, 13th, of the Director for the Fiscal Year ending June 30, 1923.
- A Handbook for Miners—Self-Contained Mine Rescue Oxygen Breathing Apparatus. By D. J. Parker et al.
- Bulletin No. 170—Extinguishing and Preventing Oil and Gas Fires. By C. P. Bowie.
- Bulletin No. 220—Bibliography of Petroleum and Allied Substances, 1921. By E. H. Burroughs.
- Bulletin No. 232—Manual for Oil and Gas Operations. By T. E. Swigart and C. E. Beecher.
- Bulletin No. 215—Timbering of Metal Mines. By E. A. Hobrook et al.
- Bulletin No. 208—The Electrothermic Metallurgy of Zinc. By B. M. O'Harra.

- Technical Paper No. 304—Water-Gas Tar Emulsions. By W. W. Odell.
 Technical Paper No. 302—Leaching Nonsulphide Copper Ores with Sulphur Dioxide. By C. E. van Barnevel.
 Technical Paper No. 262—Certain Interfacial Tension Equilibria Important in Flotation. By W. H. Coghill and Carl O. Anderson.
 Technical Paper No. 274—Efficiencies in the Use of Bituminous Coking Coal as Water-Gas Generator Fuel. By W. W. Odell.
 Technical Paper No. 289—Change Houses in the Lake Superior Region. By Cleve E. Kindall.
 Technical Paper No. 310—Recovery of Gasoline from Uncondensed Still Vapors. By D. B. Dow.
 Technical Paper No. 319—Methods of Decreasing Evaporation Losses of Petroleum. By J. H. Wiggins.

Report of Investigations:

- Serial No. 2510—The Use of Highly Volatile Natural-Gas Gasoline as a Refrigerant.—By L. D. Wyant.
 Serial No. 2511—Survey of Pacific Coast Petroleum Products. Part 3—Burning and Fuel Oils.—By Earl C. Lane and N. F. LeJeune.
 Serial No. 2512—Graphite for Steel-Melting Crucibles.—By R. T. Stull and G. A. Bole.
 Serial No. 2513—Preparation and Detonating Properties of Cyanuric Triazide.—By C. A. Taylor and Wm. H. Rinckenbach.
 Serial No. 2514—Explosives used in June, 1923.—By W. W. Adams.
 Serial No. 2515—The Concordia Type RM 6-o.d. Electric Cap Lamp, Approval No. 19.—By L. C. Ilsley and A. B. Hooker.
 Serial No. 2516—Coal-Mine Fatalities in July, 1923.—By W. W. Adams.
 Serial No. 2517—Comparative Engine Tests with Crude, Acid-Refined, and Silica-Gel Refined Motor-Benzol.—By A. C. Fieldner and G. W. Jones.
 Serial No. 2518—Forms of Sulphur in Steamed Coke and their Action in the Blast Furnace.—By John H. Thompson.
 Serial No. 2519—Anthracite Substitutes.—By O. P. Hood.
 Serial No. 2520—Fuels Available for Domestic Use as Substitutes for Anthracite Coal.—By Rudolph Kudlich.
 Serial No. 2521—Oxygen-Oil Explosions.—By J. J. Jakowsky and E. W. Butzler.
 Serial No. 2522—Explosives Used in July, 1923.—By W. W. Adams.
 Serial No. 2523—Additions, Removals and Changes in Permissible List of Explosives from January 1, 1923, to August 31, 1923.—By J. E. Crawshaw.
 Serial No. 2524—Progress in Blast-Furnace Research.—By P. H. Royster, T. L. Joseph, and S. P. Kinney.
 Serial No. 2525—Eighth Semi-Annual Motor Gasoline Survey.—By N. F. LeJeune and H. M. Smith.
 Serial No. 2526—Strength and Sensitiveness of TNT as Determined by the Laboratory "Sand-Test" Bomb.—By C. A. Taylor and R. D. Leitch.
 Serial No. 2527—Air Measurement Methods for Experimental Work on Fan-Pipe Installations.—By G. E. McElroy and A. S. Richardson.
 Serial No. 2528—The Transportation of Explosives in and about Mines.—By L. C. Ilsley.
 Serial No. 2529—Coal-Mine Fatalities in August, 1923.—By W. W. Adams.
 Serial No. 2530—Lifting Costs at Oil Well Properties.—By H. C. George.
 Serial No. 2531—Effect of Cooling Systems on Evaporation Losses of Gasoline.—By Ludwig Schmidt.
 Serial No. 2532—Drilling and Broaching in Slate Quarries.—By Oliver Bowles.
 Serial No. 2533—The Preparation and Properties of Normal Lead Trinitroresorcinate.—By C. A. Taylor and W. H. Rinckenbach.
 Serial No. 2534—Bibliography of Magnesian Cements.—By G. H. West, R. L. Sebastian and W. A. Darrow.
 Serial No. 2535—Who Pays for the Accidents?—By Richard V. Ageton.
 Serial No. 2536—Explosives Used in August, 1923.—By W. W. Adams.
 Serial No. 2537—Relation of Operating Practice to Composition of Light Oil from Carbureted Water Gas.—By R. L. Brown, E. F. Pohlman, and H. G. Berger.
 Serial No. 2538—Coal-Mine Fatalities in September, 1923.—By W. W. Adams.

- Serial No. 2539—Carbon-Monoxide Hazards from Tobacco Smoke.—By G. W. Jones, W. P. Yant, and L. B. Berger.
- Serial No. 2540—Friction Factors for Fan-Piping used in Mine Ventilation.—By G. E. McElroy and A. S. Richardson.
- Serial No. 2541—Electrical Safety Inspection; Suggestions for Mine-Safety Engineers.—By L. C. Ilsley.
- Serial No. 2542—Graphites for Brass-Melting Crucibles.—By R. T. Stull and L. E. Geyer.
- Serial No. 2543—Explosives Used in September, 1923.—By W. W. Adams.
- Serial No. 2544—Lead-Zinc Separation by Volatilization.—By G. L. Oldright.
- Serial No. 2545—Determination of the Fineness of Powdered Coal.—By W. A. Selvig and W. L. Parker.
- Serial No. 2546—Mine Timber in Pennsylvania Coal Mines.—By Harry E. Tufft.
- Serial No. 2547—A Floating Roof for Oil Tanks.—By Ludwig Schmidt.
- Serial No. 2548—Solubility of Finely Divided Rock Dusts in Water, Kerosene, and Alcohol.—By W. M. Myers.
- Serial No. 2549—Coal-Mine Fatalities in October, 1923.—By W. W. Adams.
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- The Foraminifera of the Atlantic Ocean.—By J. A. Cushman.
- The History of the Electric Light.—By Henry Schroeder.
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- Report of the Librarian for the Fiscal Year ending June 30, 1923.
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- Federal Power Commission:
- Third Annual Report for the Fiscal Year ending June 30, 1923.
- Alabama, Geological Survey of:
- Bulletin No. 26—Statistics of the Mineral Resources of Alabama for 1921. By J. H. Wingard.
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- Extract A from Bulletin No. 27.
- Analysis of Illinois Coals. By G. W. Hawley.
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- Bulletin No. 5—Elk City Gas Field. By Chas. W. Boughton.
- Bulletin No. 6—Oil and Gas Resources of Kansas.
- Part I—General Geology of Oil and Gas. By R. C. Moore.
- Part II—Geology of Kansas. By R. C. Moore.
- Part V—Allen and Neosho Cos. By R. C. Moore and E. R. Elledge.
- Part VI—Wilson and Montgomery Cos. By C. W. Boughton.
- Bulletin No. 8—The Economic Geology of the Arkansas City District. By Emmett R. Elledge.
- Kentucky Geological Survey:
- Building Stones of Kentucky. By C. H. Richardson.
- Fluorspar Deposits of Kentucky. By Louis W. Currier.
- Michigan, Geological Survey Division: Production and Value of Mineral Products in Michigan for 1921 and Prior Years.
- Pennsylvania, Department of Forests and Waters:
- Bulletin No. 79—Tidioute Oil Pool, Warren Co., Pa. By Meredith E. Johnson.
- Bulletin No. 80—Coal Beds in Northern Somerset Co., Pa. By James D. Sisler.
- Tennessee, Division of Geology: Bulletin No. 30—A Study of the Smaller Undeveloped Water Powers of Tennessee. By J. A. Switzer, Hydraulic Engineer.
- Washington, State of, Division of Geology: Bulletin No. 28—Geological Investigation of the Coal Fields of Western Whatcom County, Washington. By Olaf P. Jenkins.
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 Memoir No. 133—The Southern Part of the Sydney Coal Field, Nova Scotia.
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- Report No. 88—Landslides at Minowamura in the Prefecture of Fuku-shima. By Rokuro Kimura, Geologist.
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- Vol. XXXI, Part X, 1922.
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 Geological Survey: Publication No. 273—Mesozoic Insects of Queensland. By R. J. Tillyard and B. Dunstan.
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- Memoir No. 14—The Ballarat Goldfield, with Plates and Figures. By W. Baragwanath.
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 Proceedings of, Vol. XII, No. 26.
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 Engineering Features of the Moffat Tunnel. By D. W. Brunton.
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- Vol. 14, No. 5—Fauna of the Sooke Formation, Vancouver Island. By Bruce L. Clarke and Ralph Arnold—With a Description of a New Coral by T. Wayland Vaugn.
- Vol. 14, No. 6—The San Lorenzo Group of the San Emigdio Region, California. By C. M. Wagner and Karl H. Schilling.
- Vol. 14, No. 7—Revision of the Rimella-Like Gastropods from the West Coast of North America. By Bruce L. Clarke and Dorothy Kemper Palmer.
- Vol. 14, No. 8—A Fauna from the Middle Eocene Shales near Vacavilla, California. By Dorothy Palmer.
- Vol. 14, No. 9—Some Eocene Foraminifera near Vacaville, California. By G. Dallas Hanna.
- Vol. 14 No. 10—Basin Range Structure in the Great Basin. By George D. Louderback.
- Vol. 14, No. 11—Some New Forms of West Coast Fossil Echinoidea. By Merle C. Israelsky.
- Vol. 14, No. 12—*Alticamelus Alexandrae*, A New Camel from the Barstow Upper Miocene of the Mojave Desert. By Pirie Davidson.
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- University of New Mexico, State: Bulletin No. 114—Tables for Determining Common Minerals and Rocks. By Robert W. Ellis.
- New York State Museum Bulletin 249-250—The Magnetite Iron Ore Deposits of Southeastern New York. By R. J. Colony.

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Torrance, Cal.
Sawtelle, Cal.
Clovis, Fresno Co., Cal., Quadrangle.
Laguna Seca Ranch Quadrangle, Cal.
Orangedale School Quadrangle,
Fresno Co.
Compton, Cal.
Blanchardville, Wis.
Bowling Green, Ky.
Brownsville, Ky.
Dongola, Ill.
Grays Lake, Ill.—Wis.
Jonesboro, Ill.—Mo.
Lopena Island, Tex.
Mammoth Cave, Ky.
Monmouth, Ill.

- Mount Angel, Ore.
Watts, Cal., Quadrangle.
Bullard Quadrangle, Fresno Co., Cal.
Terra Loma School District Quadrangle, Fresno Co., Cal.
Herdon Quadrangle, Cal.
Levis, Fresno Co., Cal., Quadrangle.
Monocline Ridge Quadrangle, Fresno Co.
Malaga Quadrangle, Fresno Co.
Venice, Cal.
Wisdom Well, Cal.
Pahala, H. T.
Reedsport, Ore.
Ronceverte, W. Va.—Va.
Saltilla Ranch, Tex.
Santa Clara, N. Y.
Sierra Madera, Tex.
South Wayne, Wis.—Ill.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.
 Architect and Engineer, San Francisco.
 Arizona Mining Journal, Phoenix, Arizona.
 Asbestos, Philadelphia, Pennsylvania.
 Brick and Clay Record, Chicago.
 Cement, Mill and Quarry, Chicago, Illinois.
 Chemical Engineering and Mining Review, London, England.
 Engineering and Mining Journal-Press, New York.
 Financial Insurance News, Los Angeles, California.
 Graphite, Jersey City.
 Journal of Electricity and Western Industry, San Francisco.
 Metallurgical and Chemical Engineering, New York.
 Mining and Engineering Record, Vancouver, B. C.
 Mining and Oil Bulletin, Los Angeles.
 Oil Age, Los Angeles.
 Oil and Gas Journal, Tulsa, Oklahoma.
 Oil News, Galesburg, Illinois.
 Oildom, New York.
 Oil, Paint and Drug Reporter, New York.
 Oil Trade Journal, New York.
 Oil Weekly, Houston, Texas.
 Petroleum Age, New York.
 Petroleum Record, Los Angeles.
 Petroleum World, Los Angeles.
 Queensland Government Mining Journal, Brisbane, Australia.
 Rock Products, Chicago, Illinois.
 Safety News, Industrial Accident Commission, San Francisco.
 Salt Lake Mining Review, Salt Lake City, Utah.
 Southwest Builder and Contractor, Los Angeles.
 Standard Oil Bulletin, San Francisco.
 Stone, New York.
 The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
 Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
 Bakersfield Morning Echo, Bakersfield, Cal.
 Blythe Herald, Blythe, Cal.
 Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
 California Oil World, Los Angeles, Cal.
 Colusa Daily Sun, Colusa, Cal.
 Daily Commercial News, San Francisco, Cal.
 Daily Midway Driller, Taft, Cal.
 Del Norte Triplicate, Crescent City, Cal.
 Gateway Gazette, Beaumont, Cal.
 Goldfield News, Goldfield, Nevada.
 Guerneville Times, Guerneville, Cal.
 Healdsburg Enterprise, Healdsburg, Cal.
 Humboldt Standard, Eureka, Cal.
 Inyo Independent, Independence, Cal.
 Inyo Register, Bishop, Cal.
 Kern County Progress, Shafter, Cal.
 Lake County Bee, Lakeport, Cal.
 Mariposa Gazette, Mariposa, Cal.
 Mining and Financial Record, Denver, Colo.
 Mining Topics, Sacramento, Cal., and Unionville, Nev.
 Mountain Democrat, Placerville, Cal.
 Mountain Messenger, Downieville, Cal.

Nevada Mining Press, Reno, Nevada.
Oatman Mining Press, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Etna Mills, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
San Diego News, San Diego, Cal.
Santa Barbara Daily News, Santa Barbara, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Stockton Record, Stockton, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.



PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

Since the publication of *MINING IN CALIFORNIA* was begun, current inquiries from buyers and sellers have been summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to their quarterly publication in *MINING IN CALIFORNIA*, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes.'

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of current applications for positions and 'positions open' is carried in each issue. Notices are designated by a key number, and the name and address corresponding to any number will be supplied upon request, without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss. Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

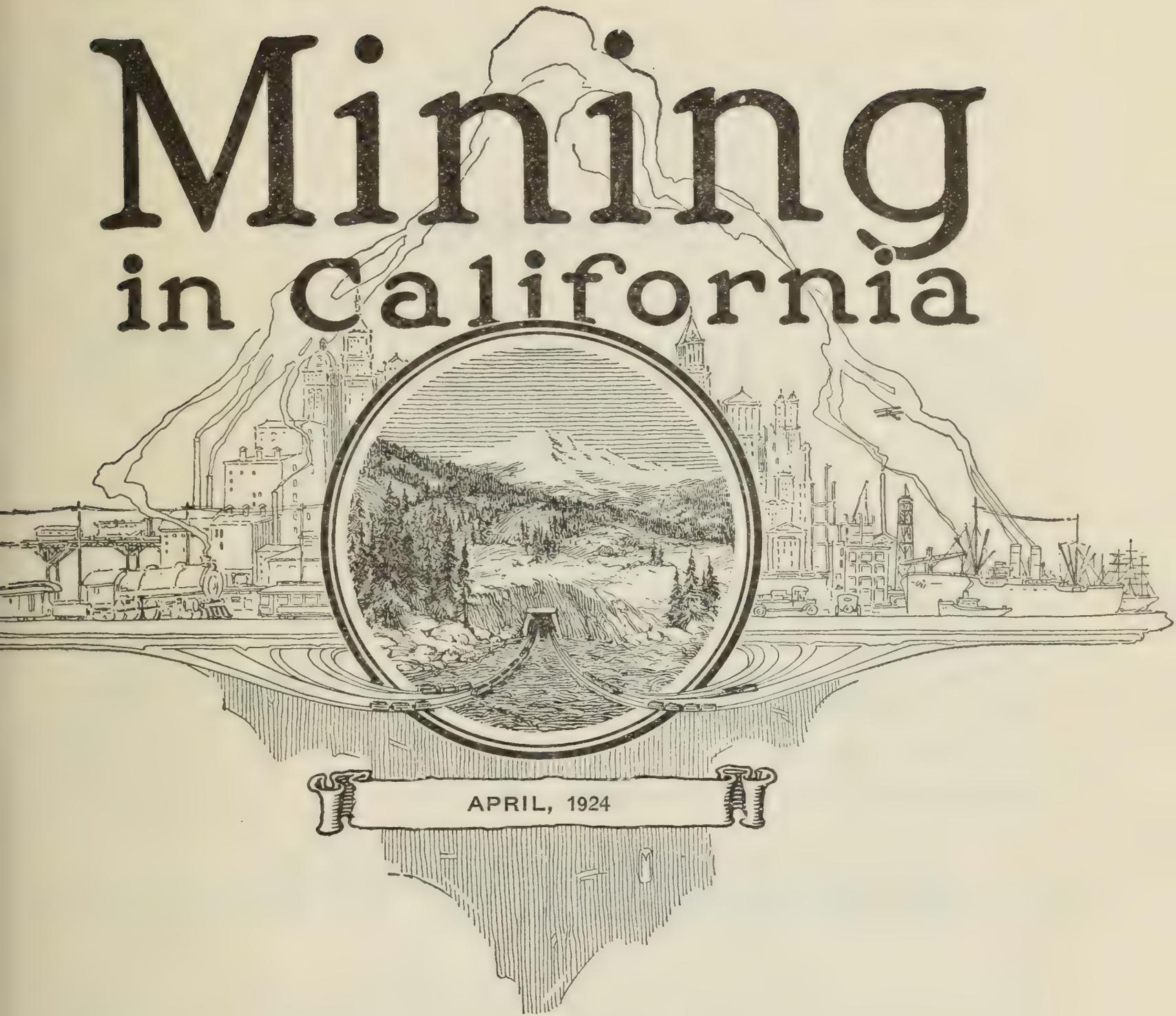
POSITIONS WANTED.

- 21-1 Engineering. Nine years' experience mining, power companies and public works. Can handle office work also. Age 30; married; references; salary wanted, \$200.
- 21-2 Engineering. Mechanical Dept.; four years' experience general construction engineering. Age 30; single; references; salary open.
- 21-3 Assistant Geologist or Engineer, Oil and Gas. One year's experience; four years in U. S. Army (Regular). Age 32; single; references; salary open.
- 21-4 Engineering, mining or geological. Two and one-half years' experience. Age 24; single; references; salary open.
- 21-5 Mine Superintendent or Foreman. Thirteen years' experience. Age 42; widower; references; salary wanted, \$200, minimum.
- 21-6 Superintendent or Foreman of Gravel Mine. Twenty-five years' experience in drift and hydraulic mining. Age 45; married; references; salary wanted, \$200.
- 21-7 Mining Engineer. Technical graduate. Seven years' experience, South Africa, Michigan and Minnesota. Age 30; married; references; salary open.
- 21-8 Assayer or Analyst. Six and one-half years' experience. Age 30; married; references; salary wanted, \$180.
- 21-9 Assayer or Mill Work. Junior student. Six months' experience. Age 30; married; references; salary open.
- 21-10 Mining Engineer. Twenty years' experience development, operation and examination of mines. Age 44; married; references; salary open.
- 21-11 Surgeon for Mining Company. Four years' chief surgeon at copper mine, Arizona. References.
- 21-12 Consultant on Diatomaceous Earth. Ten years' experience, asbestos and diatomite manufacture. Age 45; married; references.
- 21-13 Engineer or Superintendent. Thirteen years' general experience. Age 41; married; references; salary wanted, \$250.
- 21-14 Engineer, Superintendent or Manager. Twenty years' general experience. Age 42; married; references; salary open.

- 21-15 Mine Superintendent and Assayer. Experience covers operation and examination work. Age 48; married; references; salary wanted, \$250.
- 21-16 Draftsman (architectural). Seven and one-half years' experience, including railway construction. Age 30; married; references; salary wanted, \$150.
- 21-17 Hoist Engineer, Electrician, Mechanic, Millman. Sixteen years' varied experience, mainly California and Mexico, in mine, power-house and mill. Age 50; married; excellent references; salary open.
- 21-18 Mine foreman (coal) or fire boss. Thirty years' experience; thirteen as boss or fire boss. Has fire boss and mine boss certificates. Age 46; single; references; salary open.



Mining in California



APRIL, 1924

PUBLISHED QUARTERLY
CALIFORNIA STATE
MINING BUREAU

FERRY BUILDING
SAN FRANCISCO

CALIFORNIA STATE MINING BUREAU.

EXECUTIVE AND TECHNICAL STAFF

LLOYD L. ROOT

State Mineralogist

WALTER W. BRADLEY

Deputy State Mineralogist

MINING DIVISION

C. A. LOGAN, District Mining Engineer	-	-	-	-	-	-	-	Sacramento
C. McK. LAIZURE, District Mining Engineer	-	-	-	-	-	-	-	San Francisco
W. BURLING TUCKER, District Mining Engineer	-	-	-	-	-	-	-	Los Angeles
CHAS. S. HALEY, Mining Engineer	-	-	-	-	-	-	-	San Francisco
C. D. HULIN, Geologist	-	-	-	-	-	-	-	San Francisco
FRANK SANBORN, Mineral Technologist	-	-	-	-	-	-	-	San Francisco

DEPARTMENT OF PETROLEUM AND GAS

R. D. BUSH, State Oil and Gas Supervisor	-	-	-	-	-	-	-	San Francisco
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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the State Mining Bureau, entitled 'Summary of Operations, California Oil Fields.'

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

LLOYD L. ROOT

State Mineralogist

Vol. 20

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No. 2

CHAPTER OF

REPORT XX OF THE STATE
MINERALOGIST

COVERING

MINING IN CALIFORNIA

AND THE

ACTIVITIES OF THE STATE MINING BUREAU



CALIFORNIA STATE PRINTING OFFICE
FRANK J. SMITH, Superintendent
SACRAMENTO, 1924

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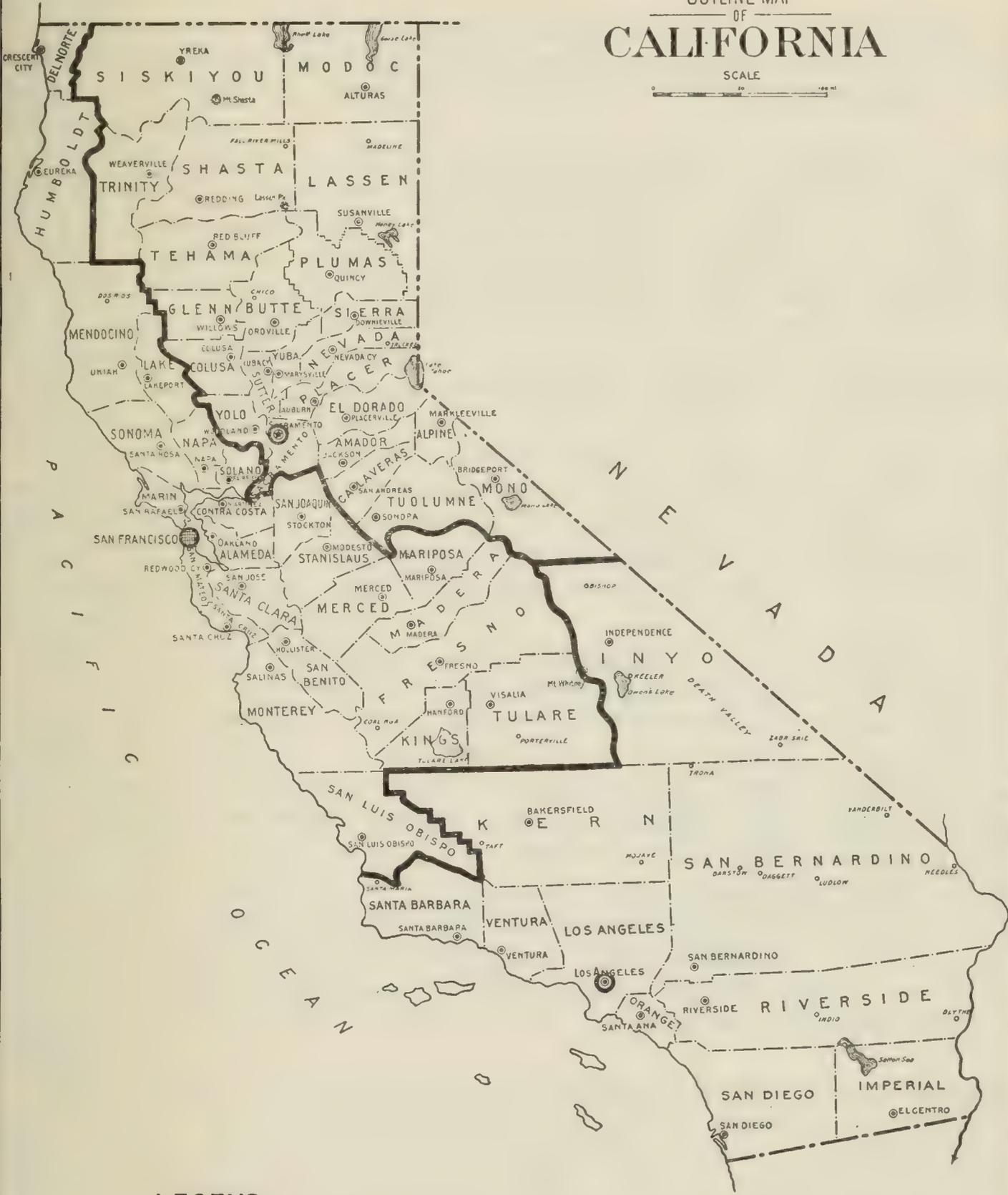
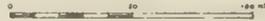
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CALIFORNIA STATE MINING BUREAU
LLOYD L. ROOT
STATE MINERALOGIST

O R E G O N

OUTLINE MAP
OF
CALIFORNIA

SCALE



- LEGEND -

- Mining Division Boundaries.
- Mining Division Offices.

M E X I C O

PREFACE.

The State Mining Bureau is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing, quarterly publication was begun in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the State Mining Bureau.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the Bureau will not discontinue its practice of issuing from time to time technical reports on special subjects. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Mining Bureau is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively.

This move brought the Bureau into closer personal contact with operators, and it has many advantages over former methods of conducting field work.

To continue this system most effectively with the limited funds available for the present biennium, the Redding and Auburn field offices were consolidated and moved to Sacramento on June 1, 1923.

The boundaries of each district were adjusted and the counties now included in each of the three divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

SACRAMENTO FIELD DIVISION.

C. A. LOGAN, Mining Engineer.

Amador County.

A. L. Chappell is in charge of work at the *Cleveland Consolidated Gravel Mine* near Volcano. A new prospect shaft had reached a depth of about 60 feet by the middle of March. The mine has been a producer.

Elephant Hydraulic Mine near Volcano was prepared for operation in the fall with three giants placed and three ditches ready to deliver water, but it had been impossible to do any work up to the middle of March on account of shortage of water. Grillo Brothers and John Baroni are the lessees.

Ludekins Hydraulic Mine, beside the highway between Volcano and Barnhart station, has been able to operate with one giant in a small way, two men being employed.

Marklee Mining Company, 105 Federal Realty Building, Oakland, Cal. This company had cleaned out the first 230 feet of the old main shaft of the *Marklee Mine* and had done a good deal of work on the surface up to the middle of March, at which time they had suspended work. It is reported that over \$18,000 had been spent.

The main shaft, in which the rich shoot of early days was found, is about 500 feet deep. The strike of the vein is north of west and the ore-shoot is said to have raked away from the shaft, necessitating longer drives on each succeeding level. The mine was discovered in 1868 and, according to a report by the original owners in 1869, was 100 feet deep

the autumn of that year and was producing ore of an assay value of \$60 a ton, from which only \$30 a ton was recovered, on account of lack of facilities for saving sulphides. While the lapse of time has been so great that definite details are hard to get, it seems certain that the main oreshoot was quite short and that the bottom level had not been run far enough to prove the shoot, although a body of \$4 ore is said to have been found on that level. Besides the main shaft, a drift was run from near the shaft collar for about 800 feet along the vein, and three winzes were sunk to depths of 350, 100 and 140 feet respectively. There is said to be about 200 feet of blank ground on the vein between the two oreshoots, the second of which is said to have been penetrated by the farthestmost winze, and is said to be about a foot wide. The mine is about five miles from Volcano. It is equipped with a 10-stamp mill, boiler and steam engines and small lumber sawing plant.

Moore Mine. Moore Mining Company, main office 923 Balboa Building, San Francisco. The 800 station had just been finished and drifting for the shoot had begun on March 13th. The oreshoot was reported 300 feet long on the 640 level and was stoped for an average width of nine or ten feet. There was a sharp bend in the shoot where it was worked 16 feet wide. This level has been about worked out.

According to a statement issued to stockholders on February 19, the total cost of the plant to that date had been \$106,502.86. The mill building and machinery (20 stamps with concentrators) cost \$50,584.41; hoist \$6,996; tailing dam \$6,672, and miscellaneous plant items \$19,147.83. A total of \$61,740 has been paid on account of purchase of property.

During January and February, 1924, only ten stamps of the mill were operated and averaged 46 tons each twenty-four hours. For this two months period the gross production was \$20,243.83. The average recovery in February was 80 per cent. During 1923 a great deal of trouble was experienced in making the actual recovery from the mill check anywhere near the indicated recovery. For December, actual recovery was said to have been \$7,252 less than indicated recovery, for November \$1,590 less, for October \$4,002 less and so on, in spite of all possible precautions in sampling and assaying. The ore is said to carry orpiment, and this mineral and galena are said to be causing the principal loss in the slimes.

Old Eureka Mine at Sutter Creek was reported sold the middle of April to the Central Eureka Mining Company. The Central Eureka Company had lately been mining good ore on and near their north end line, and the sale, if made, will set at rest any speculations about possible litigation.

Pitts Mine (Mountain King and Mountain Queen) is nine miles by road from Jackson, and adjoining the village of Pine Grove, in section 4, T. 6 N., R. 12 E., containing 110 acres in all. Owners are W. B. Pitts and Mrs. Louise Pitts. A lease and option to purchase is held by A. M. Locey, W. L. Erwin, Mrs. Alva Archer and H. C. Kennedy.

There are two series of veins and rich ore has been found near their intersections. On an easterly striking vein a shaft has been sunk 265

feet with a level at 250 feet but there is no record of production from it though some good prospects were reported in sinking. About 150 feet north of this, a northerly striking vein comes in from the south up to the first fissure, and the Anaconda shaft was sunk 125 feet on this second vein near the intersection. This vein is said to have yielded a good gold production under romantic circumstances, but there is no written record. A tunnel was run from the creek 70 feet lower than the shaft collar, northward for several hundred feet with two forks and high-grade ore was found in both directions, on the north in a winze that has been started lately by the lessees and in an old raise put up by other operators. The veins in this part of the property range from one to six feet wide. Another vein, 250 feet north of the deeper shaft, appears to cut off the east striking vein. The operators are prospecting the tunnel workings and plan to put up a five-stamp mill, believing they have considerable ore available. There are other veins on the property that have not been developed. The geological indications in the tunnel workings are promising, but it is evident that most of the work done heretofore has been in search of pockets and no attempt has been made to develop milling ore. The richer ore shows gold in galena.

In the Defender District, which is opposite the West Point District of Calaveras County, little work is going on. The two are a unit geologically.

Amador Columbus Mine is opposite the Columbus Mine and supposed to be an extension of it. Frank de Bois is sinking a prospect shaft and is down about 40 feet.

R. C. Reed of Volcano has leased the *Defender Mine* from the owner, J. B. Stapler of West Point. Reed has been working alone and has driven about 50 feet of tunnel and has sunk 50 feet of winze on what is called the west ledge. The quartz in this winze is about 6 feet wide, with hard walls and no gouge, the footwall being poorly defined. What appears to be a dike has been slightly exposed on the hanging wall. A few tons of ore milled from this winze is reported to have yielded very satisfactorily.

The Defender vein is the middle one of three veins and the only one on which much has been done previous to Reed's work. There is reported to be in the bottom workings, 480 feet deep, a body of ore very heavy with pyrite, that carries \$10 to \$12 a ton and offers a treatment problem as the sulphide content is already too high to make concentration feasible. The ore was very good to a depth of 360 feet.

Piney Creek Mine, a mile northeast of Barnhart station, is being operated by Frank Shafter, who is installing a roller mill.

Sunset Mine. John J. Ratto of Sutter Creek and C. R. Daggett of Ione have been producing some very good ore from the 300-foot level of this mine, which is a mile and a half west of Martel.

The deposit of red marble on the *Wait Ranch*, near Plymouth, is being prospected by the California Slimes Company, W. E. Darrow, president. This deposit shows an outcrop 160 feet by 400 feet, as mentioned in our 1923 report, but has not been previously prospected.

Calaveras County.

Columbus Mine was productive in 1922 and 1923 and was sold by W. W. Gibson after he realized a good profit from ore milled.

Forest Creek Mining Company. Richard Hedrich, Jr., general manager, West Point. This property is six miles from West Point and has been prospected for several years past. It is at present being equipped with considerable machinery.

Lone Star Mine. J. B. Stapler and Company, West Point. This property was productive during 1923, the ore reported as coming from a winze below the 'minus 200' level. A small mill was in operation.

Porteous Group of claims on the Licking Fork above West Point is being developed by Frank Becker. Ninety feet of new tunnel has been run recently by Becker with four men employed. Water from the Licking Fork is used to develop power for the compressor.

Woodhouse Mine is being reopened by W. W. Gibson. It is in the West Point District.

Lamphear Mine, south of Mokelumne Hill, is the basis of a new company called the Lamphear Mining Company, with an office at Mokelumne Hill. Myron D. Greve, Mokelumne Hill, is secretary of the company. The capitalization is 200,000 shares at fifteen cents each.

The Lamphear Mine was worked as early as 1867, when it had an 8-stamp mill as stated by J. Ross Browne in a report written in 1868, at which time a depth of 45 feet had been reached. According to a map by J. Robert Wylie there are two shafts on the property, the deeper about 300 feet deep with levels at 100, 180 and 280 feet, and the other 100 feet deep. The two were connected on the 100 level and the 180 level is run nearly to the second shaft which is 200 feet southeast of the first. The 280 level was drifted about 90 feet. The vein has been stoped from the 180 level to the surface. It strikes northwest and dips northeast and is reported four to eight feet wide, including gouge. While no rich assays are being claimed, the promoters of the company believe the geological conditions favorable. The mine has been unwatered and some work is being done.

Activity has continued at the *Aper Mine* (Ford) at San Andreas, where the levels below the 100 level were being unwatered at last report.

Prosperity Mine, J. Robt. Wylie, manager, is being prepared to start milling some ore. Wylie reports very encouraging assays.

COPPER.

Calaveras Copper Company. Eastern office, Oliver Ames, president, Ames Building, Boston, Mass.; C. H. Tyler, managing director and secretary; S. M. Levy, general manager, Copperopolis, Cal. The mine, concentrator and smelting plant are at Copperopolis. The extent of the property and notes on the past operations are shown in Report XIII of the State Mineralogist. The mines now consolidated under this company are among the oldest copper producers in the state, the Union, Empire and Keystone claims having been opened in 1861. Between

1861 and 1869 the properties have a record of having shipped 125,739 tons of ore assaying 10 per cent copper or better, the Union and Keystone having been during that period the principal copper producers of the state. They were closed down from 1869 to 1887, in which year underground work was resumed and continued until 1892, a 100-ton smelting furnace having been put up in 1889. The Calaveras Copper Company operated from 1909 to 1913, then again during the war period, after which the property has been under development and improvement in a small way, awaiting an increase in the price of copper, until the past year when mining and smelting were resumed. During 1923 the production was 1,436,326 pounds of copper and only 1464 ounces of silver, with no gold.

The property is being worked now through the Discovery or Keystone shaft, the collar of which is 984 feet above sea level. This shaft is 1150 feet deep on the dip of vein, which averages 61 degrees. The Union shaft is 1500 feet south of it and still further south is the South shaft, 500 feet deep, which has a hoist and is available as a second exit, being connected with the old eighth level of Discovery shaft. Former operations were through the Union shaft. At present, work is going on from the three lowest levels of Keystone shaft, No. 11 level being open 1160 feet south, No. 12 level 850 feet south and the 1350 level 650 feet south. At the time of visit (February 20) ore was being stoped from the 1100 and 1350-foot levels.

The main orebody is reported 600 feet long with an average width of 15 feet. On the 1350 level they also have a footwall orebody about 200 feet long and ten feet wide, not cut previously on the other levels and which later may be found to connect with the main body, though now distinct. The orebody is worked out above the ninth level which is about 450 feet on dip above 1350 level. The ore lies in lenses, with only an occasional break on the dip, but overlapping on the strike. The flat slips have a maximum throw of 40 feet. The ore is chalcopyrite with more or less pyrite, and is deposited typically along seams in black Mariposa slate, along the direction of strike of the bedding planes of the slate, or northwest. On the footwall of the slate is serpentine with lenses of talc. On the hanging wall on the 1350 level is a grey-green amphibolite schist, although the hanging wall is stated to have been meta-diorite in the upper levels, the gradation between the two probably being gradual. On the 1350 level where noted, the separation between the grey schist and the black slate appears gradual and indistinct, and sulphides occur in both. A granodiorite dike is reported to come up in the slate in the form of a lens, with a maximum thickness of 40 to 50 feet, and smaller dikes have been noted. The ore is reported now to be averaging about 4 per cent copper, carries no gold as far as smelter returns show, and very little silver. The main dike carries at times as much as $1\frac{1}{2}$ per cent copper. Stopes are filled and little timber is used except for chutes and drifts. In the drifts, when near serpentine, large caps are soon buckled by the heavy side pressure, while the posts take little weight. Some bunches of very rich ore are encountered, composed of chalcopyrite carrying up to 20 per cent copper, and the other copper minerals are notably lacking, the deposit being different in this respect and in the lack of precious metals from any others now or recently operated in the state.

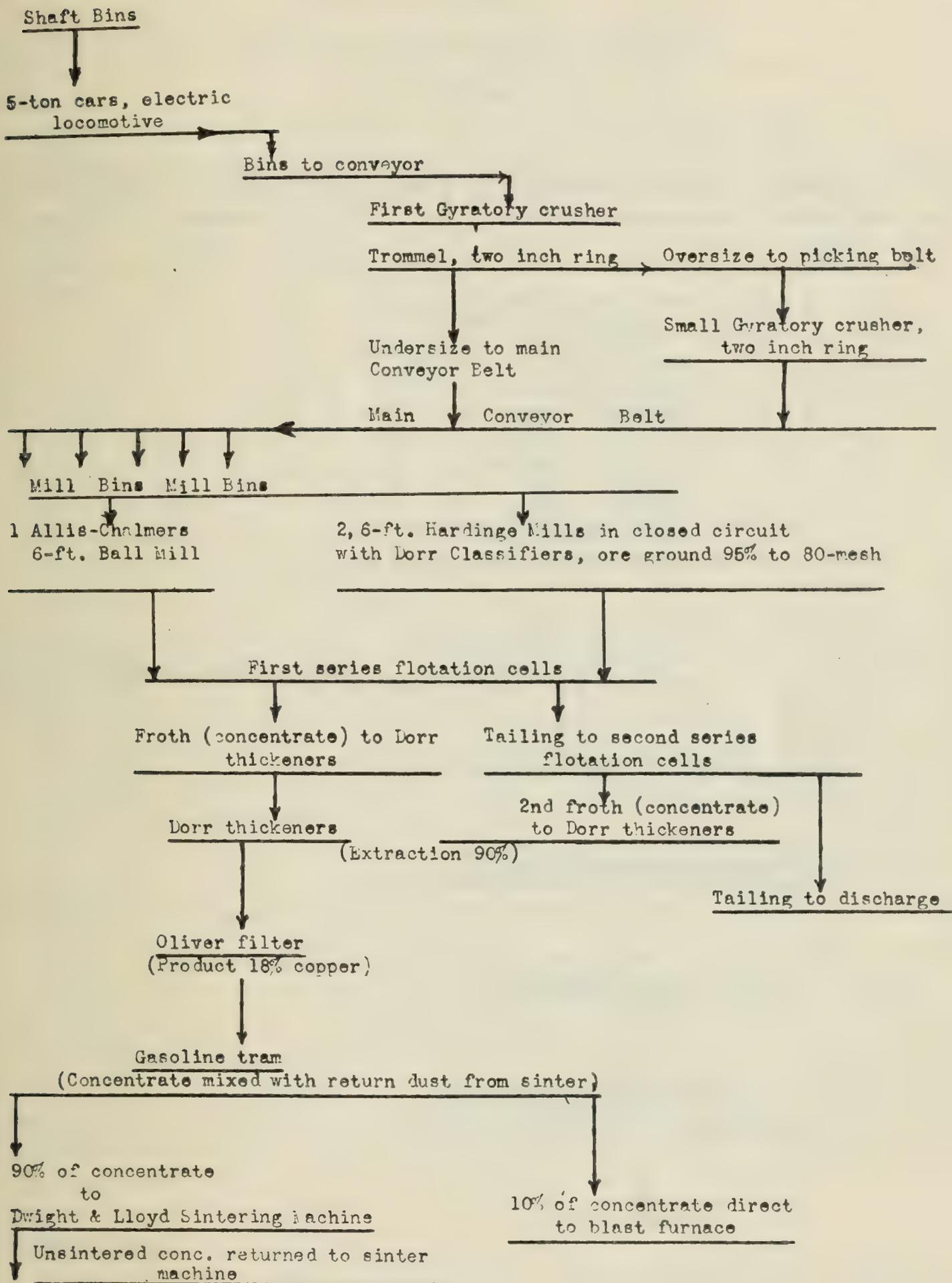
Two hundred men were employed in February, of whom 77 were working underground and producing about 200 tons of ore daily. An extra force on the surface was employed in putting up a new reverberatory furnace. The sinter plant and concentrating plant were being worked two shifts and the 200-ton blast furnace one shift. The mill and sinter plant have a capacity of about 400 tons of 4 per cent ore a day. A new reverberatory furnace being built will replace the blast furnace for smelting concentrate and the latter will then be used for smelting high-grade ore, containing 10 per cent copper or better, some of the ore being of such high grade that it would serve no purpose to put it through the concentrator. Blister copper and matte are shipped to the Tacoma smelter. An interesting feature of the plant is the gunite-covered furnace stack, which is 145 feet long. This was built of one-inch common pine lumber, with four inches of gunite outside and two inches inside. This work was done fifteen months ago and is in good shape, without any repairs having been made.

There follows an approximate flow sheet of the concentrating and smelting operations. For parts of this and other details about the property, the writer is indebted to Mr. S. A. Spellmeyer, mining engineer at the property.



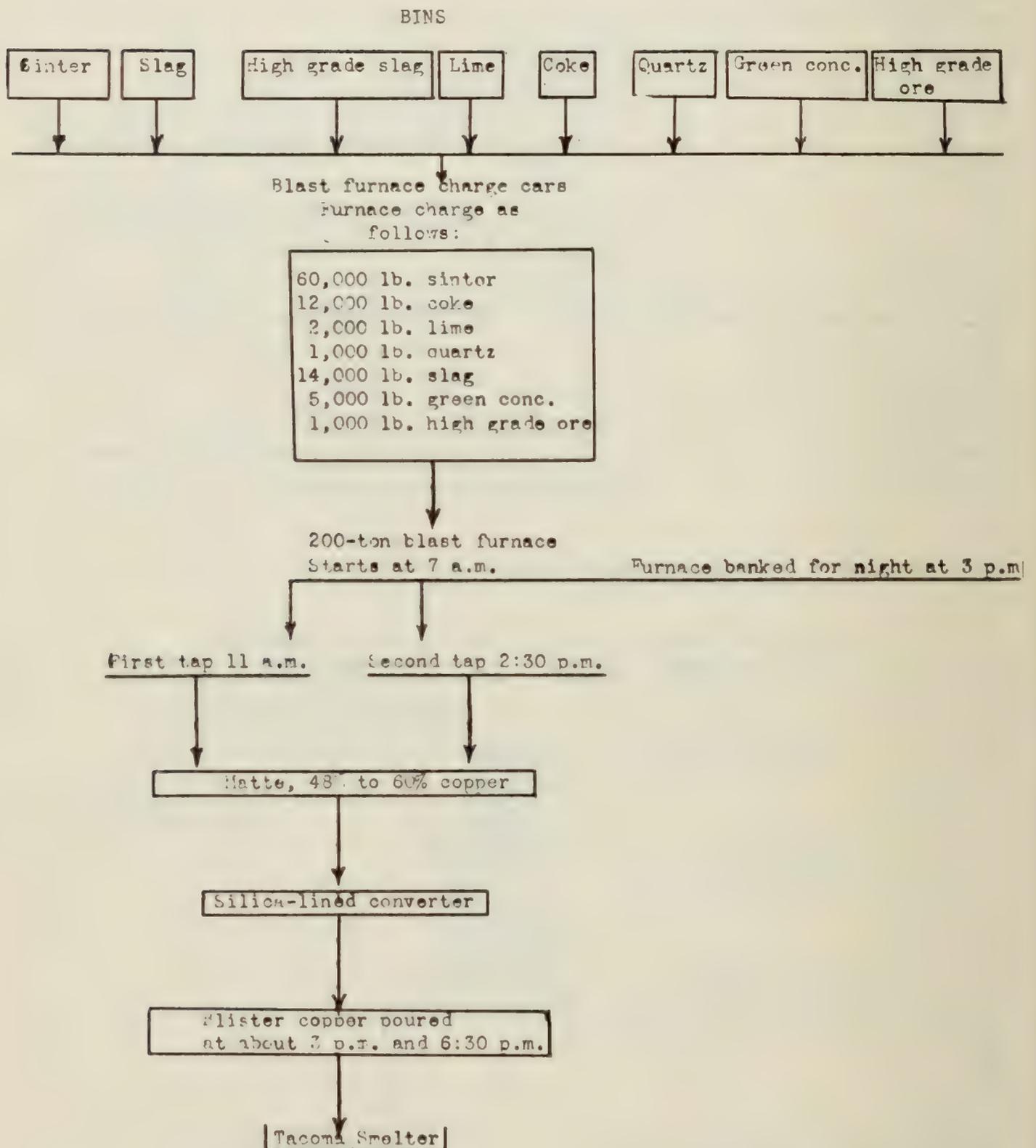
Flow Sheet, Calaveras Copper Company.

PART 1.



Flow Sheet, Calaveras Copper Company.

PART 2.



Mono County.

Comanche Mining and Reduction Company's properties were visited late in 1923 by W. B. Tucker, of the Bureau's Los Angeles office, and the following notes are from a field report prepared by him:

The properties are two miles southwest of Benton and contain 720 acres, including Comanche, Diana-Kerrick and Cornucopia mines, there being in all 12 patented and 22 unpatented claims, covering most of the principal mining claims on Blind Springs Hill.

The Comanche and Diana-Kerrick properties were worked from 1862 to 1889. The Comanche was stoped from the 550 level to the surface for a length of 860 feet and the Diana-Kerrick vein was stoped for a length of 800 feet from the 650 level to the surface. The mines were idle from 1889 to 1917 when reopened by the present company. The elevation is 6000 to 6800 feet.

The deposits consist of base ores in a series of parallel fissure veins in hornblende granite, the principal minerals being tetrahedrite, pyrargyrite, chalcopyrite, pyrite and galena, with silver predominating in value. Veins strike N. 20° W. and the strongest vein, the Comanche, dips 82 degrees east, the others dipping 40 to 45 degrees east. Ore lenses are from 30 feet to 200 feet long and the high-grade streaks are from 2 inches to 3 feet wide.

The four principal shafts are: Comanche, 700 feet deep; Diana, 800 feet deep; Kerrick, 650 feet deep, and Cornucopia, 400 feet deep. The Comanche vein has been drifted 1050 feet, Diana-Kerrick vein 1500 feet and Cornucopia 1000 feet to the time the present company began. The present operators have cleaned out and retimbered the Kerrick shaft to 650 feet where the vein is reported to be 10 feet wide and to be steepening in dip. The recent development has been confined to the Comanche, Kerrick and Hudson Mines. During 1922, \$20,000 of ore is reported to have been shipped from the Hudson claim, ore running from \$100 to \$600 a ton in gold and silver. The Kerrick shaft was being sunk at the time of visit. An inclined shaft was being sunk below the tunnel level on the Hudson claim and a raise was being put up from the Comanche tunnel to the surface. Eighteen men were employed.

Benton Mining and Development Company. J. S. Adair, general manager, 404 Union Bank Building, Los Angeles. This company is developing a group of six claims formerly owned by the Patrick Reddy Estate, and situated four miles south of Benton station on the southeast slope of Blind Spring Hill. Development consists of a tunnel 500 feet long which is being run to develop two veins that were worked in the early eighties. The veins strike north and south and dip 40 to 45 degrees east. Six men were employed.

Placer County.

American Bar Mining Company. John McCandless, president; Harry A. Kunz, secretary. Office, 859 Mills Building, San Francisco. The mine is 3½ miles by road and trail from Michigan Bluff and was described in the 1922 report, but a great deal of new work has been done since.

In the Lewis or upper adit there is a drift 150 feet north and at a point 120 feet from the portal there is a winze 23 feet deep from the

bottom of which a drift runs south 20 feet. The Duffey adit is 220 feet vertically below the Lewis adit. It is a crosscut for 500 feet to the vein, and is then drifted 480 feet south and 170 feet north on the vein. From the face of the north drift they crosscut 65 feet east and 80 feet west. The main crosscut was also run 300 feet past the vein. All the work on this level is new except the first 300 feet of crosscut. J. A. Shields reports that the Duffey south drift is in ore for a length of several hundred feet and an average width of $3\frac{1}{2}$ feet, and also that there is ore for the full length of the Lewis and winze levels, totaling 170 feet. The grade of ore indicated by assays is very good and it is expected that milling will begin soon in the old 10-stamp mill which has been repaired.

A ditch taking water from the river has been put in shape to furnish water for power to operate the mining and milling machinery. It has a capacity of 1000 miner's inches. A total crew of 25 men were employed in February, 1924.

Plumas County.

Engels Copper Mining Company. The annual report of this company, the largest copper producer of the state, for 1923, was made public at the end of February. It shows that during 1923 the output was 14,450,243 pounds of copper of a gross value of \$2,081,357; 165,441 ounces of silver of a value of \$125,601 and \$49,243 gold, or a total gross output of \$2,256,201. Cost of copper on the cars at Engels is reported to have been 7.465 cents per pound of copper; freight and smelter charges, less credits for gold and silver were 3.881 cents a pound, and net production cost after allotting reserves for depreciation, compensation insurance and amortization on development is given at 12.931 cents a pound. The average ore milled as mentioned in our past reports, has carried about 2.25 per cent copper. The profit and loss statement for 1923 shows the following items of interest because of their bearing on costs:

Net receipts from concentrates delivered to smelter		\$1,467,786 74
Value of concentrates in transit		52,735 51
		<hr/>
Total value of production		\$1,520,522 25
Sundry profits		23,929 42
		<hr/>
Total		\$1,544,451 67
Operating expenses—		
Mining ore	\$635,338 35	
Milling ore	317,111 73	
Aerial tramming	19,896 58	
Marketing expenses	7,164 14	
Crushing expenses	11,756 55	
General mine expenses	11,294 81	
General expenses, San Francisco office	41,078 94	
Taxes, interest, insurance	35,161 70	
		<hr/>
		1,078,802 80
		<hr/>
Operating profit		\$465,648 87
Less development expenditure		95,675 25
		<hr/>
		\$369,973 62
Reserve for depreciation	\$100,180 36	
Reserve, compensation	33,080 01	
		<hr/>
		133,260 37
		<hr/>
Balance to profit and loss		\$236,713 25

No. 10, the new long tunnel, which starts 6500 feet north of the mill and opens the Engels orebody 480 feet below the No. 7 level, had been nearly finished at the end of the year. This tunnel is $8\frac{1}{2}$ by 8 feet in cross section, 8337.3 feet long to the raises and has cost \$28.75 a foot, including equipment required to drive it. The costs of various items in connection with this project are reported as follows:

Haulage tunnel -----	\$240,246 01
Raises -----	25,305 39
Railroad -----	39,039 32
Additions to mill -----	15,853 35
Water line to mill -----	10,358 61
	<hr/>
Total to date of report -----	\$330,802 68
Estimated balance required to complete -----	75,000 00
	<hr/>
Total -----	\$405,802 68

When the tunnel is put in use it will eliminate the tramway from Engels Mine to the mill and is expected to pay for itself in a few years by the saving in operating cost.

Sacramento County.

Associated Development Company, Clay, Cal. This private company has drilled two wells named Mitchell No. 1 and No. 2 in search of oil one-half mile northwest of Clay. No. 1 well was put down about 1900 feet when work was stopped by operating trouble. No. 2 well is about 1250 feet northwest of No. 1 and has been drilled to a depth of 2963 feet (March 20). On that date preparations were being made to cement off water, preparatory to testing the formation near the bottom of the well. The operators state that in the course of drilling several strata of sand have been encountered that gave cuts of oil with ether.

Little light is shed on the underground structure by surface indications. The surface is mantled by gravel and sand and the only formation that has been positively identified is the Ione, but it appears from the physical character of the sand brought up that the hole has been in the Cretaceous series for a long distance and is still in it. The two wells are upon a slight ridge with its long axis northwest and it would be hard to say if this is a minor fold or an erosion feature, though probably the latter.

Sierra County.

H. L. Berkey was given a permit to hydraulic at *Scales Hydraulic Mine* the last week in February. Tailings will drain into Rock Creek, Canyon Creek and North Fork of Feather River. This is the first hydraulic mine to make use of the new Bullards Bar dam of the Yuba River Power Company, but on account of the very dry season little can be done this spring.

Tightner Mine was sold in February to the Alleghany Mining Company, and by the latter company sold immediately to the Original Sixteen-to-One Mining Company. The transfer included all the Tightner property except the Red Star claims, in which the Alleghany Mining Company has carried on for several years a persistent search for the downward extension of rich ore found years ago in the upper workings of the Red Star.

Yuba County.

Nevada Claim. R. H. Postlethwaite, owner; P. M. Simpson, lessee with option, Camptonville. This claim is on Willow Creek about five miles from Camptonville and 21 miles from Nevada City, and is a gravel deposit covered by placer mining tailings and soil. It contains 141 acres, covers about 7000 feet along the creek to an average width of 50 to 75 feet and the best pay stratum is about $4\frac{1}{2}$ feet thick on the bottom. Sampling indicates an average value of about 30 cents a cubic yard and a total depth of 10 feet or more, according to Simpson.

Simpson stated late in March that he has turned over his option and lease on part of the claim to E. T. Fisher and on the balance to Barker of the La Grange Dredging Company. Fisher is installing a drag line scraper to work his portion of the claim and it is expected that the dredging company will begin prospecting work soon with the idea of moving their dredger from La Grange if the property proves satisfactory.

SAN FRANCISCO FIELD DIVISION.

C. MCK. LAIZURE, Mining Engineer.

Contra Costa County.

Chipman Chemical Engineering Company, Inc. This company, which is one of the largest producers of calcium arsenate, lead arsenate, paris green and other insecticides in the United States, recently started operations at its new arsenic reduction works at Martinez, and a small amount of refined white arsenic has already been produced from ores shipped in from various points in California and Nevada.

The new plant at Martinez is situated on the Southern Pacific Railroad and also has water shipping facilities, comprising a dock extending into the bay at which vessels drawing 26 feet of water may be unloaded.

The initial installation consists of storage bins, crushing plant, belt conveyor system, Wright 6-hearth roaster, oil-fired with automatic temperature control, dust chamber and arsenic kitchens. The latter are so arranged that they can be cleaned up during operation, thus making it unnecessary to shut down the plant for the purpose of taking off the arsenic. From the kitchens the waste gases pass into a flue and hence to the stack. Two supplementary roasters are in course of erection.

The arsenic plant was designed by Mr. Ralph N. Chipman, president of the company, and Mr. Charles R. Wraith of the Anaconda Copper Company, and has been erected under Mr. Chipman's personal supervision. For the present the plans are to keep the plant running on custom ore and later also to roast ores to be shipped in from the company's mining properties now under development by its subsidiary, the Arsenic Products and Refining Company.

The new Chipman Chemical Engineering Company's plant is regarded as a valuable supplement to other sources of arsenic production. Its first year's operation is expected to supply about 3000 tons of white arsenic, and this capacity it is expected will be doubled in 1925, when their mines recently acquired get into full production.

The company is in the market for arsenious ores and concentrates preferably with a minimum of 20 per cent arsenic, but will accept lower grade ores if in large quantity. They will be pleased to hear from

parties having arsenic properties, and assay reports will be made on any samples sent in. Address, Chipman Chemical Engineering Company, Inc., Martinez, California. C. L. Pierce is works manager.

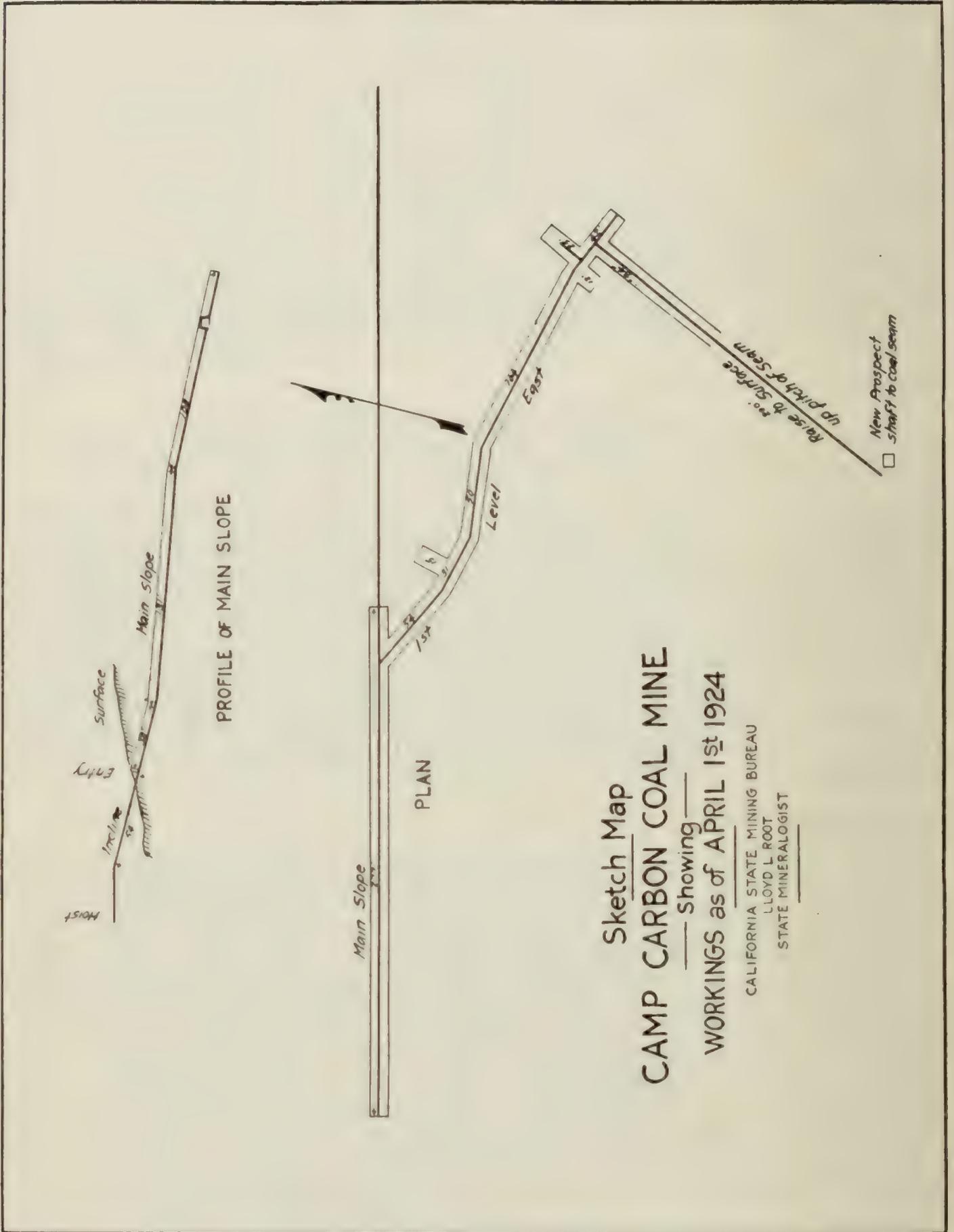
Mount Diablo Lime Marl Company. Property consists of 51 acres, situated about 5 miles northeast of Walnut Creek on what is known as Lime Ridge. Limestone outcrops conspicuously over a considerable area along this ridge. Where opened up by the Mount Diablo Lime Marl Company, the limestone is more or less soft and decomposed near the surface, but as depth is reached in the open cuts the rock becomes crystalline and of a brownish or grayish tint. The property has not been drilled to determine the extent of the deposit, but from the surface exposures and various open cuts, it appears that there is a very considerable tonnage available. The company has a plant for crushing, screening and sacking the ground limestone; or the crude limestone in lump form may be loaded from bins direct to auto trucks. The Southern Pacific Railroad is $1\frac{1}{2}$ miles, and the San Francisco-Sacramento Railroad is 1 mile distant.

The crushing plant contains a gyratory and Grindler hammer mill, operated by electric power. For agricultural use the limestone is ground so that 60 to 80 per cent passes 100 mesh. The calcium carbonate content is controlled by varying the amount of crystalline limestone ground with the softer material. The plant has a capacity of 100 to 150 tons per day of agricultural lime meal. Uncrushed limestone is sold for fluxing to the Martinez smelter of the Mountain Copper Company. Some has also been used by the Pure Carbonic Company of Berkeley for making carbon dioxide gas. Two sheet steel upright kilns were on the ground at the time of visit and it is the intention of the company to erect these and produce calcined lime as well. R. L. Fry, Walnut Creek, is president and general manager, and G. A. Putman is secretary.

Lake County.

T-B-M Prospect. J. W. Mauldin of Finley, C. A. Traylor and G. W. Bruce have obtained from the State Surveyor General a mineral lease on 160 acres of state land located in Sec. 16, T. 12 N., R. 9 W. The property is about 7 miles south of Kelseyville. There is a road to the Fifield ranch, then a trail of $1\frac{1}{2}$ miles to the prospect, which is situated in a rugged portion of the ridge separating Lake and Sonoma counties. The formations in this vicinity are the typical Franciscan of the coast range, consisting of carbonaceous slates, schist and serpentine, much broken and altered. Some quartz float is found in the vicinity, but so far prospecting has failed to locate any definite vein that would indicate a permanent orebody. An incline shaft 40 feet deep, with a slope of about 45 degrees, has been put down along a series of small quartz lenses and silicious segregations, impregnated in places with fine pyrite. Chalcopyrite and bornite also showed occasionally in small quantity. Assays are said to show values of \$3 to \$23 per ton in gold, none of which is free. So far as developed the showing is not impressive. One man is working.

A somewhat similar deposit was located in 1911, in Sec. 31, T. 16 N., R. 9 W., on which some development work was done and pyrite ore, assaying from \$5 to \$34 per ton, was reported to have been found.



Sketch Map
CAMP CARBON COAL MINE
 Showing
WORKINGS as of APRIL 1st 1924

CALIFORNIA STATE MINING BUREAU
 LLOYD L. ROOT
 STATE MINERALOGIST

Mendocino County.

Camp Carbon Coal Mine. A description of this property was included in a report on coal in Mendocino County, published in Report XIX of the State Mineralogist, September, 1923. The Carbon Company, owner, was formally incorporated on December 26, 1923, with an authorized capital of \$500,000, divided into 10,000 shares at \$50 per share. Officers of the company are J. Cal Ewing, president; Max Horwinski, vice president; Frank T. Thompson, secretary; A. L. Fisher, general manager. Offices, 420 Henshaw Building, Oakland, California. Since the last report the company has installed an additional boiler and other equipment, and continued development of their holdings. At a point approximately 525 feet from the main entry a drift was turned south at right angles, which will be extended up the pitch of the bed and connect with a new prospect shaft that will improve the ventilation and give additional access to the coal. The workings as of April 1, 1924, are shown on the accompanying sketch map.

PLATINUM.

The deposit of platinum and gold, located about 2 miles east of Hopland in Secs. 21 and 28, T. 13 N., R. 11 W., has been recently taken over by Lloyd C. Ashley, 1236 St. Charles street, Alameda, and preparations are being made for working it. A report on the property by Logan¹ was published in Bulletin No. 85. The property was acquired in 1920 by the Mendocino Mining and Milling Company, Inc., and an elaborate plant, operated by electric power and designed to handle 350 tons per 24 hours, erected. Its operation was not successful, and it was shut down after one or two day's trial, and later dismantled, only the concrete foundations remaining. The present owner will adopt a simple washing system.

LOS ANGELES FIELD DIVISION.

W. B. TUCKER, Mining Engineer.

Imperial County.

SODIUM SULPHATE.

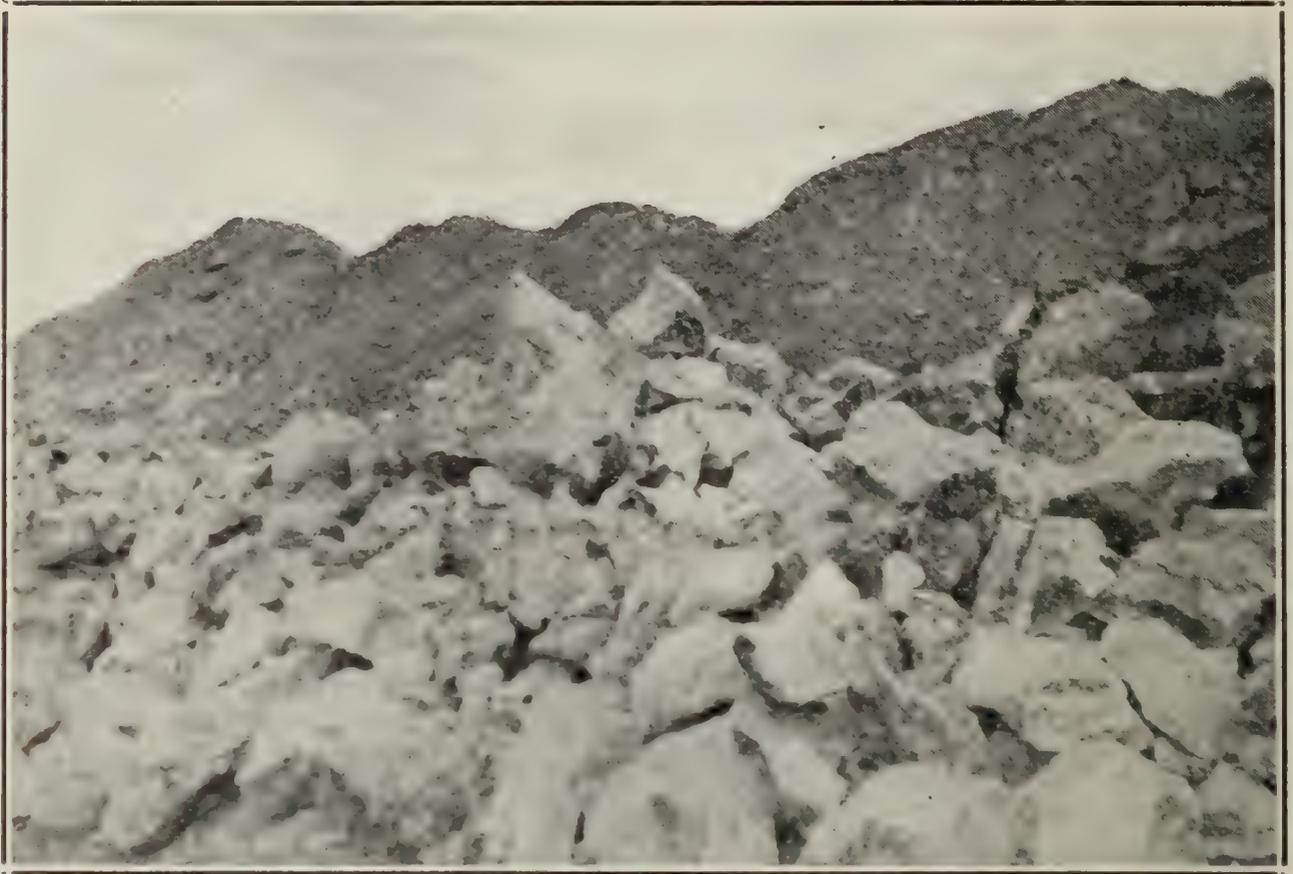
Bertram Sodium Sulphate Deposit is located $2\frac{1}{2}$ miles northeast of Bertram Station on the Southern Pacific Railroad, in Sec. 19, T. 9 S., R. 12 E. Elevation 125 feet below sea level. Holdings consist of 320 acres. Owner, E. N. Smith, El Centro, California.

The eastern border of the Salton Sink is made up of Tertiary sandstones and clay beds extensively folded. In the vicinity of Durmid, Bertram and Frink, these beds have been planed off and form a portion of the smooth, sloping desert floor below the old beach line. Generally, however, along this eastern margin of the desert they are deeply eroded and form rough foothills along the base of the higher mountains to the east.

The deposit is mainly thenardite, anhydrous sodium sulphate, which has a crystal form distinct from that of mirabilite, and is not so subject to alteration on exposure to the air. Mirabilite, glauber salt, is here associated with the thenardite, usually occurring on the top of the veins

¹C. A. Logan, Platinum and Allied Metals in California, Cal. State Mining Bureau. Bull. 85, 1918.

of thenardite. These parallel veins of sodium sulphate occur in the consolidated clay beds and sandstones which are extensively folded. The general strike of these beds is N. 70° W., dip 30° to 40° N. The



Salt Cake (mainly thenardite, anhydrous sodium sulphate). East open cut, near Bertram Station in the Salton Basin, Imperial County—Photo by E. N. Smith.



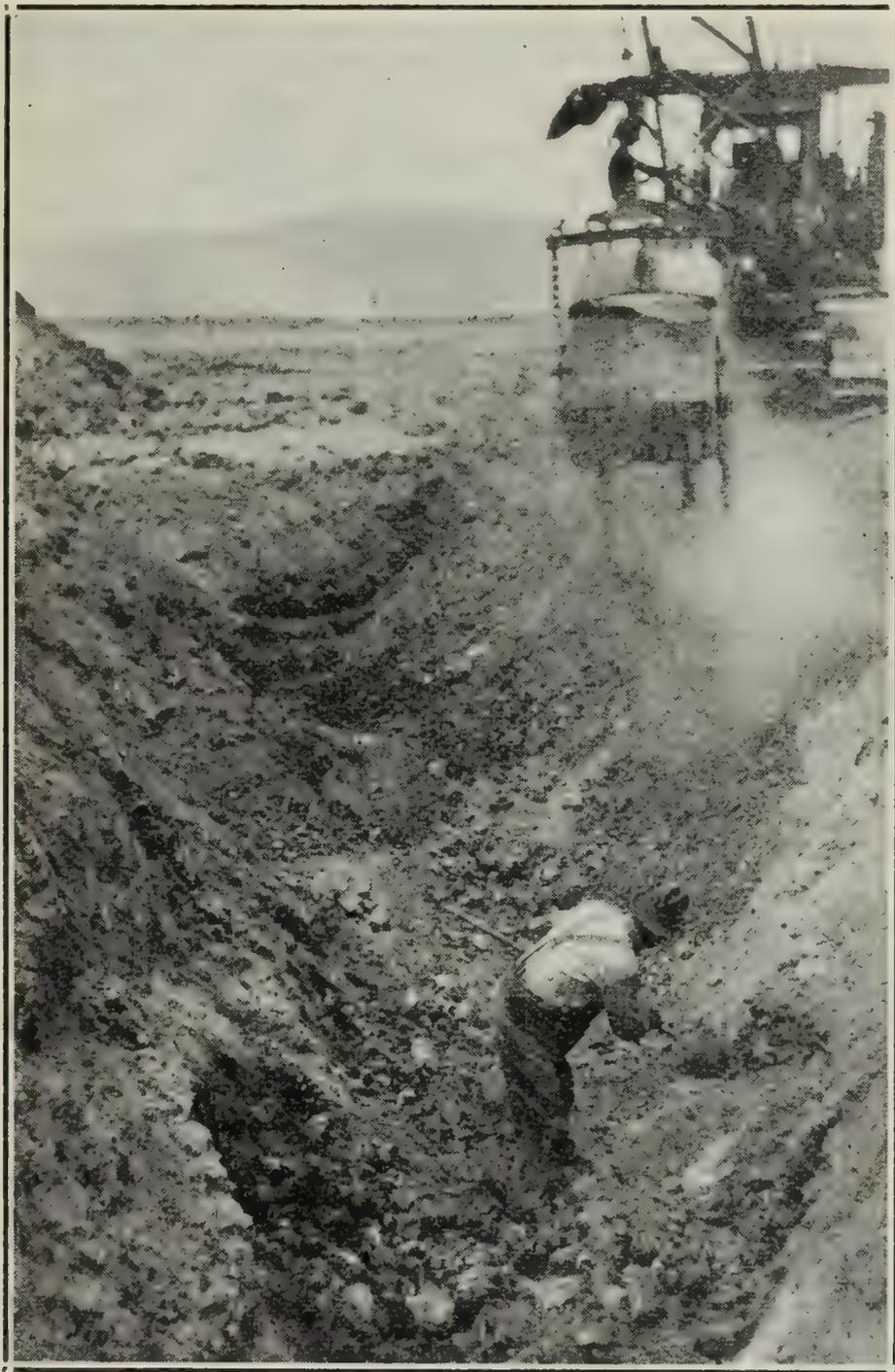
Exposure of Salt Cake (thenardite) in West open cut, near Bertram Station in the Salton Basin, Imperial County—Photo by E. N. Smith.

above mentioned veins of thenardite have a thickness varying from 8 inches to 3 feet.

The proved area containing sodium sulphate is about one-half mile

wide, and about 3000 feet in length. Samples taken from borings throughout this area are reported to carry 10 per cent to 12 per cent sodium sulphate.

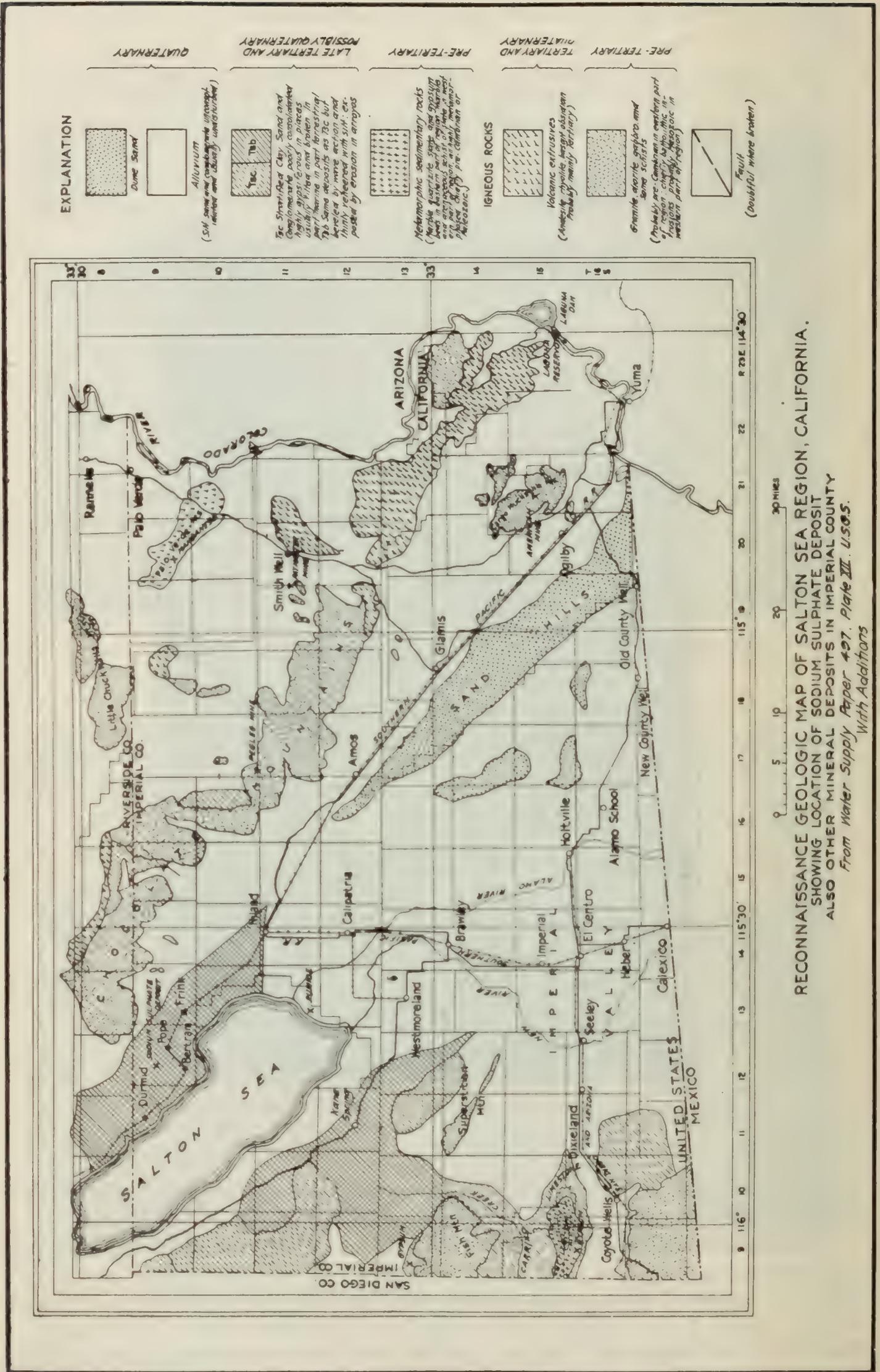
The deposit was originally located by Havens of Imperial Valley, in 1903, as the Glauber Salt Mine, but it was found that the land was owned by the Southern Pacific Railroad. E. N. Smith, of El Centro, purchased the land in 1919. Mr. Smith developed the deposit during the years 1919 to 1921. The property was under lease to E. H. Otto and Company from November 1922, to June 1923, when operations were



Bertram 'Salt Cake' Deposit, in Salton Basin, Imperial County, showing steam shovel at East open cut.—
Photo by E. N. Smith.

suspended. During this period Otto and Company shipped about 2500 tons of salt cake.

Workings consist of an open cut 600 feet in length and about 14 feet in depth, on the east end of the property. In this open cut, three parallel veins of thenardite interbedded in the clay beds were exposed, being about 4 feet apart, and varied in thickness from 18 inches to 4 feet. In the west end of this open cut, the veins formed a junction and the thickness of the material mined is stated to have been about 6 feet. About 2700 feet west of this open cut is another open cut about 200



EXPLANATION

QUATERNARY

- Dune Sand
- Alluvium (Some sand and siltstone, mostly unconsolidated)

LATE TERTIARY AND POSSIBLY QUATERNARY

- Tec. Tsb. The Stratified Clay Sand and Conglomerate poorly consolidated highly gypsiferous in places usually white and broken in thinning in part resulting in some deposits of the blue clayey sandstone and thinly bedded with silt. er. pebbles by erosion in terraces

PRE-TERTIARY

- Metamorphic sedimentary rocks (Hardly quartzite, gneiss and gneiss beds in western part of region, but all part of region, with metamorphic chiefly pre-Cambrian or Mesozoic)

TERTIARY AND PRE-TERTIARY

- IGNEOUS ROCKS
- Volcanic extrusives (Andesite, rhyolite, basalt, obsidian, probably mainly Tertiary)
- Granite, diorite, gabbro and some siltstone (Probably are Cambrian, eastern part of region, probably Mesozoic in western part of region)

Fault (Doubtful where broken)

RECONNAISSANCE GEOLOGIC MAP OF SALTON SEA REGION, CALIFORNIA.
 SHOWING LOCATION OF SODIUM SULPHATE DEPOSIT
 ALSO OTHER MINERAL DEPOSITS IN IMPERIAL COUNTY
 From Water Supply Paper 497. Plate III. U.S.G.S.
 With Additions

feet in length and 14 feet deep. Here two veins of thenardite were worked, which had an average thickness of 2 feet, being separated by beds of clay about 4 feet thick. The dumps from these open cuts are stated to carry 12 per cent sodium sulphate.

Samples of sodium sulphate crystals collected by E. N. Smith were analyzed by Smith, Emery and Company, of Los Angeles, as follows:

Analysis of sodium sulphate from Bertram, California—Sample No. 1:

Water Insoluble -----	Trace
Iron and Aluminum Oxides -----	None
Calcium Oxide (CaO) -----	None
Magnesium Oxide (MgO) -----	Trace
Sodium Oxide (Na ₂ O) -----	43.64%
Moisture (105°) -----	.07%
Combined Water -----	.12%
Chlorine (Cl) -----	.10%
Boric Anhydride (B ₂ O ₃) -----	None
Sulphuric Anhydride (SO ₃) -----	56.22%
Total -----	100.15%

Hypothetical Combination:

Sodium Sulphate (Na ₂ SO ₄) -----	99.80%
Sodium Chloride (NaCl) -----	.16%
Magnesium Sulphate (MgSO ₄) -----	Trace
Moisture and Combined Water -----	.19%
Total -----	100.15%

Sample No. 2:

Water Insoluble -----	0.39%
Iron and Aluminum -----	None
Calcium Oxide (CaO) -----	None
Magnesium Oxide (MgO) -----	0.16%
Sodium Oxide (Na ₂ O) -----	43.40%
Moisture (105°) -----	.02%
Combined Water -----	.35%
Boric Anhydride (B ₂ O ₃) -----	None
Sulphuric Anhydride (SO ₃) -----	56.40%
Total -----	100.72%

Purity as Sodium Sulphate (Na₂SO₄) ----- 98.80%

There is an increased demand for sodium sulphate which is used in the making of wood pulp in the United States by the so-called sulphate process. This process uses sodium sulphate in making sodium sulphide, which is one of the active chemicals in the process, the other being sodium hydroxide. Salt cake for this process should be ground, and should contain at least 95 per cent of anhydrous sodium sulphate. The sodium chloride should not exceed 2 per cent. Sodium sulphate is also used in the manufacture of glass.

Los Angeles County.

California Clay Products Company, offices 315 Western Mutual Life Building, Los Angeles, Victor Kremer, president and R. B. Keeler, secretary, has recently increased the capacity of its plant at Southgate. The company controls large deposits of white burning clay in San Diego County. Their principal products are glazed and colored tile.

San Bernardino County.

CLARK MOUNTAIN DISTRICT.

This district embraces that portion of the old Ivanpah District in the immediate vicinity of Clark Mountain. The district is situated in T. 17 and 18 N., R. 13 and 14 E., 10 miles northeast of Valley Wells, and 17 miles west of Roach station on the Union Pacific Railroad. The district contains deposits of gold, lead, silver, and tungsten.

The formation of the district consists principally of quartz-monzonite and limestone. The gold veins occur in quartz-monzonite. Wolframite and scheelite occur associated together in a system of narrow quartz fissure veins in quartz-monzonite. The silver-bearing lodes occurring in Cambrian limestone, though not large, produced considerable rich silver ore. Silver mining in this district was active during the '80s and early '90s. Most of the old mines ceased operations when the price of silver dropped below \$1, and since that time have only been worked spasmodically by 'chloriders.'

Among the most important producers were the following: Allie and Beatrice, Bob Lee and Hattie, Coliseum, Lizzie Bullock, Monitor, U. S. and Stonewall mines.

MINES.

Coliseum Mine, situated in the Clark Mountain District, on the east slope of Clark range of mountains, at an elevation of 5000 feet, 32 miles south of Good Springs, Nevada, and 10 miles northeast of Valley Wells.

Holdings consist of two patented claims, known as Coliseum No. 1 and No. 2, and 20 claims held under location, located in T. 17 N., R. 13 E. Owner, T. W. Devereaux, Pasadena, California. The property was taken over under option September 1, 1923, by C. H. Gowman, Hollywood, California.

The ore occurs along fractures in quartz-monzonite, which strike N. 50° E. to N. 70° E., and dip 80° S. The filling along these fractures has been silicified, and occurs as a silicified breccia which is mineralized with iron pyrite and some chalcopyrite. The orebody developed is about 50 feet wide, and 100 feet in length. The average value is said to be \$7 in gold. Developments consist of vertical shaft 200 feet deep with levels at 100 and 200 feet. Crosscuts have been driven north on the 100-foot and 200-foot levels, 350 feet, with drifts to the southwest in the orebody. On the opposite slope of the ridge, a cross-cut tunnel has been driven S. 28° E., 600 feet. At 500 feet from the portal it cut the first showing of ore. At 600 feet from the portal, a drift has been driven northeast 70 feet, of which 40 feet is in ore, and another drift has been driven southwest 125 feet in ore. The orebody developed on this level is about 60 feet wide and 125 feet in length, and is said to average \$7 per ton in gold. Present development is confined to driving a tunnel on the southwest slope of the ridge to cut the orebody on the same level as the shaft. Water is secured from Old Green Mine, formerly operated by the Mojave Tungsten Company of New York, now owned by S. E. Yates of Valley Wells. Four men are employed.

Bank Roll and Green Gold Group of claims are located in Clark Mountain Mining District, in T. 17 N., R. 13 E., on the west slope of Clark Mountain, 7 miles northeast of Valley Wells, and 23 miles north

of Cima, a station on the Union Pacific Railroad. Elevation 6000 feet. Owner, Louis F. Keiper, Cima.

Holdings consist of six claims known as Contact, Bank Roll No. 1 and No. 2, Green Gold, Green Gold No. 1 and No. 2.

Ore occurs along a series of north-south and east-west fissures in quartz-monzonite intrusion, not far from the limestone contact. These fissures are narrow, not over 8 inches to 2 feet in width, and small lenses of lead ore occur at intersections of the fissures.

The principal minerals are galena, sphalerite, and chalcopyrite, which carry values in gold and silver, in a quartz gangue. Samples taken from different workings are reported to assay Ag = 20 ozs., Pb = 25%. Development consists of a number of tunnels and open cuts on the different claims. The most extensive amount of development is confined to the Bank Roll claims. Here a cross-cut tunnel was driven S. 50° E. 300 feet, then as a drift S. 50° W., 200 feet towards the contact of quartz-monzonite and limestone. About 100 feet in elevation above this tunnel, there is a tunnel 50 feet in length driven on a N. 40° E. fissure, which developed a small lens of lead sulphide ore.

On Green Gold claims there are two tunnels about 50 feet in length which developed some ore.

On the Contact claim, which is located along the granite and limestone contact, in an open cut, there is exposed 4 feet of silicified brown limestone which is mineralized with galena.

Calarivada Silver Mines comprises 15 claims located on the north slope of the Clark Mountain range of mountains, in T. 18 N., R. 13 E., 12 miles northeast of Valley Wells. Owner, Calarivada Silver Mines, Inc., of Detroit, Michigan; Walter X. Osborne, president and general manager.

Developments consist of a 200-foot shaft. Ore carrying values in copper, gold and silver occurs in fractures in limestone. Equipment consists of 12-h.p. gasoline hoist, cars and blacksmith shop. Two men are employed.

Copper Commander Group (copper), consists of four claims, which adjoin the Copper World Mine on the northwest, situated in the Clark Mountain Mining District, 6 miles northeast of Valley Wells and 22 miles north of Cima, a station on the Union Pacific Railroad. Elevation 5500 feet. Owner, Mike Conway, Cima, California.

The ore occurs in a broad mineralized zone at contact of granitic porphyry and limestone. The granitic porphyry is an intrusive into hard gray colored limestone, and the copper ores are found through the porphyry for a considerable distance from the contacts. In the mineralized zone which is about 200 feet in width, and has a general north-west strike, veinlets of copper ore occur mostly as brown oxides, with occasional bunches of malachite and azurite. Very little sulphide ore has been encountered, but some chalcopyrite was encountered in lower workings on the property. The ore is low grade, said to average about 4 per cent with occasional bunches of 10 per cent copper ore.

Workings consist of a tunnel 140 feet in length driven southeast on contact of porphyry and limestone, also a number of short tunnels and open cuts made along the contact, all of which expose some ore. One man is employed.

Ellingford-Nipton Group consists of three claims located 10 miles northeast of Valley Wells, in the Clark Mountain Mining District. Elevation 5000 feet. Owner, Thomas E. Creed, Santa Ana, California.

Developments consist of two shafts 20 feet deep, sunk on a N. 60° E. fissure in the limestone. A small lens of ore has been developed where this fissure was cut by a northwest fissure. The ore occurs as silver chloride, with some bunches of black metal. Average value is said to be about 20 ounces in silver and 6 per cent lead. This prospect is located west of the Coliseum Mine. Two men are employed.

Silver King Mine consists of six claims located in T. 18 N., R. 13 E., in the Clark Mountain Mining District, 10 miles northeast of Valley Wells. Owner, Jack Encell of Los Angeles. Silver bromide and chlorides occur along a fault fissure in the limestone, which has a course of N. 40° W., dip 40° southwest. Developments consist of a tunnel 160 feet in length and a number of open cuts along the fissure. Idle.

Snow Storm Mine consists of four claims located in T. 18 N., R. 13 E., in the Clark Mountain Mining District, 12 miles northeast of Valley Wells. Silver bromide and chloride ores occur along northwest and southeast fissures in the limestone. Three shafts have been sunk on the different fissures to depths of 60 feet, exposing veins 12 inches to 3 feet wide, which dip 30 degrees to the southwest. The ore is stated to assay from 10 to 50 ounces in silver. George Miller, of Good Springs, Nevada, owner.

Stonewall Mine is located in T. 18 S., R. 13 E., in the Clark Mountain Mining District, about 12 miles northeast of Valley Wells, and 18 miles northwest of Nipton Station on the Union Pacific Railroad.

Holdings consist of 15 claims. Owners, Martin A. Kiwisar and B. M. Laurence, of Good Springs, Nevada.

This property was extensively worked from 1881 to 1896, and was one of the largest silver producers of the district. Developments consist of a number of tunnels driven at different elevations along a fault fissure which has a general strike of N. 35° W., dip 50° northeast. Width of vein was about 3 feet. The ore, which is a bromide and chloride of silver, occurred in irregular lenses along this fracture. A lower tunnel was driven west 100 feet to the vein, then 500 feet to the southeast on the vein, which has been stoped out to the surface. About 150 feet above this tunnel, there is another tunnel driven 600 feet on the fissure, which also has been stoped out to the surface. Idle.

U. S. Mine is located in T. 18 N., R. 13 E., in the Clark Mountain District, about 12 miles northeast of Valley Wells, and 17 miles northwest of Nipton, a station on the Union Pacific Railroad. Elevation 5000 feet.

Holdings consist of four claims, owned by C. R. Loomis, of Good Springs, Nevada. Under option to Calarivada Silver Mines, Inc. Walter X. Osborne, manager.

Property has been worked off and on since 1880 and was an important producer of silver ore in this district. Workings consist of three tunnels. The lower or main working tunnel is driven S. 20° W., 150 feet, where the Beatrix vein was cut. This vein has been drifted on 150 feet southeast, and 600 feet to northwest. The vein is 4 feet wide, and

the ore occurred as bromide and chloride of silver, in lenses along the fissure. This vein has been stoped to the surface. Several winzes have been sunk to a depth of 40 feet below the tunnel level which show from 8 inches to 2 feet of ore. Vein strikes N. 30° W., dip 50° northeast. There is another vein known as the U. S. which lies south of the Beatrix vein, and runs parallel to it, but dips 40 degrees to the northeast. This vein is developed by a cross-cut from the north drift on the Beatrix vein. The mine is reported to have produced some very high-grade silver ore. The lower workings have been recently cleaned out and retimbered. Two men are employed.

Valentine Group comprises 14 claims located on the western slope of Clark Mountain, in T. 17 N., R. 13 E., 5 miles northeast of Valley Wells, and 23 miles north of Cima, a station on the Union Pacific Railroad. Elevation 6500 feet. Owner, Louis F. Keiper, Cima.

These claims were located in February 1920, on the discovery of some high-grade argentiferous lead sulphide ore along a fissure in the limestone. The country rock consists of gray limestone with beds of shale and diorite intrusions along the bedding planes of the limestone. The limestones and shales are very much folded on the western slope of Clark Mountain. Lead sulphide and lead carbonate occur along a fissure in the limestone, conformable to the bedding planes of the limestone which is folded along the strike. The general course of the fissure is north, with a dip of 50 degrees to the east. The fissure has an average width of 5 feet and is filled with brown silicified limestone with a diorite intrusion on the footwall. The silicified limestone is mineralized with galena and lead-zinc carbonates. At different places along this fissure for 4000 feet, showings of galena ore have been exposed in open cuts and prospect shafts. The most extensive work has been done on Valentine No. 1 claim. Here a cross-cut tunnel has been driven 130 feet to cut the ore exposed in a tunnel 50 feet in length at a higher elevation. The ore exposed in this upper tunnel has a width of 5 feet and is developed for 30 feet in length. Samples taken from these workings are reported to have assayed 8 to 15 ounces in silver, and 30 per cent lead. Workings on this claim consist of 3 open cuts and two tunnels, all showing galena and carbonate ore.

On Valentine No. 2 claim, about 150 feet south of No. 1 workings, along the fissure is a small cave deposit filled with lead-zinc carbonates, said to carry 10 to 15 per cent zinc, and 10 to 15 per cent lead. There are thirty tons of sorted ore on the dump of No. 1 workings, which, it is stated, will assay 50 per cent lead. Water is secured from Pachalka Spring, which is located about one mile from the workings. Two men are employed.

LEAD MOUNTAIN DISTRICT.

War Eagle Mine is located on the eastern slope of the Lead Mountains in T. 4 N., R. 10 E., 9 miles south of Bagdad, a station on the Atchison, Topeka and Santa Fe Railroad. Elevation, 1800 feet. Owner, *Bagdad Silver Mines Company*, 53 State street, Boston, Mass. C. O. Ellingwood, president; J. F. Mullen, secretary.

Holdings consist of Alpha, Lead King, and Lead Queen group of claims, comprising 320 acres. The property was worked by the Southwestern Lead Company of Los Angeles from 1912 to 1920, when

acquired by the Bagdad Silver Mines Company which operated the property continuously until June 1923, when operations were suspended.

The ore deposits occur in a well-defined fault fracture in rhyolite porphyry, striking N. 60° W., and dipping 40° southwest. The hanging wall of the fault is a brecciated tufa. The ores found along the fissure are similar in character, being chlorides and chloro-bromides, with some galena and lead carbonates in crushed breccia in the fissure. Irregular ore bodies occur in the fissure varying from 12 inches to 12 feet in width. An incline shaft has been sunk on the vein to a depth of 700 feet, with levels at 100, 200, 300, 400, 500, and 600 feet, with over 7000 feet of drifts and cross-cuts. The oreshoot trends to the northwest and below the 200-foot level all development has been to the northwest. It is stated that the average ore mined assayed 8 per cent lead, and 7 ozs. silver. The ore mined was treated in a 25-ton concentration mill.

Mill equipment: 8" x 7" Blake crusher, Challenge ore feeder, Ball mill, and two Wilfley tables; also Stebbins dry concentrator. Mill driven by 37½-h.p. Fairbanks-Morse gas engine. Water for mill secured from well on dry lake, 3 miles northeast of mine.

Pump equipment: 4" x 6" Triplex pump driven by 40-h.p. Fairbanks-Morse gas engine.

Mine equipment: 37½-h.p. Fairbanks-Morse gas engine hoist, compressor, air drills, cars, blacksmith shop, assay office, and bunkhouses. When operating, 20 men were employed. Idle.

RANDBURG DISTRICT.

California Rand Silver, Inc., during the latter part of February, curtailed mill operations to one shift per day of eight hours, and the regular dividend disbursement of 2 cents per share, or \$25,600 monthly, will be discontinued until ore reserves are increased by intensive development. For four years the company has paid 2 cents per month, and, in addition, has paid four extra dividends of 10 cents, making a total of \$3,018,400 in dividends. The company plans an intensive development campaign to explore new territory on the property, to add to the present ore reserves in proven territory. The company reports that the development work during the past six months has proven satisfactory, and three promising ore zones have been developed.

During January, 8100 tons of ore was milled, averaging \$18.10 per ton. Concentrates shipped amounted to 456 tons, which netted approximately \$106,776. For the month of February 4698 tons of ore was milled; a daily average of 162 tons.

The highest extraction ever obtained by the company in the operation of the mill, was made during the month of February, the average gold extraction being 84.5 per cent; silver extraction was 97.46 per cent, making a total extraction of 96.20 per cent. The net value of the concentrates shipped was approximately \$128,347.50. During the month, 1621 feet of new development was completed.

TUNGSTEN.

Atolia Mining Company, whose property is situated in the Atolia tungsten district, near Randsburg, and formerly the largest producer of tungsten ore in California, recently reopened the mine on a leasing

basis. Leases are being granted by the company to miners who may want to prospect and work outlying sections of the property. The company offers to take the ore, concentrate it and market the product, half of the proceeds to be paid to the lessee. In addition, supplies and tools are furnished the lessees at cost, and necessary equipment and machinery to develop mine and hoist the ore, are rented to them under reasonable terms. Payment by the company is to be made on the basis of one-half of 90 per cent of the average quoted market value for 60 per cent tungstic acid, domestic scheelite ore, f.o.b., Pittsburgh, Pa., the quotations to be taken from the Engineering and Mining Journal-Press for the week ending 30 days after date of the preliminary sampling at Atolia. Payment for ores less than 60 per cent tungstic acid content is on the basis of a sliding scale; 75 per cent on content for ores 2 per cent tungstic acid or less; 80 per cent on 10 to 20 per cent tungstic acid content; 85 per cent on 20 to 30 per cent tungstic acid content; 95 per cent on 50 to 60 per cent tungstic acid content, and 100 per cent on ores containing 60 per cent or over in tungstic acid.

Approximately 20 lessees are working on what is known as the 'spud patch.'

Ventura County.

Gillibrand Limestone Deposit, located 5 miles north of Santa Susana, a station on the Southern Pacific Railroad, in Secs. 17 and 18, T. 3 N., R. 17 W., S. B. B. and M. Owner, E. C. Gillibrand of Santa Susana.

Holdings consist of 200 acres, of which 100 acres, located in Sec. 18, is under lease to the *Ventura County Lime and Fertilizer Company*, of Santa Paula, California. E. D. Goodenough, president.

A massive bed of limestone is exposed on the western slope of the Santa Susana Mountains, north of Simi Valley. The general strike of the limestone belt is northeast and southwest with a dip of about 30 degrees to the southeast. The exposure on the property is about 3000 feet in length, and has an average width of 300 feet. It is a decomposed shell deposit of lime.

Analysis by Smith Emery Company:

CaO -----	54.64%
CO ₂ -----	42.86%
CaCO ₃ -----	97.60%
P ₂ O ₅ -----	.07 to .33%
Insoluble -----	2.07%

The material is suitable for fertilizer.

Ventura Velvet Molding Sand Deposit is located within the city limits of Ventura, on ridge south of Buena Vista Canyon, a mile north of the Southern Pacific Railroad Station, at Ventura. Owner, Charles A. Cole, Ventura, California.

Holdings consist of 28 acres. A bed of unconsolidated sandy loam and fine-grained sand said to be 100 feet thick is exposed in the canyon.

Quarry is 200 feet in length and 75 feet to 100 feet in height. Material handled with scrapers to bins, then screened through No. 4 mesh trommel, oversize going to a set of rolls.

Quality: The sand is very fine grained. About 96 per cent of the sand will pass through 100 mesh, and 48 per cent through the 200 mesh. The sand has a good bond.

Analysis.

Silica -----	66.25%
Iron Oxide -----	8.75%
Aluminum Oxide -----	12.75%
Calcium Oxide -----	3.07%
Magnesium Oxide -----	2.70%
Alkalies -----	2.40%
Loss in ignition and undetermined -----	4.33%
 Total -----	<hr/> 100.25%



OIL FIELD DEVELOPMENT OPERATIONS.

By R. D. BUSH, State Oil and Gas Supervisor.

From December 29, 1923, to and including April 12, 1924, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
FRESNO COUNTY:					
Alta Vista Oil Co.....	6	21	15	Recovery	Coalinga
Coalinga Empire Oil Co.....	6	21	15	6	Coalinga
Premier Oil Co.....	24	20	14	27	Coalinga
Snowolene Oil Co.....	22	21	15	1-A	-----
KERN COUNTY:					
Bear State Oil Co.....	30	28	21	12	Belridge
D. S. & W. Oil Co.....	22	25	18	1	Devils Den
C. H. Finley.....	25	25	18	1	Devils Den
Associated Oil Co.....	25	30	24	3	Elk Hills
Associated Oil Co.....	26	30	24	22	Elk Hills
Associated Oil Co.....	26	30	24	21	Elk Hills
Associated Oil Co.....	26	30	24	31	Elk Hills
Belridge Oil Co.....	34	30	24	11	Elk Hills
Belridge Oil Co.....	34	30	24	13	Elk Hills
Belridge Oil Co.....	34	30	24	5	Elk Hills
Pacific Oil Co.....	27	30	24	55	Elk Hills
Pacific Oil Co.....	27	30	24	59	Elk Hills
Pacific Oil Co.....	27	30	24	54	Elk Hills
Pacific Oil Co.....	27	30	24	22	Elk Hills
Pacific Oil Co.....	35	30	24	74	Elk Hills
Pacific Oil Co.....	35	30	24	84	Elk Hills
Pan American Petroleum Co.....	6	31	25	Crampton 12-C	Elk Hills
Pan American Petroleum Co.....	6	31	25	Crampton 18-A	Elk Hills
Union Oil Co.....	26	30	24	Elk Hills 6	Elk Hills
Gray Heirs.....	3	29	28	44	Kern River
Gray Heirs.....	3	29	28	45	Kern River
Union Oil Co.....	11	28	27	Del Rey 7	Kern River
Jewett Oil Co.....	13	30	21	16	McKittrick
Potter Oil Co. of California.....	6	30	22	Fee 2	McKittrick
Balboa Oil Co.....	24	31	23	19	Midway
Bell-Evans Oil Co. Inc.....	35	32	23	4	Midway
Berry & Ewing.....	31	32	24	16	Midway
Berry & Ewing.....	31	32	24	7	Midway
Brookshire Oil Co.....	24	31	22	11	Midway
Calivada Oil Co.....	34	32	24	1	Midway
C. C. M. O. Co.....	25	31	22	20	Midway
C. C. M. O. Co.....	9	32	23	35	Midway
C. C. M. O. Co.....	25	31	22	18	Midway
C. C. M. O. Co.....	9	32	23	36	Midway
Eskridge & Craise Oil Co.....	34	30	22	1	Midway
Formax Oil Co.....	36	32	23	12	Midway
Formax Oil Co.....	36	32	23	13	Midway
Formax Oil Co.....	36	32	23	14	Midway
Formax Oil Co.....	36	32	23	15	Midway
General Petroleum Corp.....	32	31	24	8	Midway
General Petroleum Corp.....	36	32	23	Alpine 4	Midway
General Petroleum Corp.....	36	32	23	Alpine 3	Midway
General Petroleum Corp.....	36	32	23	Alpine 6	Midway
Honolulu Consolidated Oil Co.....	6	32	24	21	Midway
Honolulu Consolidated Oil Co.....	8	32	24	78	Midway
Honolulu Consolidated Oil Co.....	4	32	24	34	Midway
Honolulu Consolidated Oil Co.....	4	32	24	82	Midway
Ralph Lavin.....	28	32	23	2	Midway
E. G. Lewis.....	35	32	23	11	Midway
Midlands Oilfields Co. Ltd.....	24	31	23	5	Midway
Midlands Oilfields Co. Ltd.....	34	31	24	2	Midway
Midlands Oilfields Co. Ltd.....	24	31	23	6	Midway
Midway Oil Co.....	36	32	23	Alpine 1	Midway
Midway Oil Co.....	36	32	23	Alpine 2	Midway
North American Oil Cons.....	30	31	24	6	Midway
North American Oil Cons.....	30	31	24	7	Midway
Pacific Oil Co.....	25	31	23	33	Midway
Pacific Oil Co.....	31	31	24	67	Midway
Pacific Oil Co.....	3	32	24	40	Midway
Pacific Oil Co.....	33	31	24	21	Midway
Pacific Oil Co.....	5	32	24	85	Midway
Pacific Oil Co.....	15	32	24	51	Midway
Pacific Oil Co.....	1	32	23	97	Midway
Pacific Oil Co.....	25	31	23	32	Midway
Southwestern Petroleum Co.....	2	31	22	4	Midway
Southwestern Petroleum Co.....	2	31	22	5	Midway

Company	Sec.	Twp.	Range	Well No.	Field
KERN COUNTY—Continued:					
Transport Oil Co.-----	26	32	23	1	Midway
Victor Oil Co.-----	35	32	23	10	Midway
Vivian B Oil Co.-----	35	32	23	6	Midway
C. J. Berry-----	34	12	24	Hillside 22	Sunset
C. J. Berry-----	34	12	24	Hillside 25	Sunset
General Petroleum Corp.-----	18	11	23	2-B	Sunset
General Petroleum Corp.-----	18	11	23	3-B	Sunset
General Petroleum Corp.-----	18	11	23	7-B	Sunset
General Petroleum Corp.-----	18	11	23	11-A	Sunset
General Petroleum Corp.-----	18	11	23	10	Sunset
E. G. Lewis-----	6	11	23	11	Sunset
Pacific Oil Co.-----	3	11	23	1	Sunset
Pliocene Oil Co.-----	18	11	23	61	Sunset
Western Minerals Co.-----	18	11	23	53-F	Sunset
Western Minerals Co.-----	17	11	23	41	Sunset
Western Minerals Co.-----	18	11	23	33	Sunset
Western Minerals Co.-----	17	11	23	42-F	Sunset
Western Minerals Co.-----	17	11	23	51	Sunset
Western Minerals Co.-----	18	11	23	61	Sunset
Western Minerals Co.-----	18	11	23	23	Sunset
Western Minerals Co.-----	17	11	23	Kern Co. Lease 2 10	Wheeler Ridge
Standard Oil Co.-----	28	11	20	Kern Co. Lease 2 11	Wheeler Ridge
Standard Oil Co.-----	28	11	20	1	-----
Bell & Wrightsman, Inc.-----	29	11	23	Piper 3	-----
T. A. Piper-----	11	27	28	Piper 4	-----
T. A. Piper-----	15	27	28	Piper 5	-----
T. A. Piper-----	14	27	28	Piper 6	-----
T. A. Piper-----	15	27	28		-----
KINGS COUNTY:					
General Petroleum Corp.-----	28	22	18	Ochsner 28 1	-----
LOS ANGELES COUNTY:					
General Petroleum Corp.-----	28	3	13	White 2	Dominguez
General Petroleum Corp.-----	29	3	13	Austin 2	Dominguez
General Petroleum Corp.-----	28	3	13	Gardena 2	Dominguez
Shell Co.-----	33	3	13	Reyes 2	Dominguez
Shell Co.-----	34	3	13	Childs 1	Dominguez
Shell Co.-----	28	3	13	Hellman 1	Dominguez
Shell Co.-----	33	3	13	Reyes 3	Dominguez
Shell Co.-----	33	3	13	Reyes 4	Dominguez
Shell Co.-----	33	3	13	Reyes 5	Dominguez
Union Oil Co.-----	33	3	13	Hellman 2	Dominguez
Union Oil Co.-----	33	3	13	Callender 2	Dominguez
Union Oil Co.-----	29	3	13	Callender 4	Dominguez
Union Oil Co.-----	28	3	13	Hellman 3	Dominguez
Union Oil Co.-----	33	3	13	Hellman 4	Dominguez
Union Oil Co.-----	33	3	13	Callender 5	Dominguez
United States Royalties Co.-----	20	3	13	23	Dominguez
Dabney, Colter & Delaney-----	24	4	13	Lucky Hoffman 1	Long Beach
De Lendrecie Oil Well-----	19	4	12	Malloy 1	Long Beach
Federal Drilling Co.-----	24	4	13	Leedom 1	Long Beach
General Petroleum Corp.-----	19	4	12	Jonah 4	Long Beach
General Petroleum Corp.-----	19	4	12	K. & H. 5	Long Beach
R. E. Ibbetson Drilling Co.-----	24	4	13	3	Long Beach
A. T. Jergins Trust-----	19	4	12	10	Long Beach
A. T. Jergins Trust-----	19	4	12	11	Long Beach
A. T. Jergins Trust-----	19	4	12	12	Long Beach
Marine Oil Corp.-----	19	4	12	14	Long Beach
Marine Oil Corp.-----	19	4	12	24	Long Beach
Marine Oil Corp.-----	19	4	12	17	Long Beach
Petroleum Midway Co. Ltd.-----	19	4	12	Fields 7	Long Beach
Petroleum Midway Co. Ltd.-----	19	4	12	Bauman 3	Long Beach
Petroleum Midway Co. Ltd.-----	29	4	12	Brown 2	Long Beach
Petroleum Midway Co. Ltd.-----	29	4	12	Chamberlin 1	Long Beach
Petroleum Midway Co. Ltd.-----	19	4	12	Fields 9	Long Beach
Petroleum Midway Co. Ltd.-----	19	4	12	Fields 12	Long Beach
Petroleum Midway Co. Ltd.-----	19	4	12	O'Neill 3	Long Beach
W. R. Ramsey-----	29	4	12	Flower State 1	Long Beach
W. R. Ramsey-----	28	4	12	B-3	Long Beach
W. R. Ramsey-----	28	4	12	McNaughton 1	Long Beach
W. R. Ramsey-----	28	4	12	Morrison-Barstow 1	Long Beach
W. R. Ramsey-----	28	4	12	B-4	Long Beach
Regina Petroleum Corp.-----	24	4	13	Judd 2	Long Beach
Sack-Campbell, Schaffner-----	24	4	13	1	Long Beach
San Martinez Oil Co.-----	29	4	12	Booth Com. 3	Long Beach
San Martinez Oil Co.-----	29	4	12	Greene Com. 2	Long Beach
San Martinez Oil Co.-----	29	4	12	Booth Com. 4	Long Beach
Shell Co.-----	29	4	12	Alamitos 13	Long Beach
Shell Co.-----	29	4	12	Alamitos 12	Long Beach
Shell Co.-----	29	4	12	Alamitos 14	Long Beach
Shell Co.-----	29	4	12	Alamitos 15	Long Beach
Shell Co.-----	29	4	12	Alamitos 16	Long Beach

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued:					
Shell Co. -----	29	4	12	Patton Wilson 3	Long Beach
Shell Co. -----	29	4	12	Hutton Com 4	Long Beach
Shell Co. -----	28	4	12	Alamitos 19	Long Beach
Shell Co. -----	29	4	12	Alamitos 18	Long Beach
Shell Co. -----	29	4	12	Alamitos 17	Long Beach
Shell Co. -----	29	4	12	Goddard 5	Long Beach
Shell Co. -----	29	4	12	Stakemiller 4	Long Beach
C. A. Son -----	24	4	13	3	Long Beach
McGinley Oil Co. -----	6	2	11	16	Montebello
General Petroleum Corp. -----	5	3	11	Anderson 53-B	Santa Fe Springs
General Petroleum Corp. -----	5	3	11	Santa Fe 52-C	Santa Fe Springs
Petroleum Midway Co. Ltd. -----	6	3	11	Foix 3	Santa Fe Springs
Standard Oil Co. -----	12	6	11	Thomson 4	Santa Fe Springs
Union Oil Co. -----	6	3	11	Bell 25	Santa Fe Springs
Anglo-American Oil Co. -----	20	4	13	1	Torrance
Armstrong & Guthrie -----	23	4	14	1	Torrance
Associated Oil Co. -----	8	4	14	Watson 4	Torrance
Bear Oil Co. -----	23	4	14	1	Torrance
Jos. J. Berliner -----	23	4	14	Jean 1	Torrance
W. C. Bramham -----	16	4	14	1	Torrance
Bush-Voorhis Oil Co. -----	23	4	14	5	Torrance
Bush-Voorhis Oil Co. -----	23	4	14	7	Torrance
California Drilling Co. -----	23	4	14	M. & M. 1	Torrance
E. B. Campbell -----	23	4	14	1	Torrance
Catalina View Oil Co. -----	23	4	14	3	Torrance
C. C. M. O. Co. -----	14	4	14	Kettler 5	Torrance
C. C. M. O. Co. -----	14	4	14	Kettler 6	Torrance
C. C. M. O. Co. -----	14	4	14	Torrance 32	Torrance
C. C. M. O. Co. -----	14	4	14	Kettler 8	Torrance
C. C. M. O. Co. -----	10	4	14	Torrance 30	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 9	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 10	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 33	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 35	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 36	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 37	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 11	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 12	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 13	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 16	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 15	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 14	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 43	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 42	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 41	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 40	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 39	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 38	Torrance
C. C. M. O. Co. -----	14	4	14	Kettler 7	Torrance
C. C. M. O. Co. -----	8	4	14	Del Amo 11	Torrance
C. C. M. O. Co. -----	9	4	14	Del Amo 10	Torrance
C. C. M. O. Co. -----	14	4	14	Kettler 18	Torrance
C. C. M. O. Co. -----	14	4	14	Kettler 19	Torrance
C. C. M. O. Co. -----	23	4	14	Kettler 17	Torrance
C. C. M. O. Co. -----	3	4	14	Dominguez 2	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 50	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 55	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 46	Torrance
C. C. M. O. Co. -----	14	4	14	Torrance 51	Torrance
C. C. M. O. Co. -----	8	4	14	Del Amo 14	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 56	Torrance
C. C. M. O. Co. -----	15	4	14	Torrance 34	Torrance
C. C. M. O. Co. -----	16	4	14	Del Amo 12	Torrance
C. C. M. O. Co. -----	16	4	14	Del Amo 13	Torrance
Checot Oil Trust -----	23	4	14	2	Torrance
Chicksan Oil Co. -----	23	4	14	1	Torrance
Chicksan Oil Co. -----	23	4	14	2	Torrance
Consolidated Mutual Oil Co. -----	23	4	14	5	Torrance
Consolidated Mutual Oil Co. -----	30	4	13	1	Torrance
Jack E. F. Darnell -----	23	4	14	1	Torrance
Empire Development Co. -----	30	4	13	1	Torrance
Herman Fisher -----	23	4	14	1	Torrance
Fisher Gregg Cooperative -----	23	4	14	1	Torrance
W. H. Ford -----	23	4	14	1	Torrance
Fortuna Oil Co. Inc. -----	23	4	14	Clark 2	Torrance
Fullerton Oil Co. -----	8	4	14	Waddell 4	Torrance
Fullerton Oil Co. -----	9	4	14	Lenz 2	Torrance
Fullerton Oil Co. -----	16	4	14	Cotton 1	Torrance
General Petroleum Corp. -----	8	4	14	Carson 3	Torrance
George F. Getty -----	14	4	14	Torrance 17	Torrance
George F. Getty -----	14	4	14	Torrance 19	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued:					
George F. Getty-----	14	4	14	Torrance 18	Torrance
George F. Getty-----	14	4	14	Torrance 20	Torrance
George F. Getty-----	23	4	14	Torrance 21	Torrance
George F. Getty-----	15	4	14	Torrance 6-A	Torrance
George F. Getty-----	14	4	14	Torrance 14-A	Torrance
George F. Getty-----	23	4	14	Torrance 22	Torrance
George F. Getty-----	8	4	14	Torrance 23	Torrance
B. Gildner-----	23	4	14	1	Torrance
Hackworth & Brunwin-----	23	4	14	McGovern 1	Torrance
International Drilling and Eng. Co.-----	23	4	14	2	Torrance
International Drilling and Eng. Co.-----	23	4	14	3	Torrance
International Drilling and Eng. Co.-----	23	4	14	4	Torrance
E. E. Jennings-----	23	4	14	Rhoads 1	Torrance
E. E. Jennings-----	23	4	14	Scott 1	Torrance
Keefe Risten Co.-----	23	4	14	2	Torrance
Bernard Le Mohn-----	13	4	14	2	Torrance
Leonard Wells, Inc.-----	23	4	14	12	Torrance
McKeon Drilling Co.-----	23	4	14	2	Torrance
J. F. McMahon-----	23	4	14	2	Torrance
E. J. Miley-----	24	4	14	Torrance 2	Torrance
E. J. Miley-----	24	4	14	Torrance 1	Torrance
E. J. Miley-----	24	4	14	Torrance 1-A	Torrance
E. J. Miley-----	24	4	14	Torrance 3	Torrance
E. J. Miley-----	24	4	14	Torrance 6	Torrance
E. J. Miley-----	24	4	14	Torrance 5	Torrance
E. J. Miley-----	24	4	14	Torrance 4	Torrance
Mohawk Oil Co.-----	14	4	14	1	Torrance
Native Petroleum Corp.-----	23	4	14	1	Torrance
Cullen E. Nye-----	14	4	14	1	Torrance
Pan American Petroleum Co.-----	24	4	14	Thomas 1	Torrance
Pan American Petroleum Co.-----	24	4	14	Thomas 2	Torrance
Pan American Petroleum Co.-----	24	4	14	Knappe 1	Torrance
Pan American Petroleum Co.-----	24	4	14	Sloan 1	Torrance
Pan American Petroleum Co.-----	24	4	14	Hub 1	Torrance
Pan American Petroleum Co.-----	24	4	14	House 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Stoddard 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Ford 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Young One 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Dudley 1	Torrance
Petroleum Midway Co. Ltd.-----	22	4	14	Wilson Com. 8	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Barrow Com. 1	Torrance
Petroleum Midway Co. Ltd.-----	24	4	14	Logan 1	Torrance
Petroleum Midway Co. Ltd.-----	15	4	14	Stock Com. 3	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Deitrick 3	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Young One 2	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Lord 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Eyster 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Gannon 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Dudley 2	Torrance
Petroleum Midway Co. Ltd.-----	9	4	14	Casad 2	Torrance
Petroleum Midway Co. Ltd.-----	8	4	14	Gish 3	Torrance
Petroleum Midway Co. Ltd.-----	5	4	14	Redondo Im. Co. 1	Torrance
Petroleum Midway Co. Ltd.-----	5	4	14	Crocker Com. 1	Torrance
Petroleum Midway Co. Ltd.-----	23	4	14	Deitrick 2	Torrance
Petroleum Midway Co. Ltd.-----	9	4	14	Craven Com. 1-A	Torrance
Petroleum Securities Co.-----	15	4	14	11	Torrance
Petroleum Securities Co.-----	15	4	14	28	Torrance
Petroleum Securities Co.-----	15	4	14	27	Torrance
Petroleum Securities Co.-----	15	4	14	15	Torrance
Petroleum Securities Co.-----	15	4	14	20	Torrance
Petroleum Securities Co.-----	15	4	14	24	Torrance
Petroleum Securities Co.-----	15	4	14	19	Torrance
Petroleum Securities Co.-----	15	4	14	12	Torrance
Petroleum Securities Co.-----	15	4	14	16	Torrance
Petroleum Securities Co.-----	15	4	14	23	Torrance
Petroleum Securities Co.-----	15	4	14	25	Torrance
Petroleum Securities Co.-----	15	4	14	26	Torrance
Petroleum Securities Co.-----	15	4	14	22	Torrance
Petroleum Securities Co.-----	15	4	14	21	Torrance
Petroleum Securities Co.-----	15	4	14	13	Torrance
Petroleum Securities Co.-----	15	4	14	14	Torrance
Petroleum Securities Co.-----	15	4	14	17	Torrance
Petroleum Securities Co.-----	15	4	14	18	Torrance
D. F. Peyton-----	23	4	14	1	Torrance
R K Drilling Co.-----	23	4	14	Martner 1	Torrance
Ring Petroleum Corp.-----	23	4	14	2	Torrance
Rogers & Edwards-----	23	4	14	Equitable 1	Torrance
Seaboard Petroleum Co.-----	23	4	14	McIntyre 1	Torrance
Seaboard Petroleum Co.-----	23	4	14	McIntyre 2	Torrance
Selby & Root Co.-----	23	4	14	4	Torrance
Selby & Root Co.-----	23	4	14	6	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued:					
Selby & Root Co.	23	4	14	7	Torrance
Sentinel Oil Co.	24	4	14	Joughin 3	Torrance
Sentinel Oil Co.	24	4	14	Joughin 4	Torrance
Sentinel Oil Co.	24	4	14	Joughin 5	Torrance
Sentinel Oil Co.	24	4	14	Joughin 7	Torrance
Sentinel Oil Co.	24	4	14	Joughin 6	Torrance
Shell Co.	24	4	14	Kettler 1	Torrance
Shell Co.	24	4	14	March 3	Torrance
Shell Co.	24	4	14	March 1-A	Torrance
Shell Co.	24	4	14	March 4	Torrance
Shell Co.	23	4	14	Kettler 2	Torrance
Shell Co.	23	4	14	Kettler 4	Torrance
Shell Co.	23	4	14	Kettler 5	Torrance
Shell Co.	23	4	14	Kettler 3	Torrance
Shell Co.	23	4	14	Kettler 6	Torrance
Shell Co.	23	4	14	Kettler 7	Torrance
Shell Co.	23	4	14	Kettler 8	Torrance
Shell Co.	23	4	14	Kettler 9	Torrance
Shell Co.	23	4	14	Kettler 10	Torrance
Shell Co.	24	4	14	March 5	Torrance
Shell Co.	20	4	13	Dolores 1	Torrance
Shell Co.	24	4	14	Bluemle 2	Torrance
Shell Co.	24	4	14	Bluemle 1	Torrance
Shell Co.	8	4	14	Redondo Com. 2	Torrance
Standard Oil Co.	13	4	14	Dominguez 3	Torrance
Standard Oil Co.	13	4	14	Interstate 1	Torrance
Standard Oil Co.	24	4	14	Interstate 2	Torrance
Standard Oil Co.	15	4	14	Marble Lease 1	Torrance
Standard Oil Co.	15	4	14	Marble Lease 2	Torrance
Standard Oil Co.	13	4	14	Dominguez 2	Torrance
Standard Oil Co.	15	4	14	Marble Fee 1	Torrance
Standard Oil Co.	15	4	14	Marble Fee 2	Torrance
Standard Oil Co.	15	4	14	Marble Fee 3	Torrance
Standard Oil Co.	15	4	14	Marble Lease 6	Torrance
Standard Oil Co.	22	4	14	Marble Lease 5	Torrance
Standard Oil Co.	15	4	14	Marble Fee 5	Torrance
Standard Oil Co.	15	4	14	Marble Fee 6	Torrance
Standard Oil Co.	15	4	14	Marble Fee 4	Torrance
Standard Oil Co.	22	4	14	Marble Lease 4	Torrance
Standard Oil Co.	23	4	14	Interstate 5	Torrance
Standard Oil Co.	14	4	14	Interstate 3	Torrance
Standard Oil Co.	14	4	14	Interstate 4	Torrance
Standard Oil Co.	14	4	14	Interstate 6	Torrance
Standard Oil Co.	14	4	14	Interstate 7	Torrance
Standard Oil Co.	15	4	14	Marble Fee 7	Torrance
Standard Oil Co.	16	4	14	Ellinwood 1	Torrance
Standard Oil Co.	15	4	14	Marble Fee 14	Torrance
Standard Oil Co.	22	4	14	Weston 1	Torrance
Superior Oil Co.	24	4	14	Torrance 15	Torrance
Superior Oil Co.	24	4	14	Torrance 16	Torrance
Superior Oil Co.	24	4	14	Torrance 17	Torrance
Superior Oil Co.	24	4	14	Torrance 21	Torrance
Superior Oil Co.	24	4	14	Torrance 18	Torrance
Superior Oil Co.	19	4	13	Torrance 20	Torrance
Superior Oil Co.	24	4	14	Torrance 19	Torrance
Superior Oil Co.	24	4	14	Torrance 22	Torrance
Superior Oil Co.	24	4	14	Torrance 23	Torrance
Superior Oil Co.	24	4	14	Torrance 24	Torrance
Superior Oil Co.	24	4	14	Torrance 25	Torrance
Superior Oil Co.	24	4	14	Torrance 26	Torrance
Superior Oil Co.	24	4	14	Torrance 27	Torrance
Superior Oil Co.	24	4	14	Torrance 30	Torrance
Union Drilling & Petroleum Co.	23	4	14	Perkins 1	Torrance
United States Royalties Co.	23	4	14	21	Torrance
United States Royalties Co.	23	4	14	22	Torrance
Standard Oil Co.	15	4	14	Marble Lease 3	Torrance
United States Royalties Co.	23	4	14	20	Torrance
United States Royalties Co.	10	4	14	16-A	Torrance
United States Royalties Co.	10	4	14	17	Torrance
Universal Consolidated Oil Co.	23	4	14	Jones 2	Torrance
Van Alen Oil Co.	23	4	14	4	Torrance
Van Alen Oil Co.	22	4	14	6	Torrance
Westland Oil, Inc.	23	4	14	1	Torrance
Westland Oil, Inc.	23	4	14	2	Torrance
Henry S. Woolner	14	4	14	Woolner 1	Torrance
Mohawk Oil Co.	16	2	11	Denny 1	Whittier
Montijo & Johnson	17	2	11	Clark 1	Whittier
Petroleum Midway Co. Ltd.	17	2	11	Rideout-	
				Hamburg 1	Whittier
Petroleum Midway Co. Ltd.	17	2	11	Seward-Rideout 1	Whittier
Petroleum Midway Co. Ltd.	17	2	11	Witte-Vinning 1	Whittier

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued:					
Standard Oil Co.-----	17	2	11	Patten 1	Whittier
Whitley Oil & Refining Co.-----	17	2	11	9	Whittier
Standard Oil Co.-----	22	2	11	Home 21	Whittier
Fortuna Oil Co. Inc.-----	18	3	14	Fortuna 1	-----
Hermosa Syn.-----	30	3	14	1	-----
Lynwood Cons. Oil Interests, Inc.-----	11	3	13	1	-----
Oak Ridge Oil Co.-----	22	2	12	K-B 1	-----
Oak Ridge Oil Co.-----	28	2	12	Gage 1	-----
Oak Ridge Oil Co.-----	22	2	12	Ogden 1	-----
Selby & Root Co.-----	23	4	14	5	-----
Shell Co.-----	11	4	13	Carson 1	-----
Shell Co.-----	11	5	12	Fred Bixby 1	-----
Shell Co.-----	30	2	12	Loomis 1	-----
St. Helens Petroleum Co. Ltd.-----	20	3	13	Rowell 1	-----
Standard Oil Co.-----	17	2	14	L. A. Investment 1	-----
Standard Oil Co.-----	35	2	15	L. A. Extens. 1	-----
Superior Oil Co.-----	9	3	12	Quill 1	-----
Superior Oil Co.-----	20	3	13	Maxwell Com. 1	-----
ORANGE COUNTY:					
Union Oil Co.-----	13	3	10	G. & L. 56	Coyote Hills
Associated Oil Co.-----	2	6	11	Wardlow 1	Huntington Beach
Globe Petroleum Corp.-----	13	6	11	Judd 1	Huntington Beach
Miley-Keck Oil Co.-----	2	6	11	46	Huntington Beach
Standard Oil Co.-----	13	6	11	Surf 4	Huntington Beach
Standard Oil Co.-----	2	6	11	Hunt. B. 23	Huntington Beach
Standard Oil Co.-----	3	6	11	Hunt. A. 23	Huntington Beach
Standard Oil Co.-----	13	6	11	Gisler 2	Huntington Beach
Standard Oil Co.-----	11	6	11	Hunt. E. 8	Huntington Beach
Standard Oil Co.-----	4	6	11	Hunt. B. 25	Huntington Beach
Winters Club-----	23	5	11	Club 1	Huntington Beach
Pasadena Oil Co.-----	28	6	10	1	Newport
Petroleum Midway Co. Ltd.-----	29	3	9	Yarnell 17	Richfield
E. J. Miley-----	17	4	10	1	-----
O'Donnell Oil Syn.-----	20	6	10	Macklin 1	-----
Olive-Ventura Oil Corp.-----	9	4	9	1	-----
SAN BENITO COUNTY:					
Petroleum Midway Co. Ltd.-----	10	12	4	1	-----
SAN BERNARDINO COUNTY:					
B. & G. Development Co.-----	34	1	8	Bruce 1	-----
C. S. Summar-----	11	2	8	1	-----
SAN DIEGO COUNTY:					
National City Oil Co.-----	22	18	2	1	-----
SAN LUIS OBISPO COUNTY:					
Panorama Oil Co.-----	7	31	21	Panorama 1	-----
SANTA CRUZ COUNTY:					
Santa Cruz Lavaca Trust Oil Co.-----	5	11	1	1	-----
United Royalties Co.-----	Hughes Tract			1	-----
STANISLAUS COUNTY:					
L. W. Thomas-----	16	3	13	1	-----
VENTURA COUNTY:					
Calumet Oil Co.-----	3	3	19	14	Bardsdale
Trinitas Oil Co.-----	4	1	20	5	Conejo
Crown Oil Co.-----	7	4	18	Crown A	Piru
Piru Petroleum Co.-----	32	4	18	2	Piru
Ten Friends Oil Co.-----	18	4	18	2	Piru
H. A. Ivers-----	1	4	20	7	Sespe
R. F. Labonge-----	1	4	20	11	Sespe
Oak Ridge Oil Co.-----	13	3	21	Harvey 13	South Mountain
Associated Oil Co.-----	27	3	23	Lloyd 12	Ventura
Associated Oil Co.-----	27	3	23	Lloyd 10	Ventura
Associated Oil Co.-----	28	3	23	Lloyd 14	Ventura
R. L. Hineckley-----	33	4	23	17	Ventura
Alexander Drilling Co.-----	5	2	17	1	-----
Wm. G. Helis-----	36	2	19	1	-----
YOLO COUNTY:					
Divide Ridge Oil Co.-----	8	8	1	1	-----

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff and others are published in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

OIL AND GAS RIGHTS.

By A. H. RICKETTS, of the bar of the Supreme Court of the United States, of California and of Nevada.

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PART I.

ADJUDICATED TERMS AND PHRASES.

§ 1. As Long as Gas or Oil is Found in Paying Quantities.

The term, "as long as gas or oil is found in paying quantities" means, not merely that those minerals shall be found in paying quantities, but also that either oil or gas shall actually be discovered and produced in paying quantities within the term named in the lease, and if neither oil nor gas is being produced at the end of the term of years named in the lease, the lease ends.¹

§ 2. Casing Line.

A casing line is a large, strong rope used in oil-well drilling to raise and lower the casing.²

§ 3. Commencing Operations.

To commence operations is the performance of some act which has a tendency to produce an intended result.³

§ 4. Completed Well.

The term "completed" as used in a lease means finished or sunk to the depth necessary to find oil or gas in paying quantities, or to such a depth as in the absence of such oil or gas would reasonably preclude the probability of finding oil or gas at a further depth. It can not be construed to mean that the lessee bound himself, under penalty of for-

¹ Union Co. vs. Adkins, 278 Fed. 854.

² Long vs. Foley, 82 W. Va. 502, 96 S. E. 794.

³ Flemming Co. vs. South Penn Co., 37 W. Va. 645; 17 S. E. 203; Terry vs. Texas Co., Tex. C. A., 228 S. W. 1019; Duffield vs. Russell, 13 Ohio C. C. 266; see Henderson vs. Ferrell, 183 Pa. St. 547, 38 Atl. 1018; and see Henning vs. Wichita Co., 100 Kan. 255, 164 Pac. 297.

feiture, to sink a producing well or in the absence of oil or gas to bore through to China.⁴

§ 5. Diligence.

To prosecute drilling with due diligence to success or abandonment means, that there must be a product capable of division between the parties in the proportions mentioned in the lease. Unless this is done, drilling is not prosecuted to success.⁵ The rule is that whatever, under the circumstances, would be reasonably expected of operators of ordinary prudence, having regard to the interest of both lessor and lessee, is what is required.⁶

§ 6. Fixtures.

A fixture is an article which may or may not actually be affixed to the freehold.⁷ Engines, boilers, hoisting works, mills, pumps, electric hoist firmly bolted to the substructure upon which it rests, the superstructure and engine house sufficiently affixed to the soil for mining purposes, a gallows frame together with the gallows, hoist and transformer forming integral parts of one mechanism are fixtures.⁸ So, a boiler and smokestack, derrick, belt house, calf and bull wheels, rig irons, drilling tools, bunkhouse and oil well casing affixed to the land

⁴ Frost vs. Martin. — Tex. C. A. —, 203 S. W. 72. The term "completion of well" for the purpose of operating and testing of the amount of production, as used in a drilling contract, means the clearing of the well after reaching the specified depth, so that the sand reached may give that flow of production, by its own force or by pumping, which would result from a well so prepared in the ordinary and usual manner for making preparation for such test. Twin States Co. vs. Westery Co., — Okla. —, 220 Pac. 839; see Parish vs. Bridgewater Co., 51 W. Va. 558, 42 S. E. 655. In Chapman vs. Ellis. — Tex. C. A. —, 254 S. W. 616, it is said that the word "completed" is ambiguous, and where ambiguity in the terms of a contract exists, the testimony of experts in matters of the kind called for in the contract is admissible to explain the ambiguity. That a well may not be completed until it is "shot," see Uncle Sam Co. vs. Richards, 76 Okla. 277, 175 Pac. 749. In Unity Oil Co. vs. Hill, — Ky. —, 255 S. W. 151, the well was cased, and showed what was called a "rainbow of oil." It was not shot and was not a producing well; that is, one from which oil in profitable quantities could be taken. It was contended that it was not a completed well within the terms of the contract since it was not shot. It was not shown that the evidence of oil was such as to indicate to a reasonably prudent man that the shooting of the well would result in the production of oil. There was not a pipe line close enough to justify shooting at that time. It was held that in view of the evidence as to the prospects of oil it was not necessary to shoot the well or that the shooting of it could reasonably be expected to make it a producing well; see, also, Rice vs. Ege, 42 Fed. 661. It will be deemed "completed" when the contract depth is reached. Key vs. Big Sandy Co., — Tex. C. A. —, 212 S. W. 300.

⁵ Kennedy vs. Crawford, 138 Pa. St. 561, 21 Atl. 19.

⁶ Eastern Oil Co. vs. Beatty. — Okla. —, 177 Pac. 104; see Hall vs. South Penn Co., 71 W. Va. 82, 76 S. E. 124. That there may be a too strenuous as well as a too dilatory operation see Wellsville Oil Co. vs. Miller, 44 Okla. 493, 145 Pac. 344.

⁷ Merritt vs. Judd, 14 Cal. 59; Watterson vs. Cruse, 179 Cal. 379, 176 Pac. 870; Breyfogle vs. Tighe, 58 Cal. A. 306, 107 Pac. 1036; Conde vs. Sweeney, 16 Cal. A. 157, 116 Pac. 319; Washburn vs. Inter-Mt. Co., 56 Or. 578, 109 Pac. 382; see Midland Oil Co. vs. Rudneck, 188 Cal. 265, 204 Pac. 474. A chattel will remain such although attached to the realty when it is the subject of a conditional sale. Arnold vs. Goldfield Co., 32 Nev. 447, 109 Pac. 718; Montana Co. vs. Northern Valley Co., 51 Mont. 266, 153 Pac. 1017.

⁸ Arnold vs. Goldfield Co., *supra* (7); see Mammoth Co. vs. Juab County, 10 Utah 232, 170 Pac. 78.

become a part of the realty.⁹ By legislative enactment in several of the mining states all machinery or tools used in working or developing a mine, whether they are attached to it or not, are to be deemed affixed to the mine.¹⁰ It is immaterial whether the fixtures be attached to property held by an invalid,¹¹ a possessory or a fee-simple title.¹²

§ 7. Gasoline.

Gasoline is a colorless, inflammable fluid, the first and highest distillant of crude oil, is extracted from it by distillation; and being the most volatile compound of petroleum, it readily separates from it and in the process of distillation is the oil drawn off at the lowest temperature.¹³

§ 8. Gas Well.

The words "gas well" used in an oil lease mean a well having such a pressure and volume of gas, taking into account its proximity to market, as could be operated profitably and the gas utilized or disposed of commercially.¹⁴

⁹ *Conde vs. Sweeney*, *supra* (7); *Son vs. Adamson*, 34 Cal. A. D. 1046. Compare *Cortelyou vs. Baker*, 185 Cal. 168, 187 Pac. 417. As to mining fixtures on withdrawn land see *Son vs. Adamson*, 188 Cal. 99, 204 Pac. 392; *Midland Oil Co. vs. Rudneck*, *supra* (7). Under a lease giving the right to remove any and all buildings and machinery from the leased premises within a reasonable time after the termination of the lease, any property placed on the premises by the lessee remains personal property and does not become a fixture, though actually affixed to the soil. *Cowgill vs. Little Persimmon Co.*, — Mo. A. —, 183 S. W. 346; see *McClendon vs. Busch-Everett Co.*, 138 La. 722, 70 So. 781. In *Patton vs. Woodrow*, 198 Ky. 85, 248 S. W. 226, it is said: "The general rule requires the lessee for oil and gas purposes to remove all fixtures and machinery placed on the premises during the term of the lease, or at least within a reasonable time thereafter. If this is not done, the fixtures and machinery become the property of the lessor; and he may enjoin their removal; if severed from the freehold and then removed without his consent, he may replevin them, or recover their value in an action for damages. This is true where the lessee expressly reserved the right to remove them." See, also, *Monarch Co. vs. Hunt*, 193 Ky. 315, 235 S. W. 772; *Shellar vs. Shivers*, 171 Pa. St. 569, 33 Atl. 95.

¹⁰ *Malone vs. Big Flat Co.*, 76 Cal. 583, 18 Pac. 772; *Britannia Co. vs. U. S. Co.*, 43 Mont. 93, 115 Pac. 46; see *Hamilton vs. Delhi Co.*, 118 Cal. 153, 50 Pac. 378. In California sluice boxes, flumes, hose, pipes, railway tracks, cars, blacksmith shops, mills and all other machinery or tools used in working or developing a mine, are deemed to be affixed to the mine. Sec. 661, Civil Code. In *Cortelyou vs. Baker*, *supra* (9), the court said: "The kind of property therein disclosed shows that it was intended to apply to a mine in the ordinary meaning of the term, such as a quartz or placer mine. While the development and production of petroleum is for some purposes classed as mining (*Miller vs. Chrisman*, 140 Cal. 440, 73 Pac. 108, 74 Pac. 441), we think this section was not intended to apply to oil operations."

¹¹ *Watterson vs. Cruse*; *supra* (7); *Son vs. Adamson*, *supra* (9).

¹² *Merritt vs. Judd*, *supra* (7); *Roseville Co. vs. Iowa Co.*, 15 Colo. 29, 24 Pac. 920. The authorities clearly distinguish between the word "improvements" and the word "fixtures," holding that under the former term much will pass which would be excluded under the latter. Where the contract provides that the owner shall retake possession upon default the term "improvements" would seem to mean improvements of the realty; that is to say, such things as are placed thereon by the way of betterment which are of a permanent nature and which add to the value of the property. This would include buildings and structures of every kind; and also such machinery as was placed thereon of a permanent nature and which tended to increase the value of the property for the purpose for which it was used. Much can pass thereunder which, strictly speaking, can not be denominated fixtures and which in the absence of such a condition might be taken away. *Siegloch vs. Iroquois Co.*, 106 Wash. 632, 181 Pac. 51; see, also, *Conde vs. Sweeney*, *supra* (7); and see *American Fork Co.*, 291 Fed. 746. The object in placing machinery and fixtures on the land is to enable the lessees to develop the leased property. It is for the benefit of the lessees, and not to enhance the value of the land by permanent improvements thereon. Engines, derricks, oil tanks, casing and pipes are not permanent fixtures, nor parts of the freehold, and do not, upon the forfeiture or other termination of the lease, necessarily vest in the lessor. *Gartland vs. Hickman*, 56 W. Va. 85, 49 S. E. 14.

¹³ *Locke vs. Russell*, 75 W. Va. 602, 84 S. E. 498; *Bubb vs. Parker Co.*, 252 Pa. St. 26, 97 Atl. 114; see *Hammett Co. vs. Gypsy Co.* — Okla. —, 218 Pac. 501. Casing head gas is a component part of oil. It is not made from dry gas. It is a product of wet gas which exists only with oil. *Twin Hills Co. vs. Bradford Corporation*, 264 Fed. 440. For a case involving the method of manufacturing gasoline from casing head gas, see *Hammett Co. vs. Gypsy Co.*, *supra*.

¹⁴ *Prichard vs. Freeland Co.*, 80 W. Va. 787, 84 S. E. 945; see *Hammett Co. vs. Gypsy Co.*, *supra* (13).

§ 9. Good Clean Hole.

As applied to oil well drilling a "good clean hole" is one free from those things the presence of which would render the well incapable of use as a well.¹⁵

§ 10. Kill.

The word "kill" as applied to an oil or gas well means to shut off the flow of oil or gas temporarily or to destroy the well entirely so that neither oil nor gas can flow.¹⁶

§ 11. Minerals *Ferae Naturae*.

Water and oil, and still more gas, may be classed as "minerals *ferae naturae*."¹⁷

§ 12. Natural Gas.

Natural gas is a fluid mineral substance, subterraneous in its origin and location, possessing in a restricted degree the properties of underground waters, and resembling water in some of its habits. Unlike water it is not generally distributed. Its physical occurrence is in limited quantities only within circumscribed areas of greater or less extent. But the difference between natural gas and underground waters, whether flowing in channels or percolating the earth, is so marked that the principles which the courts apply to questions relating to the latter are not adapted to the adjustment of the difficulties arising from conflicting interests in the former.¹⁸

¹⁵ *Bain vs. White*, 256 Fed. 432. A contract to drill an oil well provided that it should be completed to a certain prescribed depth and "shall be a good, clean hole." When the well reached the contracted depth a piece of pipe had been left in such condition that either the withdrawal of the drill stem or the mere lapse of a short period of time would result in the hole being obstructed by the pipe. By a "good, clean hole" is not to be understood one which is free from mud, but one which is free from those things which would render the hole incapable of the uses for which it was designed. Under these circumstances when the well was tendered by the driller for measurement the conditions were such that it did not meet the requirements of the contract. *Bain vs. White*, *supra*; see *Gates vs. Little Fay Co.*, 105 Kan. 191, 182 Pac. 184.

¹⁶ *Department vs. Louisiana Co.*, 144 La. 962, 181 So. 454.

¹⁷ *Jones vs. Forest Co.*, 194 Pa. St. 379, 44 Atl. 1074; see *Manufacturers' Co. vs. Indiana Co.*, 155 Ind. 545, 58 N. E. 851. For a discussion of the analogy between animals *ferae naturae* and mineral deposits of oil and gas, see *Ohio Oil Co. vs. State*, 177 U. S. 190; *Dunlap vs. Jackson*, — Okla. —, 219 Pac. 314.

¹⁸ *Manufacturing Co. vs. Indiana Co.*, *supra* ⁽¹⁷⁾. Natural gas is found at pronounced depths in porous strata—usually sand rock—constituting a natural reservoir and is brought to the surface and reduced to possession through wells drilled into the containing strata. When a surface owner reduces it to possession he becomes its owner and it becomes a subject of commerce, like any product of the forest, field or mine. *Penn. vs. W. Virginia*, 262 U. S. 586; *City of Erie vs. Public Service Com.*, — Pa. St. —, 123 Atl. 475. Natural gas is a commodity as much so as coal, and like coal it is a fuel and as such is used for domestic and industrial purposes. It is a subject marketable, either within the state wherein it is produced or in the state to which it is transported. *Suttle vs. Hope*, 82 W. Va., 729, 97 S. E. 429. *Natural gas is land*. *Haskell vs. Sutton*, 53 W. Va. 206, 44 S. E. 533; *Reynolds vs. Whitescarver*, 66 W. Va. 392, 66 S. E. 518. The owner of the land owns everything that goes to make up the realty. Natural gas beneath the surface is a part of the realty and the owner of the land is the owner of the gas. By reason of the fugitive character of natural gas the landowner is the owner of the gas only in a qualified sense. He owns it only while it remains beneath the surface of his land. If by its natural tendency to flow it escapes to the lands of an adjoining proprietor such ownership then ceases. But this qualified ownership in the gas authorizes the owner of the land to reduce it to possession by sinking wells upon his own land and thus permit it by natural means or its own ordinary pressure to flow to the surface and into a receptacle he may prepare to receive the same. When thus reduced to possession through a well and regardless of whether it came from beneath his own land or remotely from the lands of an adjoining proprietor, the natural gas becomes personal property, the absolute ownership of which is in the owner of the land upon which it is produced. *Fairbanks vs. Warrum*, 56 Ind. A. 337, 86 S. E. 883. Operations for gas can not be measured by the same rule applied in the same manner as in the case of operations for oil. The peculiar characteristics of the business of producing and transporting gas being such as to distinguish it for some purposes from operations for oil. *McKnight vs. Manufacturing Co.*, 146 Pa. St. 185, 23 Atl. 164. The rule of property right in natural gas and oil in all the states save Indiana is stated in *Brown vs. Spilman*, 155 U. S. 665; see *Gas Co. vs. Rankin*, 68 Mont. 372, 207 Pac. 998.

§ 13. Net Profits and Net Proceeds.

An oil and gas lease provided that the net profits were to be determined by deduction from the gross income only the royalties and operating expenses, as distinguished and considered apart from "capital expenses." A modifying clause providing for a change in the payment of royalty based on the "net proceeds" provided for in the modifying clause was not dependent upon the cost of capitalization but only upon the sum total of royalties and operating expenses and in estimating the net proceeds the lessee could not deduct capital expenses in addition to operating expenses.¹⁹

§ 14. Oil.

The word "oil" as used in an oil and gas lease, has always been referred to by the courts and understood to designate the oil produced from a well, or crude petroleum in its natural state.²⁰

§ 15. Oil and Gas.

Oil and gas are minerals, and in their places are real estate and part of the land.²¹

§ 16. Oil as Personal Property.

Oil in place is a part of the land in which it is found or from which it is obtained, but when brought to the surface or reduced to possession, it ceases to be real estate and becomes personal property, and as such may be subject to partition among its joint owners.²²

§ 17. Oil Operations.

The courts take judicial notice of the fact that oil and natural gas are mined by means of deep wells drilled into the earth.²³

¹⁹ Nathan vs. Porter, 36 Cal. A. 356, 172 Pac. 170. The word "profits" signifies an excess of the value of advances, People vs. Savings Union, 72 Cal. 199, 130 Pac. 887, or as the word is defined in Connolly vs. Davidson, 15 Minn. 519, it means the excess of receipts over expenditures; or, in Eyster vs. Centennial Board, 94 U. S. 500, it is the receipts of a business deducting current expenses; it is the equivalent to net receipts; see, also, Blanck vs. Pioneer Co., 93 Wash. 26, 159 Pac. 1077.

²⁰ Hammett Co. vs. Gypsy Co., *supra* (13). Oil shale is a valuable mineral deposit and a source of petroleum oil. Reed vs. Doyle, 47 L. D. 548; see, also, McCombs vs. Stephenson, 154 Ala. 109, 44 So. 867; Dean vs. Wyoming Co., 21 Wyo. 133, 128 Pac. 881.

²¹ Kennedy vs. Hicks, 180 Ky. 562, 203 S. W. 318; McKinney vs. C. K. G. Co., 134 Ky. 239, 120 S. W. 314; DeMoss vs. Sample, 143 La. 243, 78 So. 482; Rich vs. Doneghey, — Okla. —, 177 Pac. 86; see, also, Daughetee vs. Ohio Co., 263 Ill. 518, 105 N. E. 308. Oil and gas within the ground are minerals. The fact that they have attributes not common to other minerals because of their fugitive nature or vagrant habits, and the disposition to percolate, and the possibility of their escape from beneath one part of the surface to another, does not remove them from the class of minerals. Texas Co. vs. Daugherty, 107 Tex. C. A., 176 S. W. 719; see, also, United Co. vs. Meredith, — Tex. C. A. —, 258 S. W. 550. But oil and gas are not synonymous terms. A lease of oil does not embrace the right to take the gas and vice versa. While they usually are found together, or near to each other in the same strata, though not always so, they are regarded as separate minerals, or mineral substances. Of course either would be a proper subject of reservation in a lease of the land. Murphy vs. Van Voorhis, — W. Va. —, 119 S. E. 297; see, also, Arnold vs. Garnett, 103 Kan. 477, 174 Pac. 1027; Palmer vs. Truby, 136 Pa. St. 563, 20 Atl. 516. Oil and gas are furtive, migratory and self-transmissive minerals, and because of these characteristics or qualities contracts and rights relating thereto require the application of principles different in many respects from those applicable to other minerals that are not affected with such characteristics. Reckard vs. Cowley, 202 Ala. 337, 80 So. 419; see Kimbley vs. Luckey, 72 Okla. —, 179 Pac. 928.

²² Warren vs. Boggs, 83 W. Va. 89, 97 S. E. 589; see, also, Kimbley vs. Luckey, *supra* (21).

²³ Kemp vs. Barr Co., 103 Kan. 595, 175 Pac. 988. Nothing is more uncertain than the production of oil wells and any representation as to future production is a mere expression of opinion as to exploitation and probabilities and will not constitute fraud even though it should turn out to be untrue. Engemann vs. Allan, — Ky. —, 257 S. W. 25; see, also, Cooper vs. Gastliger, — Pa. St. —, 123 Atl. 506.

§ 18. Oil Seepage.

While it is possible that at times oil may be found issuing from the surface of the ground, known in practice as seepage, in which case discovery may be made without difficulty or expense, it is a matter of common knowledge that almost always drilling is essential to such discovery, and in many sections drilling to a great depth, involving heavy cost.²⁴

§ 19. Oil Territory.

Oil territory does not necessarily imply a real issue of fact as the phrase has no fixed nor well-recognized meaning and may well be used in one sense and understood in another. But it may mean territory where the observable geological conditions are such as to justify expenditures in prospecting by those who are able to take the chance.²⁵

§ 20. Oil Well.

An oil well is a "mine."²⁶

§ 21. One-Eighth.

An instrument conveying the oil and gas under certain land but reserving title to one-eighth of the oil and gas is a covenant running with the land.²⁷

§ 22. Original Package.

The term "original package" properly is applied to natural gas transported by pipe lines.²⁸

§ 23. Paying Quantities.

The phrase "paying quantity" is to be construed with reference to

²⁴ *Con. Mutual Oil Co. vs. U. S.*, 245 Fed. 525; see *Nevada Sierra Co. vs. Home Oil Co.*, 98 Fed. 673; *Butte Oil Co.*, 40 L. D. 602; *Miller vs. Chrisman*, *supra* (10); *Bay vs. Oklahoma Co.*, 13 Okla. 425, 73 Pac. 963.

²⁵ *S. P. Co. vs. U. S.*, 249 Fed. 786. Oil fields become definitely defined by boundaries established through the exploration of operators so that those who are engaged in operating or speculating with reference to them rely upon the defined area as a known fact. The expression "proven territory" has a fixed meaning in the business. It means territory so situated with reference to known producing wells as to establish the general opinion that, because of its location in relation to them, oil is contained in it. Of course, no particular area can be known to contain oil until the wells actually are drilled and the oil thus is discovered. Such are the uncertainty, irregularity, and elusiveness which characterize the deposit of oil lying beneath the surface in the average oil field that barren areas are not infrequently found to exist in what is regarded as proved territory. *Minchew vs. Morris*, — Tex. C. A.—, 241 S. W. 215.

²⁶ *Mid-Northern Co. vs. Walker*, 65 Mont. 414, 211 Pac. 353; see *Burke vs. S. P. R. Co.*, 234 U. S. 997; *Escott vs. Crescent City Co.*, 56 Or. 190, 106 Pac. 452. But see *Hollingsworth vs. Berry*, 107 Kan. 544, 192 Pac. 763; *J. M. Guffey Co. vs. Murrel*, 127 La. 483, 53 So. 705; *Kreps vs. Brady*, 37 Okla. 754, 133 Pac. 216; *Carter vs. Phillips*, 88 Okla. 202, 212 Pac. 747. In the case of *J. M. Guffey Co. vs. Murrel*, the court said: "A productive oil well or aggregation of them is always universally and invariably known as an 'oil field.' Whoever heard of such being called a mine? If an oil well was a 'mine' in the usual signification of the word, surely sometime, somewhere, some intelligent person would be heard to designate it by that term; but it is never done. Now a 'mining operation' must certainly be something having to do with a mine, and if an oil well is never known in the ordinary and customary use of language as a 'mine' then neither the making nor operating of one could possibly be considered a mining operation in the ordinary signification of the word. He who works in a mine is termed a 'miner,' but no one ever heard of a laborer at an oil well being called a 'miner.' It is shown by the testimony that an oil well is too small for a man to get into, even if such was necessary or desirable, which it is not. We think it absolutely clear that the words 'mine' or 'mining operation' never refer to oil wells or oil production in ordinary parlance."

²⁷ *Pierce Ass'n vs. Woodrum*, — Tex. C. A.—, 188 S. W. 245; see *Spence vs. Lucas*, 138 La. 763, 70 So. 796; and see *Con. Arizona Co. vs. Hinchman*, 212 Fed. 813.

²⁸ *W. Virginia Co. vs. Towers*, 134 Md. 137, 106 Atl. 265; *Landon vs. Public Utilities Co.*, 249 U. S. 236; s. c. 242 Fed. 658, 245 Fed. 950; *State vs. Flannelly*, 96 Kan. 372, 152 Pac. 22; see 26 A. L. R. 971, note.

the operator, and by his judgment when exercised in good faith.²⁹ There must also be taken into consideration the distance to market and the expense of marketing in determining whether oil can be marketed at a reasonable profit.³⁰ This phrase is also defined as meaning in sufficient quantities to pay a reasonable profit on the necessary sum required to be expended, including the cost of drilling, equipment, and operation of the well.³¹ It may be defined in a lease, by the parties thereto.³² As a general rule the determination of the lessee, acting in good faith, is the controlling factor.³³

§ 24. Rent and Royalty.

In mining leases the words "rent" and "royalty" are used interchangeably to convey the same meaning.³⁴

§ 25. Royalty.

The word "royalty" as used in an oil and gas lease, generally refers to a share of the product or profit reserved by the owner for permitting another to use the property.³⁵ A lease by which the owner or lessor grants to the lessee the privilege of mining and operating the land in consideration of the payment of a certain stipulated royalty on the mineral produced, creates the relation of landlord and tenant and when that relation is created whatever is paid for the occupation and use of the premises, whether it be in money or kind, is equally in substance rent, and under such circumstances the royalties received are rentals.³⁶

§ 26. Surface.

The word "surface" in mining controversies means that part of the earth or geologic section lying over the minerals in question, unless otherwise defined by the deed or conveyance. It is not merely the top of the glacial drift, soil, or the agricultural surface. The owner of a

²⁹ Young vs. Forest Co., 194 Pa. St. 243, 45 Atl. 121; Summerville vs. Apollo Co., 207 Pa. St. 334, 56 Atl. 876; Manhattan Co. vs. Carrell, 164 Ind. 526, 73 N. E. 1084; Hennessy vs. Junction Oil Co., 75 Okla. 220, 182 Pac. 666; see Tucker vs. Watts, 25 Ohio C. C. 320.

³⁰ Iams vs. Carnegie Co., 194 Pa. St. 72, 45 Atl. 54.

³¹ Keechi Co. vs. Smith, 81 Okla. 267, 198 Pac. 588; see, also, Aycock vs. Paraffine Co., — Tex. C. A. —, 210 S. W. 851; Lowther Co. vs. Miller-Sibley Co., 53 W. Va. 508, 44 S. E. 433; Summerville vs. Apollo Co., *supra*.⁽²⁹⁾

³² McLean vs. Kishi, — Tex. C. A. —, 173 S. W. 502; see Hennessy vs. Junction Oil Co., *supra*⁽²⁹⁾; Lowther Co. vs. Miller Co., *supra*⁽³¹⁾.

³³ Barbour Co. vs. Tompkins, 81 W. Va. 116, 93 S. E. 1038; Hennessy vs. Junction Oil Co., *supra*⁽²⁹⁾; Summerville vs. Apollo Co., *supra*⁽²⁹⁾. If a well, being down, pays a profit, even a small one, over the operating expenses, it is producing in "paying quantity," though it may never repay its cost, and the operation as a whole may result in a loss. Few wells, except the very largest, repay cost under a considerable time, and many never do; but that is no reason why the first loss should not be reduced by profits, however small, in continuing to operate. The phrase "paying quantities," therefore, is to be construed with reference to the operator, and by his judgment when exercised in good faith. Young vs. Forest Co., *supra*⁽²⁹⁾; Lowther Co. vs. Miller-Sibley Co., *supra*⁽³¹⁾; see Reynolds vs. White Plains Co., — Ky. —, 250 S. W. 975.

³⁴ Nelson vs. Republic Co., 240 Fed. 293; Campbell vs. Lynch, 81 W. Va. 374, 94 S. E. 739.

³⁵ Saulsberry vs. Saulsberry, 162 Ky. 486, 172 S. W. 932.

³⁶ Von Baumbach vs. Sargent Co., 242 U. S. 503. Under an oil and gas contract giving the privilege of drilling and developing the land for oil, until severance takes place, the lessee has no title and on severance and not earlier when the royalty in oil is payable. At that time the oil or gas is personal property after alienation or disposition of which no deed or other solemn instrument of conveyance is necessary. It is personal property in the hands of the lessee. He has bound himself to deliver a portion of it called royalty to the lessor as rent in kind for occupation, use, and operation of the lessor's land. The royalty is a rent susceptible of division as if it were a rent payable in money. While the lease does not actually pass the title to the oil or gas, it confers a right to take it. Where there is a severance of or a partition of the leased lands, the divided tracts go into the hands of their owners subject to such right, whether they are acquired by deed, will, or a decree of partition. Campbell vs. Lynch, *supra*⁽³⁵⁾.

higher stratum is entitled to the same rights to surface support as the actual surface owner.³⁷ When the landowner grants the underlying minerals, reserving the surface to himself, his grantee is entitled only to so much of the mineral as he can extract without injury to the superincumbent soil.³⁸

§ 27. Test Well.

A test well is one that determines not only the presence of petroleum oil, but its commercial value, considering its abundance and accessibility. The information resulting should be such as a prudent and experienced investor would desire to know before expending his capital in labor, or improvements for the profitable working of the property.³⁹

§ 28. Wild Cat Territory.

The term "wild cat territory" is applied to land which is not proven but is thought to be susceptible of development as petroleum oil and natural gas producing land.⁴⁰

³⁷ *Marquette Co. vs. Ogelsby Co.*, 253 Fed. 111.

³⁸ *Id.*, *supra* (37); see *Lloyd vs. Catlin Co.*, 210 Ill. 460, 71 N. E. 335; *Coleman vs. Chadwick*, 8 Pa. St. 81; *Morner vs. Watson*, 79 Pa. St. 251; *Zinc Co. vs. Franklinite Co.*, 13 N. J. Eq. 312; *Harris vs. Ryding*, 5 Mees. & Wel. 59; *Smart vs. Morton*, 5 Ellis & Black 30; compare *Oberly vs. Frick Co.*, 262 Pa. St. 83; 104 Atl. 864. A lessee of the service has no right under his lease to commit waste by the removal of oil. *Isom vs. Rex Crude Oil Co.*, 147 Cal. 659, 82 Pac. 317.

³⁹ *Petroleum Co. vs. Coal Co.*, 89 Tenn. 381, 18 S. W. 65; *Texas Co. vs. Davis*, — Tex. —, 254 S. W. 307. The authorities are uniform that where there is no provision in a lease providing what shall be done if the test well proves dry, there is an implied obligation on the lessee to proceed further with the exploration and development of the land with reasonable diligence according to the usual course of business. A failure to do so amounts to an abandonment, which will sustain a re-entry by the lessor. *Aye vs. Philadelphia Co.*, 193 Pa. St. 451, 44 Atl. 555. An oil and gas lease provided that it should remain in force for the term of one year from its date and as long thereafter as oil or gas is produced from the premises by the lessee; and providing that "if said territory proves to be productive, then the party of the second part to complete this contract shall drill as many as eight wells on said premises, and said wells shall be drilled with due diligence and dispatch having in view the interest of both parties thereto, and so to produce all the oil or gas that may be reasonably produced from said premises." The lessee proceeded immediately and within thirty days drilled a productive well upon the leased premises. It then became his duty to proceed immediately to drill the eight wells as contemplated by the lease. The word "if," as used in the quoted clause, means "when" and the word "then" used in the quoted clause, is an adverb of time and means "at the time," that is, at the time the territory proved productive by drilling of the test well. It was then the duty of the lessee to drill as many as eight wells upon the leased premises and, within a year from the date of the lease, as a condition precedent to the extension of the lease beyond the term of one year. Whether such wells were by the lessee drilled with due diligence and dispatch, having in view the interest of both parties to the lease, and so as to produce all the oil and gas that may reasonably be produced from the premises as required by the lease, is a question of fact to be determined in connection with all the circumstances attending the operations. The fact that a test well was profitable and that there was, at its conclusion, a profitable market, make the failure of the lessee to drill as many as eight wells with due diligence sufficient ground for the forfeiture of the lease on the part of the lessor. *Paraffine Oil Co. vs. Cruce*, 63 Okla. 95, 162 Pac. 716; *Lavery vs. Mid-Continent Co.*, 62 Okla. 206, 162 Pac. 737.

⁴⁰ *Downey vs. Gooch*, 240 Fed. 531; see, also, *S. P. Co. vs. U. S.*, 249 Fed. 786; *Ringle vs. Quigg*, 74 Kan. 581, 87 Pac. 724; *Prownant vs. Sealy*, — Okla. —, 187 Pac. 235; *Lone Star Co. vs. McCullough*, — Tex. C. A. —, 220 S. W. 1114; *Masterson vs. Amarillo Oil Co.*, — Tex. C. A. —, 235 S. W. 908.

PART II.

OIL AND GAS LEASES.

GENERAL SUBJECTS TREATED.

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§ 1. Introductory.

It is immaterial whether the instrument giving rights and privileges to take oil and gas is called a lease, license, sale, contract, grant, deed or conveyance, a right to land, or other name. It is the language used aside from the terms used therein which will determine its legal effect.¹

¹ *Gulf Co. vs. Hayne*, 138 La. 555, 70 So. 509. In estimating the language which constitutes a lease, the form of words used is of no consequence. It is not necessary that the term "lease" should be used. Whatever is equivalent will be equally available. If the word assume the form of a license, covenant, or agreement, and the other requisites of a lease are present, they will be sufficient. *Pelton vs. Minah*, 11 Mont. 281, 28 Pac. 310; see, also, *Hudepohl vs. Liberty Co.*, 80 Cal. 553, 22 Pac. 339; *Michaelek vs. New Almaden Co.*, 42 Cal. A. 741, 184 Pac. 56. For a conjoint deed and lease see *Wright vs. Carter Oil Co.*, — Okla. —, 223 Pac. 835. An oil and gas lease, whether a chattel real, an incorporeal hereditament, or whatever termed, is a right or interest relating to real estate, and while it does not rise to the dignity of an estate prior to entry by a lessee, yet it is property, and as such is subject to transfer and sale. *Shaffer vs. Marks*, 241 Fed. 139. A lease granted to the lessee the exclusive right to sink shafts, to drill wells, and to extract any and all kinds of minerals, especially petroleum, from the land for a term of twenty years unless sooner forfeited. The lessee agreed to incorporate a company for the operation and development of the leased property before commencement of active operations on the property and to commence active work of boring for oil not later than a specified date, and to prosecute such labors diligently. The court held that the lease was a lease of the land itself and not an ordinary oil and gas lease by which the lessor remains in possession and control of the land, giving the mere right of entry to the lessee to begin the prosecution of search for oil; and the discovery of oil was not a prerequisite to the existence of a cause of action on the part of the lessee or its assigns for the failure of the lessor to place the lessee in possession of the property. *Kline vs. Guaranty Oil Co.*, 167 Cal. 476, 140 Pac. 1; *Allan vs. Guaranty Co.*, 176 Cal. 421, 168 Pac. 884, A. C. 15 B. 807, note; see *Cooke vs. Gulf Co.*, 135 La. 609, 65 So. 758. A contract or lease of land for the exploration of land for minerals, oil and gas, although designated a sale by the parties, was a grant of an exclusive right to search for, take and appropriate the minerals mentioned in the contract, and is in effect a lease of the land described for mining purposes. *DeMoss vs. Sample*, 143 La. 243, 78 So. 482.

The term "lease" is applied to such instruments merely through habit and for convenience. Such an instrument creates no interest in land but simply a kind of license.² It creates an incorporeal hereditament, a right growing out of or concerning or annexed to a corporeal thing, but not the substance of the thing itself.³

§2. Nature of Lease.

Because of the peculiar nature of petroleum oil and natural gas, leases for land of that character are governed by different principles than leases of other classes of real property.⁴ The reason is the danger of loss to the landowner from draining his oil away by wells sunk on the surrounding lands; and such leases are construed most strictly against the lessee and in favor of the lessor, especially where the lessee may delay performance indefinitely,⁵ and the law will imply conditions to attain the end sought by the execution of such lease.⁶

² *Huston vs. Cox*, 163 Kan. 73, 172 Pac. 972; but see *Shaffer vs. Marks*, *supra* (1); *McKean Oil Co. vs. Walcott*, 254 Pa. St. 323, 98 Atl. 955; *Ewart vs. Robinson*, 289 Fed. 149; *Exchange Bank vs. Head*, 155 La. —, 99 So. 272. "In its inception at least, and before oil is found on the leased property, an ordinary oil lease has no effect on the title to the premises covered by the lease. It occupies a position differing no appreciable degree from any other contract, and upon its breach in a material part, may be canceled in a similar manner. The title, if any, transferred by an oil lease is inchoate in its nature. At the outset the purpose of the instrument is not to effect a conveyance of any interest in the land, but to permit only a temporary possession thereof for the purposes of exploration. If the quest be unsuccessful, no estate vests in the licensee and whatever rights may have inured to the so-called lessee end when the search is abandoned. *Payne vs. Neuval*, 155 Cal. 46, 99 Pac. 476; *Ventura Oil Co. vs. Fretts*, 152 Pa. St. 451, 25 Atl. 732; *Pittsburg Vitriified, etc., Co. vs. Bailey*, 76 Kan. 42, 90 Pac. 803; *Kelly vs. Keys*, 213 Pa. St. 295, 62 Atl. 911; *Steelsmith vs. Gartlan*, 45 W. Va. 27, 29 N. E. 978; notes, 26 L. R. A. (N. S.) 619; 2 Ann. Cas. 446, 448; *Thornton on Oil and Gas* (2d ed.), 87." *Taylor vs. Hamilton*, 44 Cal. A. D. 159.

³ *Guert Co. vs. Dayne*, *supra* (1). A grant by lease of oil and gas when they are in the ground is a grant, not of the oil and gas in the ground, but of such part of the oil and gas as the lessee finds and reduces to possession. *Parker vs. Reilly*, 243 Fed. 12. The mere fact that oil and gas leases are not a grant of the oil or gas or mineral in the ground is not a finding that they may not, by their terms, convey an interest in the soil, or grant more than a mere license or incorporeal hereditament. *Ewert vs. Robinson*, *supra* (2); *Von Baumbach vs. Sargent Co.*, 242 U. S. 503; *Webb vs. O'Brien*, 263 U. S. 313; *Ex parte Okahara*, — Cal. —, 216 Pac. 614. A lessee acquires no title to oil until it is taken from the ground. *Mexican Oil Co. vs. Compania*, 281 Fed. 148.

⁴ *Acme Co. vs. Williams*, 140 Cal. 691, 74 Pac. 296; see *Becker vs. Submarine Oil Co.*, 55 Cal. A. 703, 204 Pac. 245; *Owens vs. Corsicana Co.*, — Tex. C. A. —, 169 S. W. 192; *Leonard vs. Caruthers*, — Tex. C. A. —, 236 S. W. 189.

⁵ *Huggins vs. Daley*, 99 Fed. 606; *Warner vs. Page*, 59 Okla. 259, 159 Pac. 264. Where the lease requires the lessee to begin a well within a time certain or pay a stipulated rent for each year such work was delayed, the lessee can not refuse to begin the development of the property for an unreasonable time and extend the lease indefinitely by the payment of a mere nominal rent. *Warren Co. vs. Gilliam*, 182 Ky. 807, 207 S. W. 698; *Hughes vs. Parsons*, 183 Ky. 584, 209 S. W. 853; see *Bristow vs. Christine Co.*, 139 La. 312, 71 So. 521. Where the lease does not specify the time within which the well or wells shall be completed the law will imply a reasonable time, and it is too clear to need argument that the lessee could in no event be held responsible until such reasonable time had elapsed. *Barquin vs. Hall Co.*, 28 Wyo. 168, 201 Pac. 352.

⁶ *Acme Co. vs. Williams*, *supra* (4). Where the language in an oil and gas lease was as much that of the lessee as that of the lessor, the lease will be construed most strongly against the lessee in order to provoke development and prevent delay and unproductiveness, looking to all parts of the instrument in the light of the facts in connection with the operation. *Paraffine Co. vs. Cruce*, 63 Okla. 95, 162 Pac. 716; see, also, *Hughes vs. Busseyville Co.*, 180 Ky. 545, 203 S. W. 515. Where some causes of forfeiture are expressly mentioned none others can be implied. *Grubb vs. McAfee*, 109 Tex. C. A. 383, 212 S. W. 464. Where the terms of an oil and gas lease are clear and explicit, and the meaning is not doubtful, and there is no latent ambiguity, the lease can not be varied by the subsequent conduct of the parties or surrounding circumstances. The parties must be deemed to be bound by the lease, regardless of the results produced. *Jameson vs. Chanslor-Canfield Co.*, 176 Cal. 1, 167 Pac. 372; compare *Kelley vs. Harris*, 62 Okla. 236, 162 Pac. 221.

§ 3. Time as Essence.

In an oil and gas lease time, ordinarily, is of the essence of the contract. A proper construction of the language used will not limit the lessee to the particular term mentioned in the lease where he has demonstrated that the leased land is underlaid with oil or gas and that he is proceeding with all diligence in an efficient manner to produce the oil or gas therefrom in paying quantities.⁷

§ 4. Mutuality.

An oil or gas lease for a stated term of years or as long as oil or gas is produced and providing that operations should be commenced within a stated period, or, if not, for the payment of a certain stated annual rental, and giving the lessor a certain royalty on the oil and gas produced, is not void for want of mutuality. It is not a unilateral contract.⁸

§ 5. Surrender Clause.

The presence of the surrender clause in the lease does not render the

⁷ Ohio Oil Co. vs. Greenleaf, 84 W. Va. 67, 199 S. E. 274. The parties expressly stipulated in the lease that it was "the essence of the contract" that drilling should be commenced "within a reasonable time" and prosecuted with diligence. They thus emphasized a condition which is inherent in all oil and gas leases. So much is time considered to be an "essence" of such leases that a court is without power or right to grant an extension for performance. Murray vs. Barnhart, 117 La. 1023, 42 So. 489; Woodley vs. Hollingsworth, 154 La. —, 98 So. 87. The term "reasonable time" is a relative one, and the meaning is dependent upon the circumstances of the particular case in which the court is called upon to define it. Woodley vs. Hollingsworth, *supra*. Where the lease did not provide that time was of essence, a slight delay in monthly payments due under the lease, did not operate to forfeit the lease. Jackson vs. Twin States Co., — Okla. —, 218 Pac. 325. The right to insist upon time as the essence of a contract may be waived expressly or by necessary implication. Craig vs. Thompson, — Pa. St. —, 121 Atl. 408; Garfield Co. vs. Champlin, 78 Okla. 91, 189 Pac. 214; Pettitt vs. Double-O Co., — Okla. —, 198 Pac. 616; see also, Virginia Co. vs. Haeder, 32 Ida. 240, 181 Pac. 141. Even though the contract contain no express provision making time the essence thereof, where it appears that such was within the contemplation of the parties, the courts will so construe the contract. Taylor vs. Hamilton, *supra* ⁽²⁾; see Whitman vs. Hall, 41 Cal. A. D. 472.

⁸ Hughes vs. Parsons, *supra* ⁽⁵⁾; Ohio Oil Co. vs. Irvin Co., 184 Ky. 517, 212 S. E. 130. A unilateral contract is one in which there is a promise on one side only, the consideration on the other side being executed. Rich vs. Doneghey, 72 Okla. —, 177 Pac. 86. Such contracts are construed strictly. Bearman vs. Dux Co., 64 Okla. 147, 166 Pac. 199; see Northwestern Co. vs. Branine, 71 Okla. —, 175 Pac. 533. A land owner executed an oil and gas lease for certain lands for a term of five years for a cash consideration of two hundred and forty dollars. The lessee agreed to pay to the lessor one-eighth of the oil produced and to pay a stipulated sum per annum for each gas well. The lessee was to complete a well on the premises within twelve months from the date of the lease or pay two hundred and forty dollars quarterly in advance for each year such completion was delayed. The lease contained a provision that upon the payment of one dollar at any time to the lessor, the lessee should have the right to surrender the lease for cancellation. Such a lease is not unilateral and is not void for want of mutuality. The cash bonus supports each and all the covenants of the lease, and although no well has been commenced on the premises, the lessor had not the option to refuse the timely tender of payments and terminate the lease. Magnolia Co. vs. Saylor, 72 Okla. —, 180 Pac. 861; see Northwestern Co. vs. Branine, *supra*; Rich vs. Doneghey, *supra*; see, also, Shaffer vs. Marks, *supra* ⁽¹⁾. For instances of want of mutuality see Davis vs. Riddle, 25 Colo. A. 162, 136 Pac. 551; Caddo Co. vs. Producers' Co., 134 La. 701, 64 So. 684.

lease void for want of mutuality nor does it confer on the lessor the right to terminate the lease at will.⁹

§ 6. Construction of Surrender Clause.

The surrender clause in oil and gas leases will be construed strictly in favor of the landowner, the party who is bound, and against the lessee, the party who is not bound.¹⁰

§ 7. "Unless Lease."

Most of the oil and gas leases fall into two classes, commonly designated as the "unless lease" and the "or lease." The leases belonging to these respective classes possess such marked distinctions in the rights and liabilities that these distinctions should not be lost sight of in the construction of such a lease. Under an "unless lease," the lessee, so long as he pays the rentals in the manner provided, has an option to

⁹ Carter Oil Co. vs. Tiffin, 74 Okla. —, 176 Pac. 912; Gypsy Oil Co. vs. Van Slyke, — Okla. —, 178 Pac. 683; Northwestern Oil Co vs. Branine, *supra* ⁽⁹⁾; see Ewart vs. Robinson, *supra* ⁽³⁾. The option to surrender an oil and gas lease can not be declared inequitable. In case it was not exercised the lessee would be bound by his covenants. If exercised the lessor would be free to deal with the premises as he chose. Rechar vs. Cowley, 202 Ala. 337, 80 So. 419; see, generally, Eastern Oil Co. vs. Beatty, — Okla. —, 177 Pac. 104; Rich vs. Doneghey, *supra* ⁽⁶⁾; Riddle vs. Keechi, — Okla. —, 176 Pac. 737, 177 Pac. 104; but see Advance Oil Co. vs. Hunt, 66 Ind. A. 228, 116 N. E. 340, in which case it is said: That an oil and gas lease provided that the lessee was to complete a well within three months from its date or pay a stipulated rental until a well should be completed. The lease gave the lessee the right at any time on the payment of one dollar to surrender the lease for cancellation and thereafter all payments and liabilities should cease and terminate. Such a lease or contract is wanting in mutuality because, for a nominal sum, the lessee is given the right to annul it at any time and end all liability thereafter accruing under the lease. The lessee of such a lease can not enforce its terms by injunction as courts refuse to grant equitable relief where, if granted, one of them may nullify so taken by the exercise of a discretionary right which either the law or his contract has conferred upon him. An oil and gas lease contained the usual surrender clause and contained this further provision: "This surrender clause and the option herein reserved to the lessee shall cease and become absolutely inoperative immediately and concurrently with the institution of any suit in any of its terms." Such a provision is valid and binding, and when the lessee filed a suit to enjoin the lessor from re-leasing the premises and further interfering with his rights under the lease the surrender clause became inoperative and the lessee thereby became bound to perform the covenants of the lease and is entitled to be protected in his rights under the lease. Pucini vs. Baumgarner, — Okla. —, 175 Pac. 537. Cited in Brunson vs. Carter Oil Co., 259 Fed. 665; see, also, Rich vs. Doneghey, *supra* ⁽⁶⁾; and see Eastern Oil Co. vs. Beatty, *supra* ⁽⁶⁾. A lessor may refuse to accept a surrender of an oil and gas lease though the lease contains a clause giving the lessee the right to surrender, when the lessee denies liability on an unperformed covenant of the lease to be performed by him in lieu of development, but in postponement of operations. The lessor's refusal is justified when the lessee denies liability on the covenant broken, and where the surrender expressly states that the acceptance thereof will operate as a waiver of performance of the covenants and conditions broken. Hefner vs. Light Co., 77 W. Va., 217, 87 S. E. 206.

¹⁰ Shaffer vs. Marks, *supra* ⁽¹⁾; see, also, Ewart vs. Robinson, *supra* ⁽⁶⁾. For reciprocal rights see Melton vs. Cherokee Co., 67 Okla. 247, 170 Pac. 691. An oil and gas lease contained a clause giving the lessee the right to surrender the lease at any time, but provided that the right to surrender should cease and become inoperative upon the institution of any suit by the lessee to enforce any rights under the lease. Such a clause does not prevent a court from enforcing specific performance of the lease at a suit by the lessee, for the reason that the institution of the suit renders the surrender clause ineffective, and the lease is no longer an unilateral contract. Downey vs. Gooch, 240 Fed. 520; but see Hill Oil Co. vs. White, 53 Okla. 748, 157 Pac. 710, in which it is said: that a surrender clause in an oil and gas lease which gives to the lessee the right at any time to surrender and terminate the lease, after which all payments or liabilities should cease and terminate, deprives the lessee of the right of specific performance, directly or indirectly, until he has performed the contract or placed himself in such a position that he might be compelled to perform it on his part. The owner of land under an existing oil and gas lease executed a second lease that contained a clause by the terms of which the lessee could at any time upon the payment of one dollar surrender the premises and relieve himself from any obligation under the lease. This provision makes such a lease unilateral, and is such a one as a court of equity will refuse to enforce, and it will furnish the basis for an action in ejectment or other real action. The lessee in such a lease has no standing to question the validity of the first lease nor to maintain ejectment against the original lessee. Brennan vs. Hunter, 68 Okla. 112, 172 Pac. 49.

continue the lease in force. Such a lease is subject to termination at the will of the lessee, and the privilege may be exercised by a mere failure to pay the stipulated rental at the time due and upon which the lease automatically terminates, and the lessor can not sue under the lease for the rentals; but under such a lease the lessor has not the right to terminate the lease so long as the lessee complies with its terms.¹¹

§ 8. "Or Lease."

Under an "or lease," even when containing a surrender clause, the payment of rentals by the lessee as required is not necessary to keep it alive from time to time, nor does the failure to pay automatically terminate the contract, as under an "unless lease." Where the lessee makes default in the payment of rentals the lessor may waive the forfeiture clause and sue and recover rentals due according to the lease. The lessee may terminate the lease at any time by availing himself of the right to do so contained in the surrender clause, and by paying all the accrued rentals, due at the time of surrender.¹²

§ 9. Implied Covenants.

Implied covenants are those only which, on grounds of legal necessity, the courts may read into the contract for the proper effectuating the manifest intention of the parties.¹³

§ 10. Joint and Several Covenants.

A covenant in an oil and gas lease may be construed to be joint or several according to the interest of the parties appearing upon the face of the lease, if the words are capable of such construction. But the

¹¹ *Northwestern Oil Co. vs. Branine, supra* (8); *Ireland vs. Chapman*, 87 Okla. 223, 208 Pac. 408. An oil and gas lease containing the "unless" clause confers an optional right upon the lessee, and should be strictly construed in favor of the lessor and against the lessee, and time is of the essence of the contract. *McKinley vs. Feagins*, 82 Okla. 193, 198 Pac. 997; see, generally, *Guffey vs. Smith*, 237 U. S. 101; *Hopkins vs. Zeigler*, 259 Fed. 46; *Leeper vs. Lemon G. Neely Co.*, 293 Fed. 971; *Garfield Oil Co. vs. Champlin*, — Okla. —, 189 Pac. 514; 3 A. L. R. 344, 352; *Thornton's Oil and Gas* (3d Ed.), Secs. 192, 193. An "unless" lease does, by its terms, become null and void when the lessee intentionally fails to make the payment at the time and in the manner stipulated. *Shaffer vs. Marks, supra* (1); see, also, *Brunson vs. Carter Oil Co., supra* (9). For a lease which was neither an "unless" nor an "or" lease see *Brennan vs. Hunter, supra* (10).

¹² *Northwestern Oil Co. vs. Branine, supra* (8). In the case of an "or" surrender clause lease, the lessor can elect as to whether he will cancel and terminate the lease for nonpayment or treat it as continuing in force and collect the stipulated rental. An intentional failure to pay as stipulated, in every case, may be treated as an abandonment of the lease. *Shaffer vs. Marks, supra* (1); see *Healdton Co. vs. Smith*, 80 Okla. 242, 195 Pac. 756; see note 11, *supra*. An "or" lease is one in which the lessee agrees to drill, or in lieu of drilling to pay a rental. *McMillan vs. Philadelphia Co.*, 159 Pa. St. 142, 28 Atl. 220.

¹³ *Allen vs. Colonial Co.*, 92 W. Va. 689, 115 S. E. 842. Leases for oil and gas are subject to the implied covenants that the lessee will do all that is necessary to carry into effect the purposes and objects of the lease. There is an implied covenant, in the absence of an express agreement to begin work within a certain time, to begin the operations within a reasonable time. This implied covenant is, after oil or gas has been discovered, as effectual and forceful as if it were expressed in direct terms. Implication is but another term for intention. And the practically universal interpretation of oil and gas leases is that in the absence of an express covenant there arises a legal implication that the lessee will drill as many wells as will afford sufficient protection against drainage and otherwise so develop the leased premises as to serve the mutual benefit of both lessor and lessee. *Jennings vs. South Carbon Co.*, 73 W. Va. 215, 80 S. E. 368; *Chandler vs. French*, 73 W. Va. 658, 81 S. E. 825; see, also, *Daughetee vs. Ohio Oil Co.*, 263 Ill. 518, 105 N. E. 308. The doctrine of implied covenants in mineral leases has been limited generally to cases in which it has been invoked to supply a consideration when none has been expressed and to make effective a principle of surrender by operation of law when the premises have been abandoned after discovery of mineral and delay rentals have ceased, and to prevent loss of the subject matter of the lease through wells on adjacent lands. *Carper vs. United Co.*, 78 W. Va., 433, 89 S. E. 14.

covenant will be construed to be several by reason of several interests if it be expressly joint. This rule was applied to an oil and gas lease executed by a husband and wife as "parties of the first part" where the rentals were to be paid to the "party of the first part." Under this ruling a payment of rentals to the wife was a discharge of the obligation, although the title to the land was in the husband.¹⁴

§ 11. No Covenant Implied.

No covenant to develop the land can be implied under an oil and gas lease in the face of an expressed stipulation for periodical payments for delay thereof not extending beyond a definite term. Development on other lands in the vicinity may show the premises to be situated in an oil and gas territory and prove the adaptability of the land for profitable mining operations, but the lessor has no legal cause for complaining so long as he receives compensation for the delay for which he contracted and the operations on neighboring lands do not drain the leased premises. Under such circumstances a court will not imply a covenant for diligent operation or operation at all. The lessor is deemed to have assented to the postponement through the several periods and bound to accept the periodical payments therefor.¹⁵

§ 12. Breach of Implied Covenant.

Equity rarely will arbitrarily declare the forfeiture for the breach of an implied covenant. It never will do so where less drastic redress will satisfy the demands of justice.¹⁶ Where the lessee fails to begin operations within a reasonable time he will be presumed to have aband-

¹⁴ *Jens Marie Oil Co. vs. Rixse*, 72 Okla. —, 178 Pac. 658; see, also, *Jenkins vs. Williams*, 191 Ky. 165, 229 S. W. 98.

¹⁵ *Eastern Oil Co. vs. Beatty*, *supra* (6). An implied covenant may exist to reasonably operate the premises, but there is no implied or express covenant on the part of the lessee to leave the premises and forfeit his lease for a breach of such implied covenant. A lease provided for a forfeiture for the failure to comply with its conditions or to pay the cash consideration according to the agreement, but a breach of the implied covenant to reasonably operate the premises was not included in the causes of forfeiture. Where some causes of forfeiture are expressly mentioned none others can be implied. The remedy for a breach of the implied covenant to reasonably operate the premises is, therefore, not by way of forfeiture of the lease, but must be brought in a proper action for a breach of covenant. *Grubb vs. McAfee*, *supra* (6), see *Harris vs. Ohio Oil Co.*, 57 Ohio St. 131, 48 N. E. 502; *Poe vs. Ulrey*, 233 Ill. 56, 84 N. E. 46.

¹⁶ *Alford vs. Dennis*, 102 Kan. 403, 170 Pac. 1005; see *Rembarger vs. Losch*, 70 Ind. 98, 118 S. W. 831; *Hughes vs. Busseyville Co.*, *supra* (6). It is error for a court to instruct a jury in an action to cancel or forfeit an oil and gas lease to the effect that the law looks with disfavor upon and discourages the forfeiture of rights of parties and declares that before a forfeiture will be decreed the evidence on which the forfeiture is predicated must preponderate in favor of the forfeiture. The general rule of law does not apply where the grant is in the hope and expectation of pecuniary profit from mineral development. In such cases the rule that equity abhors forfeitures does not apply for the reason that forfeitures when the lessee is guilty of laches is in that respect but equity. *Munsey vs. Marnet Co.*, — Tex. C. A. —, 199 S. W. 686.

oned his rights, and a court of equity will, at the suit of the lessor, cancel the lease as constituting a cloud upon the title.¹⁷

§ 13. Diligence.

The question of reasonable diligence is one of fact.¹⁸ Whether or not due diligence has been exercised depends on the facts and circum-

¹⁷ *Horse Creek Co. vs. Trees*, 75 W. Va. 401, 84 S. E. 376; see *United Co. vs. Smith*, — W. Va. —, 117 S. E. 902. The lessor in an oil and gas lease for a stated term and conditions and requiring the lessee to drill a well within a specified time and to pay certain stipulated royalties, may sue the lessee for a breach of any express or implied covenant of the lease resulting in damages to him. A cause of action immediately arises in his favor. He is not required to wait until the abandonment of the premises or expiration of the lease to bring his action. The remedy in such case is not the forfeiture but a right to sue for a breach of the contract. In an action against the lessee of an oil and gas lease for damages for breach of a covenant, in that the lessee failed to diligently develop the premises after the discovery of oil in paying quantities, the lessor is not prevented from recovery because the damages are speculative or conjectural. The rule is that while the law will not permit witnesses to speculate or conjecture as to the possible or probable damages, still the best evidence of which the subject will permit is receivable. This is often nothing better than the opinion of well-informed persons on the subject matter under investigation. The lessee in such an action is not liable for damages though he has committed no fraud and has acted in good faith and has not drained oil from the lessor's premises by means of wells on other adjacent lands. Nor, is he permitted to escape for a failure to drill and operate additional wells if, acting on his own judgment, he believes that it will not be profitable for him to do so, as his determination in such case is not final. Such a lease can not be construed to save the lessee harmless on his arbitrary refusal to further explore and develop the leased premises. In such case the lessor is not required to prove that oil and gas have actually been lost to him by being drawn from the leased premises through wells on adjacent premises or by some wrongful or fraudulent act of the lessee. Under such a lease it clearly is the contemplation of the parties and the primary object in making the lease that the lessee shall go on and drill additional wells, market the product, and pay the lessor his royalties thereon. The lessee, in effect, agrees to do this in order that the lessor can realize on the value of the product. *Daughetee vs. Ohio Co.*, *supra* ⁽¹³⁾; *Indiana Co. vs. McCrory*, 42 Okla. 136, 140 Pac. 610; *Hammett vs. Gypsy Oil Co.*, — Okla. —, 218 Pac. 501.

¹⁸ *Buffalo Valley Co. vs. Jones*, 75 Kan. 18, 88 Pac. 537; *Chapman vs. Sunshine Oil Co.*, — Tex. C. A. —, 256 S. W. 327. As a net result of consideration of the cases which hold that, in the absence of express and definite stipulation as to the measure of diligence, an implied covenant exists demanding reasonable diligence in the development of the premises leased, it may be fairly said, in determining whether or not other wells should have been drilled, consideration must be given to a number of facts regarded collectively. Some of these are: the result of oil operations on adjacent premises; the extent of the subterranean oil reservoir; also its character and contour as affecting the question of drainage to and from the property in question; market conditions; the quantity and quality of oil thus far produced; the prospects for further production as indicated and the knowledge possessed by those expert in locating oil bodies; the demands made upon the lessee in the maintenance of the wells already drilled and his diligence in operating them to secure the greatest possible production. Leases are intended for the benefit of both parties. The lessee has a right to regard his own interest as well as that of the lessor. In short, the diligence required of the lessee involves such a course of conduct upon his part as operators of ordinary diligence would pursue, having in mind the securing of the financial benefits sought by both lessor and lessee. *Becker vs. Submarine Oil Co.*, *supra* ⁽⁴⁾. A lease of certain lands granted "all the oil and gas" under the lands described together with the right to enter at all times for the purpose of drilling and operating, together with the right to erect and maintain structures, pipe lines, and machinery necessary for the production and transportation of oil and gas and gave the right to use sufficient water, oil, and gas to run the necessary engines in the prosecution of the business. The lease reserved to the lessor substantial royalties in kind and in money on the oil produced and saved and on the gas used off the premises. The lease indicating that the promise of such royalties was the controlling inducement to the grant. While expressly requiring that such drilling commence within a stated time from the date of the lease, but not expressly defining the measure of diligence to be exercised by the lessee in the work of development and production after the expiration of the stated period, the lease was held to contain a covenant on the part of the lessee arising by necessary implication from the nature of the lease and the stipulations therein contained to the effect that if during the term of the lease whether oil or gas is found in paying quantities then the work of development and production shall be continued with reasonable diligence and along lines as will reasonably be calculated to make the extraction of oil and gas from the leased land of mutual advantage and profit to the lessor and lessee. *Indiana Co. vs. McCrory*, *supra* ⁽¹⁷⁾. Though a lessee not guilty of fraud or bad faith may be liable for failure to exercise reasonable diligence in drilling protection wells, and where the lease has no express requirements, no breach of an implied covenant can occur, except when the absence of such diligence is both certain and substantial in view of the actual circumstances as distinguished from mere expectancy on the part of the lessor and conjectures on the part of mining enthusiasts. The expense of exploration and development, and the fact that the lessee must bear the loss of unsuccessful operations, entitles him to proceed with due regard for his own interests as well as those of the lessor. *Goodwin vs. Standard Oil Co.*, 290 Fed. 92.

stances of the case. If an oil and gas lease is not operated with due diligence under the facts and circumstances of the case, then a court upon proper showing may declare the lease forfeited.¹⁹ Where the only consideration the lessor receives for the exclusive right to explore, develop and remove the minerals is a royalty, whether it be oil or gas or other minerals, the courts have read into the lease the implied covenant to develop and operate with reasonable diligence.²⁰ It is an implied covenant in an oil and gas lease providing for the payment of royalties that the lessee will use reasonable diligence and good faith in exploring and developing the property.²¹ The question of due diligence may be affected by the fact that the lessee worked in a "wild cat" field.²² In *Wapa Co. vs. McBride*,²³ the court, in stating his reason for cancelling the lease, stated it was for failure to comply with the implied covenant which was to protect the premises from drainage of off-set wells. A court of equity will declare a forfeiture of an oil and gas lease because of the breach of an implied covenant to diligently operate and develop the property when such forfeiture will effectuate justice, but the granting of such relief depends upon the facts and circumstances surrounding the particular case; and if the evidence shows that a part of the leased premises under an oil and gas lease has been properly developed with reasonable diligence by the lessee, and other parts have not, the court may cancel the lease as to the undeveloped portion and permit the lessee to continue the developed part.²⁴ Where a mining lease provided for an annual payment as an advance payment, to continue "until mining is commenced or during the continuance of this agreement," the court said: "That the exploration for minerals should be made within a reasonable time is of the very essence of the agreement; and a condition precedent to the accruing of the right to take the minerals discovered upon the terms of payment indicated. The failure to make such exploration within a reasonable time, and to make it with such thoroughness and certainty as to determine the existence of mineral or oil, would be fatal to the agreement. Upon this, we think, this lease depended as a condition precedent."²⁵ Where an oil and gas lease covering lands located in a field which is being actively developed is given for a term of two years and contains a provision that, in case oil or gas is found on the premises, the lease may be continued in force by lessee so long as he diligently develops the land and markets the product, the failure of the lessee to use reasonable diligence in the respects named will cause said lease to lapse.²⁶ Where the lessee undertakes to pay the lessor until, in the judgment of the lessee, "oil or gas can not be found on the premises, or, having been found, has ceased to exist," clearly implies an engagement to explore and develop the premises.²⁷ The extent of the development and number of wells to be drilled, and as to the protection of the lines is often, if not usually, expressed in the lease; and that is certainly the better practice. When the extent of

¹⁹ *Strange vs. Hicks*, 78 Okla. 1, 188 Pac. 350.

²⁰ *Cotner vs. Munday*, — Okla. —, 219 Pac. 321.

²¹ *Peoples Gas Co. vs. Dean*, 193 Fed. 938.

²² *Keechi Co. vs. Smith*, 81 Okla. 266, 198 Pac. 588.

²³ 84 Okla. 184, 201 Pac. 984.

²⁴ *Papoose Oil Co. vs. Rainey*, 89 Okla. 110, 213 Pac. 882.

²⁵ *Tenn. Oil Co. vs. Brown*, 131 Fed. 700.

²⁶ *Buffalo Valley vs. Jones*, *supra*.⁽¹⁸⁾

²⁷ *Consumers Co. vs. Littler*, 162 Ind. 320, 70 N. E. 363.

the development and protection of the lines is provided for in the lease, there can be no implied covenant for further development and protection of the lines. The implied covenant arises only when the lease is silent on the subject.²⁸ The smaller the tract of land demised, the more important is the need of prompt exploration and development, because the lessor is entitled to his royalty as promptly as it can be had, and delay endangers the drainage of oil and gas from the demised premises through wells in its immediate vicinity.²⁹

§ 14. Surface Rights.

Ordinarily, by implication, the lease carries with it the right to use so much of the surface as is necessary for extracting and removing the minerals thereunder.³⁰

§ 15. Location of Wells.

An oil and gas lease provided that no wells be drilled within two hundred feet of the buildings on the leased premises without the consent of the lessor. During the development of the land by the lessee and over the objections of the lessor the lessee located and drilled a well within the prohibited distance with full knowledge that the well was so located. The lessor was entitled to an injunction perpetually restraining the lessee from operating the well so drilled and from entering upon or in any manner using any ground within two hundred feet of the buildings upon the demised premises.³¹

²⁸ *Harris vs. Ohio Oil Co.*, *supra.*⁽¹⁵⁾; see *Brewster vs. Lanyon Zinc Co.*, 140 Fed. 801.

²⁹ *Federal Oil Co. vs. Western Oil Co.*, 112 Fed. 375.

³⁰ The lessor and the lessee under an oil and gas lease are both in possession of the surface. Each, in the exercise of his right therein and thereon is in duty bound to have due regard for the rights of the other. The lessee in exercising his rights under such a lease owes the duty to the lessor to not unnecessarily, carelessly, or wantonly injure him in the proper use of the surface. In choosing between two locations for drilling a well equally available to him, the lessee is bound to choose the one to do least injury to the lessor. He is not at liberty to choose locations for the drilling of wells in utter disregard of the rights of the lessor. Likewise the lessor in the use of the surface for any available purposes is in duty bound to exercise reasonable care not to interfere with, injure, or annoy the lessee in drilling and operating his oil wells. Under such circumstances each is bound to use his own so as not to injure the rights of the other. *Gillespie vs. American Zinc Co.*, 247 Pa. St. 222, 93 Atl. 272; see *Moore vs. Decker*, — Tex. C. A. —, 220 S. W. 773. Injunction lies to prevent the surface owner of land from obstructing the mineral owner in the right to use surface. *Squires vs. Lafferty*, — W. Va. —, 121 S. E. 90. In the absence of a specific covenant in an oil and gas lease making the lessee liable for damages to growing crops and their surface rights, the lessee is not liable for such damages as are necessarily incident to the operations authorized by the lease. Such a lease carries within its implications, if not within its expression, such rights to the surface as may be necessarily incident to the performance of the objects of the contract. Yet these implications go no further. The lessee must protect the surface of the ground in so far as such incident necessity does not exist and is liable to the lessor for any damages to the surface resulting from acts not within the implications of the lease. *Pulaski Oil Co. vs. Connor*, 62 Okla. 211, 162 Pac. 466. A lessee having the right under his lease to go upon certain described land of the lessor and bore and develop said land for oil and gas, with the necessary usual and convenient rights therefor, has a right to build a road over the land where the building of such road is necessary to enable him to haul material for his rig and tools and machinery for drilling. If, after building such road in good faith, he abandons the contemplated exploration for oil and gas before drilling a well, he is liable to the lessor for damages to the land caused by the building of said road. *Coffindaffer vs. Hope Co.*, 74 W. Va. 107, 81 S. E. 966. The right of the owner of surface of land to subjacent support includes the right to use the soil for the agricultural pursuits to which it may be adapted. *Cole vs. Signal Knob Co.*, — W. Va. —, 122 S. E. 268; see *Walsh vs. Kansas Fuel Co.*, 91 Kan. 310, 137 Pac. 941.

³¹ *Kelly vs. Phillips Co.*, 262 Pa. St. 412, 105 Atl. 631. A stipulation in an oil and gas lease to the effect that no wells should be drilled within three hundred feet of a dwelling house unless with the consent of both parties, indicates that the parties in making the lease did not intend to burden the property. This intention will prevail as against an effort to make the provision a covenant running with the land. *McFarland vs. Gulf Co.*, — Tex. C. A. —, 204 S. W. 460.

§ 16. Additional Wells.

The number and location of oil wells requisite to the performance of the covenant to develop on the part of the lessee depends upon the character of the leased lands. The area of the lands does not determine the number and their relation to one another and is not governed by any fixed rule. Whether, after discovery of oil or gas by means of the initial or experimental well, there is a duty to sink additional wells depends upon the probability arising from the circumstances surrounding the property, that an additional well be profitable to the lessee. The lessee in an oil lease is under no duty to operate at a loss to himself in order to make the premises profitable to the lessor. It is only under circumstances indicative of mutual profit to the lessee as well as to the lessor that the duty to develop devolves.³²

§ 17. Drainage of Adjoining Lands.

While oil wells drilled and operated may, by reason of their proximity to a division line, in fact drain oil from adjoining lands, yet such operations, in the absence of special circumstances or relations between the parties, offer no basis for a claim to a share in or accounting for the oil so produced, or for a receivership for the operation of the wells.³³

§ 18. Off-set Wells.

The courts are not harmonious as to whether or not in an ordinary lease of oil and gas lands there is no implied covenant by the lessee to

³² *Steele vs. American Co.*, 80 W. Va. 206, 92 S. E. 410; and see *Burt vs. Deorsam*, — Tex. Co. C. A. —, 227 S. W. 354; *Humble Oil Co. vs. Strauss*, — Tex. C. A. —, 243 S. W. 536; *Clark vs. Coover*, — Tex. C. A. —, 247 S. W. 929. For a clear and full discussion of the principle of law, see *Brewster vs. Lanyon Zinc Co.*, *supra* (28). The number and location of wells requisite to the performance of a covenant to drill under an oil and gas lease depend upon the character of the leased territory and whether after the discovery of oil or gas there is a duty to sink an additional well or wells depends upon the probabilities arising from the circumstances surrounding the property and whether they will be profitable to the lessee. The lessee is under no duty to operate a lease at a loss to himself to make the premises profitable to the lessor. The lessee must bear all the burdens incident to development and if a well is dry he loses its cost; but if it proves rich in either mineral the lessor receives his share but loses nothing in any event. For such reasons the lessee, except where he fraudulently fails or refuses to act when affirmative action is required, must control the prosecution of the necessary operations, but he can not unduly delay operations where clearly the conditions surrounding the property are such as require speedy progress to effect development and to afford protection against drainage. *Jennings vs. South Carbon Co.*, *supra* (29).

³³ *Gain vs. South Penn. Co.*, 76 W. Va. 769, 86 S. E. 883; see *Fairbanks vs. Warrum*, 56 Ind. A. 337, 104 N. E. 1114. The courts of Texas recognize that a cause of action may be alleged and proved against a lessee for failure to act so as to save from waste the leased premises caused by outside wells under express, as well as by implied agreement. *Burt vs. Deorsam*, *supra* (32); *Humble Oil Co. vs. Strauss*, *supra* (32); *Texas Co. vs. Barker*, — Tex. C. A. —, 252 S. W. 809. As to measure of damages see *Texas Co. vs. Barker*, *supra*. A lessee who obtained an oil and gas lease from the owner of land and who was unable to obtain a lease from the adjoining landowner, is not to be charged with fraud by the latter and is not liable to such adjoining landowner for any part of the oil produced by him from wells on the leased land, though located so near the line as to drain the oil from the adjoining premises. The mere execution of such a lease causes no inference of a fraudulent intent and justifies no implication on the part of the lessee to wrong the adjoining landowner. *Gain vs. South Penn. Co.*, *supra*. Drainage can be prevented only by drilling off-set wells. *Eastern Oil Co. vs. Beatty*, *supra* (9). The authorities are generally agreed upon the rule that because of the peculiar nature of the subject matter of the contract and the probability of great loss likely to result to the lessor from the failure by the lessee to prosecute drilling operations promptly, by reason of drainage from the leased property into surrounding wells already in operation, such leases are most strictly construed against the lessee and in favor of the lessor. *Taylor vs. Hamilton*, *supra* (2).

protect the leased premises against drainage through flowing wells on adjacent land by drilling off-set wells. There is an implied condition that he will do so upon the demand of the lessor.³⁴

§ 19. Failure to Drill Off-set Wells.

In order that a lessor may recover damages from a lessee in an oil and gas lease because of the failure to drill off-set wells to prevent the drainage of the oil in the leased lands by wells drilled on adjacent lands, it must appear from the evidence that it is reasonably certain that the oil from the lessor's land has been or is being drained by the wells drilled on adjacent land. It is not possible to prove this with absolute certainty. It is not impossible, nor is it difficult, to prove such circumstances as would reasonably lead to the conclusion that such was the fact. Thus, it would be easy to show the character of the sand in which the oil was found on the adjoining land. That wells had been drilled on such lands; their distance from the land, and the oil produced therefrom. It could also be shown what area would probably be drained of oil by the wells drilled in the particular sand in which the wells were drilled on the adjoining land. If such area, so probably drained, included a part of the leased lands, it could then be reasonably assumed that the wells on the adjoining lands were draining oil from the leased lands.³⁵

§ 20. Rentals.

The development of the leased premises is a controlling consideration with oil and gas leases and lessees may be held liable in damages, or the lease forfeited and cancelled according to its provisions for failure to develop in accordance with the fair and reasonable interpretation of the lease. But this does not prevent the contracting parties from stipu-

³⁴ Stanley vs. United Co., 78 W. Va. 793, 90 S. E. 344. But see United Co. vs. Meredith, — Tex. C. A. —, 258 S. W. 550; Chambers vs. Perrine, 81 W. Va. 321, 94 S. E. 381; compare Jennings vs. Southern Carbon Co., *supra* (13); Chandler vs. French, *supra* (13). The rule that should govern in determining whether off-set wells should be drilled, and the intent, etc., is that which in the circumstances would be reasonably expected of operators of ordinary prudence and it is not necessary to prove that the lessee acted fraudulently. Burt vs. Deorsam, *supra* (32); Texas Co. vs. Ramsower, — Tex. C. A. —, 255 S. W. 466. In a lease of land for the production of oil and gas in which the lessee obligated himself to begin the drilling of a well within a specified time or forfeit the lease, there is no implied covenant on his part to drill as many wells as may reasonably be necessary to secure the oil or gas for the common advantage of the lessor and the lessee within such time, where oil or gas has not been found in paying quantities. Nabors vs. Producers Co., 140 La. 985, 74 S. E. 527; but see Carper vs. United Co., *supra* (13). The practically universal interpretation of oil and gas leases is, that where the contract does not expressly state what shall be done by the lessee, there lies the legal implication that if he finds oil and gas, or if they are found on adjoining lands, he will drill as many wells as will offer sufficient protection against drainage, and so otherwise develop the leased lands as to serve the mutual benefit of lessor and lessee. The necessity for such interpretation is based on the illusive and migratory nature of oil and gas, their disposition to travel and to find vent through the most readily accessible opening. The lessee though experienced, as against the lessor, who is without experience, can not fraudulently exercise his judgment solely to promote his individual interest, ignoring the interest of the lessor, but to serve him, his judgment must conform to that generally exercised by other operators in similar circumstances and conditions and in view of the intention of the parties entering into the lease. Steele vs. American Oil Co., *supra* (32); see, also, Doddridge Co. vs. Smith, 154 Fed. 970; Harris vs. Ohio Oil Co., *supra* (15); Highfield Co. vs. Kirk, *supra* (8); Guffey Co. vs. Jeff Chaison Co., 48 Tex. C. A. 555, 107 S. W. 609; Texas Co. vs. Ramsower, *supra*.

³⁵ Steele vs. American Oil Co., *supra* (32).

lating for the payment of a fixed sum as a minimum rental in lieu of development.³⁶

§ 21. By-products.

The fact that the lessee of an oil and gas lease, who had drilled and was operating oil wells, installed and connected vacuum pumps in connection with such wells for the purpose of increasing the production thereof, and the further fact that the lessee successfully utilized what was called "vapor," which was emitted from the wells at the casing head, and by process of distillation and compression converted the escaping substance into gasoline for the mutual advantage and benefit of the lessor and lessee, did not thereby render the lessee liable for the annual rental of gas wells, under the terms of the lease. The mere collecting of the vapor or volatile substance and the manufacture of gasoline therefrom was no indication of proof of gas in the wells, and did not bring them within the terms of the lease as producing gas wells.³⁷

§ 22. Delay Rentals.

A covenant in an oil and gas lease for quarterly delay rentals, performed in part only, is separate, distinct, and disassociated from a covenant to drill or pay rentals. Performance or part performance of the former covenant does not excuse the nonperformance of the latter.³⁸ A covenant in an oil and gas lease requiring the lessee to complete a well within a specified time from the date of the lease or pay the lessor a stated sum each month for each additional month such completion was delayed until a well was completed, is for the benefit of the lessor only. In case of violation of the covenant on the part of the lessee the lessor may either cancel or terminate the lease, or he may, at his option, col-

³⁶ Gilbert vs. Bolds, 62 Ind. A. 595, 113 N. E. 379; see Carper vs. United Co., *supra* (35). A provision in an oil and gas lease rendering it null and void for failure to pay the rent as stipulated is for the protection of the lessor. In order to terminate the lease by reason thereof it requires affirmative action on his part. Notwithstanding the failure to pay the rent the tenancy continues until the lessor declares a forfeiture. If before the lessor takes action the rent due is paid or tendered it heals the breach and saves the tenancy. McKean Co. vs. Walcott, *supra* (32). In an oil and gas lease where development is contemplated and an annual rent is provided for, if in case wells are not drilled within a stated time the payment of rent is not of the essence of the contract. Payment at any reasonable time or upon reasonable demand would be sufficient to avoid forfeiture. Bloom vs. Rugh, 98 Kan. 589; 160 Pac. 1135. A clause in an oil and gas lease to the effect that the failure of the lessee to complete a well upon the premises described within the time specified or to pay the rentals at the time and manner as therein provided shall *ipso facto* work a forfeiture of the lease without notices applies only to rentals provided to be paid for delay in drilling and not to rentals or royalties to be paid for gas from a producing well. Castlebrook Co. vs. Ferrell, 76 W. Va. 300, 85 S. E. 544. A lessee of an oil and gas lease may be required to pay rent as long as he holds possession, although the lease by its terms may be at an end; but the execution of an oil and gas lease creates no presumption of subsequent possession by the lessee. Ash Grove Co. vs. Chanute Co., 100 Kan. 547, 164 Pac. 1087. Where the lands of which the husband died seized were subject to a valid oil and gas lease at the time of his death, yielding a rental, the widow is dowable of the reversion and the rent or royalty as an incident of the reversion. Campbell vs. Lynch, 81 W. Va. 374, 106 S. E. 869.

³⁷ Locke vs. Russell, 75 W. Va. 602, 84 S. E. 948; see Wemple vs. Producers Oil Co., 145 La. 1031, 83 So. 222.

³⁸ Hefner vs. Light Co., *supra* (31).

lect the rents stipulated in the lease until the premises are reconveyed or until the term of the lease expires.³⁹

§ 23. Forfeiture Avoided.

An oil and gas lease provided that if the lessee did not drill a well within one year a stipulated rental was to be paid for each additional year the beginning of operations was delayed. Where no operations were commenced during the second year the stipulated rental was not due until the end of that year. The tender of the rental for the second year before the end of that year was sufficient to avoid forfeiture.⁴⁰

§ 24. When Development Not Compulsory.

Where an oil and gas lease is for a definite term and provides for the payment of a stipulated sum for delay during that time and that provision still is effective, the lessor can not refuse the stipulated payments for delay and recover damages, or invoke a forfeiture for a failure to develop on demand. This, in fact, would permit one party to the contract to demand and enforce immediate performance of that which he had agreed might be deferred. A lessor suffers no injury in consequence of his inability to compel development under such circumstances except delay in realizing royalties upon oil and gas that might be produced. The oil and gas still are available for later operation and to the delay in producing that he has solemnly consented for the compensation payable as stipulated.⁴¹

³⁹ McKee vs. Grimm, 57 Okla. 680, 157 Pac. 308; Brunson vs. Carter Oil Co., *supra* (11). Where an oil and gas lease was executed before any discoveries of oil or gas had been made on the leased premises and before there had been any discoveries or developments on adjacent lands, and the lease provided for payment of rentals as to certain stated periods in lieu of development, and where after execution of the lease wells are drilled on adjacent lands that make the drainage of oil and gas under the leased premises probable and the consequent loss to the lessor imminent, the law will then imply a condition for the development of the leased premises by the lessee, on demand and notice from the lessor that he will refuse to receive further rentals. This on the theory that where an implied condition will adequately protect from the results of a contingency which it is evident the parties did not intend to disregard but for which they made no express provision, and will be less onerous to one of them than a covenant for such purpose would be. The principle of equity covering any construction and the limitation of necessity upon addition by implication, make it the duty of a court to adopt the condition, not the covenant, as an unexpressed provision of the contract. Carper vs. United Co., *supra* (34). An oil and gas lease provided that on certain conditions it should become null and void unless the payee paid quarterly in advance a specified sum as compensation in lieu of drilling within the succeeding quarter. Such a lease or agreement does not create a mere tendency at will, terminable at the option of the lessor or void as a perpetuity. But the lessor may require development after the end of any quarter for which the lessee has paid the agreed compensation for delay upon reasonable notice to the lessee. In the event of the lessee's failure to drill within reasonable time after such notice, equity will cancel the lease upon application by the lessor. Johnson vs. Armstrong, 81 W. Va. 399, 94 S. E. 753; see Todd vs. Manufacturers Co., 90 W. Va. 40, 110 S. E. 446; see, also, Smith vs. McCullough, 285 Fed. 698.

⁴⁰ Hughes vs. Parsons, *supra* (5); see Dix River Co. vs. Pence — Ky. —, 123 S. W. 263; Warren Co. vs. Gilliam, *supra* (5); McNutt vs. Whitney, 192 Ky. 132, 232 S. W. 386; Union Co. vs. Indiana Tex. Co., — Ky. —, 251 S. W. 1008. Where an oil and gas lease provides for a forfeiture unless a well is drilled through a certain sand within a specified time, the lessee is not required to drill below such sand in search of a new sand, but his contract has been complied with when he has drilled through the specified sand. Papoose Co. vs. Swindler, — Okla. —, 220 Pac. 506.

⁴¹ Eastern Oil Co. vs. Beatty, *supra* (9).

§ 25. Lessor's Option.

An oil and gas lease required the lessee to begin drilling within a stated time or pay a certain stated sum per month for failure to commence drilling. The lease also provided that a failure upon the part of the lessee to comply with the conditions thereof would render it void. These provisions give the lessor the option as to his remedy. He may elect to put an end of the lease, or he may elect to have the lease continued in force to the end of the term and enforce the payment of the amount due each month.⁴²

§ 26. Consideration.

Oil and gas leases are not dependent for their validity on an agreement to pay royalties and a consequent expressed or implied covenant to develop. There may be any other consideration agreeable to the parties and valuable in law, or the consideration may be wholly executory. It may be in money only, paid at the time of the execution and delivery of the instrument. The amount recited may be small, only one dollar, but a dollar is a unit of value and is a thing of value. In fact and in the eyes of the law one dollar is a sufficient consideration to support a conveyance of land. If sufficient to support the conveyance of the whole estate in land it is sufficient to support a grant of a less interest. Where one dollar was the sole consideration paid for an oil and gas lease and the payment was recited in the instrument, the instrument would not be void. But, aside from this, it may be that development and prospective royalties are the real and moving consideration for such a lease. But this can not be where the parties expressly agree that development may be deferred for a stated time. One of the considerations, and, perhaps, the principal one for such a

⁴² *Allen vs. Narver*, 178 Cal. 102, 172 Pac. 980. An option supported by a consideration, furnishes an illustration of a contract which is valid notwithstanding the lack of mutuality. It is no objection to the validity of a contract that the holder of the option is under no obligation to exercise it. *Pierce Ass'n vs. Woodrum*, — Tex. C. A. —, 188 S. W. 245. Unless based upon a sufficient consideration, an option merely is a continuous offer of sale which may be withdrawn at any time before acceptance. *Worlds Fair vs. Powers*, 224 U. S. 173; *Milwaukee Co. vs. Shea*, 123 Fed. 9; *Brown vs. Savings Union*, 134 Cal. 448, 55 Pac. 598; *Hobbs vs. Davis*, 168 Cal. 556, 143 Pac. 733; see *Baker vs. Mulrooney*, 265 Fed. 529. A consideration of one dollar, in the absence of fraud or bad faith, is sufficient. *Pittsburg Co. vs. Bailey*, 76 Kan. 42, 90 Pac. 803. An agreement to drill a well on the property covered by the option is sufficient. *Starr vs. Crenshaw*, 279 Mo. 344, 213 S. W. 811. After acceptance of the terms by the holder of the option, the parties are mutually bound and either one may compel specific performance by the other. *Hoogendorn vs. Daniel*, 178 Fed. 765; *Heyward vs. Bradley*, 179 Fed. 325. That an accounting may be had, see *S. P. Mines vs. Court*, 33 Nev. 97, 110 Pac. 503. Time is of the essence of the option whether so expressly stated therein or not. *Waterman vs. Banks*, 144 U. S. 394; *Mackey vs. U. S.*, 144 U. S. 394; *Mackey vs. U. S.*, 244 Fed. 275; *Champion Co. vs. Champion Mines*, 164 Cal. 205, 128 Pac. 315; *Merk vs. Bowery*, 31 Mont. 298, 78 Pac. 519. The condition as to time may be waived or relieved against in equity. *Wheeling Co. vs. Elder*, 54 W. Va. 255, 46 S. W. 357. A further consideration is not necessarily incidental to the mere extension of time for performance of the conditions of the option. See *L. R. A. 1915B*. That a verbal promise to extend the time is sufficient, see *Stamey vs. Hemple*, 173 Fed. 61; *Downey vs. Gooch*, *supra* ⁽⁶⁾. One who is in possession under an agreement to convey giving him the right of possession, may maintain an action against a stranger to the title for a trespass which consists of the removal and conversion of the substance of the estate. He may even recover from his vendor for injuries amounting to waste, committed upon the premises after delivery of possession. *Lightner vs. Lane*, 161 Cal. 689, 120 Pac. 771. If it is provided in the option agreement that in case of default in making any of the payments the property shall revert back to the grantor of the option, it is not necessary to return the payments made nor wait until final payment was due and in default before bringing suit in ejectment. *Williams vs. Long*, 139 Cal. 186, 62 Pac. 264; see, also, *Hazzard vs. Johnson*, 45 Cal. A 191, 187 Pac. 121. For repossession of property and fixtures, see *Smith vs. Beebe*, 31 Ida. 496, 174 Pac. 608; see, generally, *Worlds Fair vs. Powers*, *supra*; *Skookum Co. vs. Thomas*, 162 Cal. 539, 123 Pac. 363; *Champion Co. vs. Champion Mines*, *supra*.

grant, is the covenant to develop and yield prospective royalties, or pay the stipulated price in lieu thereof.⁴³

§ 27. Insufficient Consideration.

The rule that contracts performed without sufficient consideration which are optional as to one of the parties are optional as to both, applies to contracts or oil and gas leases consisting of mutual promises wholly executory and unperformed. The promises on one side being the sole consideration for the promise on the other and in which it is optional with one of the parties whether he will perform his promise, then prior to performance by him, it is optional with the other whether he will perform his promise. The correct statement of the rule is that contracts unperformed, without sufficient consideration, which are optional as to one are optional as to both.⁴⁴

§ 28. Ambiguous Lease.

The object of the interpretation and construction of an oil and gas lease is to arrive at and give effect to the mutual intent of the parties as expressed in the lease. Where a lease is ambiguous, the true intention, if it can be ascertained from the contract, must prevail over verbal inaccuracies, inapt expressions, and dry words of the stipulations. It is the duty of a court to place itself as far as possible in the position of the parties at the time the lease was executed and to consider the instrument itself as drawn, its purpose and the circumstances surrounding the transaction; and, from a consideration of all these elements, to determine upon what sense and meaning of the terms used their minds actually met.⁴⁵

§ 29. Joint Lease.

A joint lease, by which separate owners lease their lands described as a single tract, gives the lessee the right to explore for oil upon any or all of such tracts of land. By the production of oil upon any one of such tracts there is vested in the lessee the right to extract and remove the oil from all the tracts whether by means of a well, or wells, drilled upon one of them, or more than one of them. After the oil is produced the royalties, or the royalty oil, should be delivered to the lessors and divided among them in the proportion that the parcel of land held by each of them bears to the total area of the land.⁴⁶

⁴³ Rich vs. Doneghey, *supra* (8); McKay vs. Lucas, — Tex. C. A. —, 220 S. W. 172; McKay vs. Kilcrease, — Tex. C. A. —, 220 S. W. 177; Davis vs. Texas Co., — Tex. C. A. —, 232 S. W. 556; but see Nolan vs. Young, — Tex. C. A. —, 220 S. W. 154; see Guffey vs. Smith, *supra* (11); Eastern Oil Co. vs. Beatty, *supra* (9); Norton vs. Young, — Tex. C. A. —, 220 S. W. 158; see Hunter vs. O'Rear, — Ky. —, 259 S. W. 41.

⁴⁴ Rich vs. Doneghey, *supra* (8); see Hill Oil Co. vs. White, *supra* (10).

⁴⁵ Witherington vs. Gypsy Oil Co., 68 Okla. 138, 172 Pac. 634; Prowant vs. Sealy, 77 Okla. 244, 187 Pac. 239. In the construction of an ambiguous oil and gas lease a court, in order to ascertain the intention of the parties will consider the interpretation placed upon the lease by the parties themselves and will also look to their actions thereunder before any controversy arose between them as to its meaning. And such construction, when reasonable, will be adopted and enforced by a court and the construction placed thereon by the parties will prevail if the language will reasonably allow of such construction, although the court would probably adopt a different one but for the particular construction already placed by the parties on their agreement. Bearman vs. Dux Co., *supra* (8).

⁴⁶ Lynch vs. Davis, 79 W. Va. 437, 92 S. E. 427; see Higgins vs. California Co., 109 Cal. 304, 41 Pac. 1087; Wettengel vs. Gormley, 160 Pa. 559, 28 Atl. 934; Gillette vs. Mitchell, — Tex. C. A. —, 214 S. W. 619; but see Northwestern Co. vs. Ullery, 68 Ohio St. 259, 67 N. W. 494; compare Pittsburgh Co. vs. Ankrom, 83 W. Va. 81, 97 S. E. 593; see, generally, Fairbanks vs. Warrum, *supra* (33); Pierce Corp. vs. Schacht, 75 Okla. 101, 181 Pac. 731.

§ 30. Sublease.

A lessee of certain oil and gas lands sublet a portion of the leased premises to a third person. The original lease contained a covenant against incumbrances. The lessor brought suit to recover the rents collected from a subtenant and to forfeit the original lease on the ground that the subletting was for a purpose not contemplated by the provisions of the lease and was an incumbrance in violation of the covenants of the lease. The lessor made no claim for damages nor was any proof offered of any damages by reason of the subletting and of the alleged improper use of the premises by the sublessee. The Civil Code of California (§ 1930) provides that when a thing is let for a particular purpose the hirer must not use it for any other purpose. If he does so he is liable for all damages and the lessor may treat the contract as rescinded. Under this section of the Code the lessor could only maintain an action for damages. He could not sue to recover rents received from the sublessee and have the original rescinded; nor could he on appeal change the theory of his action and insist that it was an action for damages.⁴⁷

§ 31. Second Lease.

A lessor can not lawfully execute a second lease to a stranger covering property held under a valid subsisting lease unless subject to the rights of the prior lessee.⁴⁸

§ 32. Lease of Homestead.

An oil and gas lease occupied as a homestead which granted the right to enter upon and operate the same for oil and gas, together with the right to lay pipes, erect power houses, stations, and fixtures necessary for the production of oil and gas, is such a grant of the use and occupancy of the homestead as requires the joint consent of the husband

⁴⁷ *Smith vs. United Crude Oil Co.*, 179 Cal. 570, 178 Pac. 141, and see 50 Cal. A. 466, 195 Pac. 434. In the lease under discussion in this case it was provided that all expenditures in connection with the boring of wells, erecting derricks, pumps, tanks, pipes and material, should be provided by the lessee at his own expense. The lessee expressly agreed that he would keep the premises clear and free of incumbrances and liens, particularly mechanics', material men's, and laborers' liens. There was no agreement in the lease against subletting and the lessee had a right to sublease portions of the land for the development of oil and a sublease could not be considered an incumbrance within the meaning of the lease.

⁴⁸ Equity has jurisdiction at the suit of the holder of a valid oil and gas lease, whose rights have become vested by the discovery of oil or gas, to remove as a cloud upon his rights a subsequent lease executed to a stranger covering the same tract of land. *Ohio Oil Co. vs. Greenleaf*, *supra* (7). See *Carbon Black Co. vs. Ferrell*, 76 W. Va. 300, 95 S. E. 514. Where the holder of a valid oil and gas lease has obtained vested rights by drilling wells and by the production of oil and gas, equity will enjoin the lessor from creating a cloud on his title by executing to a stranger another lease on the same property where it appears to be reasonably certain that such cloud will be created unless enjoined. *Castlebrook Co. vs. Ferrell*, *supra* (36). A second lessee in an oil and gas lease of certain described lands had actual and constructive notice of a prior existing lease of the same lands. Such a second lessee acquired no rights under his lease as against the prior lease. Under these circumstances the original lessee had the right to have his title to the oil and gas under the leased lands quieted as against the second lessee and to have such second lessee enjoined from interfering with his right to enter upon the land and remove the oil. *Warren Oil Co. vs. Gilliam*, *supra* (6); see, also, *Castlebrook Co. vs. Ferrell*, *supra* (36). As to second lease by heirs see *Powell vs. Schoenfield*, 262 Pa. St. 588, 106 Atl. 110; see *Bessho vs. General Pet. Corp.*, 186 Cal. 133, 199 Pac. 22; *Follette vs. Pacific Corp.*, 189 Cal. 205, 208 Pac. 295.

and wife. An oil and gas lease executed by one of the spouses alone is invalid.⁴⁹

§ 33. Interest and Rights of Lessee.

Oil and gas while in the earth, unlike solid minerals, are not the subject of ownership distinct from the soil, and a grant of the oil and gas is a grant not of the oil that is in the ground, but of such a part as the grantee may find and reduce to possession. It passes nothing except the right to explore for the same under the terms of the agreement or lease.⁵⁰ But the lessee is entitled to protection in his right to explore the premises for oil or gas; and he is entitled to an injunction restraining subsequent lessees of the same premises from destroying this right.⁵¹ Where it is stipulated that the lease is to continue during the time that oil or gas is found in paying quantities, and no oil or gas has been found during the term that the lessee has the right to exploit the land, the lease expires and may be annulled.⁵²

§ 34. Lessee's Right of Determination.

Where the lease does not fix the number of wells to be drilled for the development of the premises as contemplated, the lessee then has the right to determine the number of wells or the extent of the development, and his decision is conclusive on the subject so long as he acts honestly and in good faith upon sound business principles.⁵³ When oil is found the right to produce it becomes a vested right and the lessee will be protected in extracting it agreeably to the terms of the lease.⁵⁴

⁴⁹ Gillespie vs. Fulton Co., 140 Ill. A. 147; Ray vs. Brush, 112 Kan. 110, 210 Pac. 662; Carter Co. vs. Popp, — Okla. —, 174 Pac. 747, 210 S. W. 563; see Gary vs. McKinney, — Tex. C. A. —, 239 S. W. 283, 202 S. W. 103; McEntire vs. Thomason, — Tex. C. A. —, 210 S. W. 563; Haynie vs. Stovall, — Tex. C. A. —, 212 S. W. 792; but see Rumsey vs. Sullivan, 150 N. Y. S. 287, 212 S. W. 422; Griffin vs. Bell, — Tex. C. A. —, 202 S. W. 173; see, generally, Caudi vs. Wagoner, 184 Ky. 381, 212 S. W. 422; Robinson vs. Smalley, 102 Kan. 842, 171 Pac. 1155; see, also, Chisholm vs. Creek Co., 273 Fed. 589. The claimant of an unperfected unrestricted homestead right can not make a valid lease of the minerals therein. Bower vs. Higbee, 9 Mo. 239; Milliken vs. Carmichael, 134 Ala. 623, 33 So. 9; see Wadkins vs. Producers Oil Co., 227 U. S. 368; Parish vs. U. S., 184 Fed. 590; Chanslor-Canfield Co. vs. U. S., 266 Fed. 145; compare Tiernan vs. Miller, 69 Neb. 764, 96 N. W. 661; Anderson vs. Wilder, 83 Miss. 606, 35 So. 875.

⁵⁰ Warner vs. Page, *supra* (5); Kelley vs. Harris, *supra* (6); Lima Oil Co. vs. Pritchard, — Okla. —, 218 Pac. 866; but see Terry vs. Humphreys, — Okla. —, 203 Pac. 539, in which case it was held that an oil well and gas lease for a stated period or as long thereafter as oil or gas, or either of them, is produced from the demised premises, by the lessee, conveys "real property." In Daughetee vs. Ohio Oil Co., *supra* (13) it was held that where it was provided the lessee should hold the premises for a stated period and as much longer as gas and oil are found in paying quantities on the premises, the lease conveyed a freehold estate, for the reason that it may continue indefinitely. "An oil lease to have and to hold the same unto the party of the second part, his heirs and assigns, for the period of ten years from date hereof, with the right of renewal for a further term of ten years at the end of such term, or at the end of any subsequent term for which it may be renewed, gives the lessee the right of renewal in perpetuity." Becker vs. Submarine Oil Co., *supra* (4).

⁵¹ Downey vs. Gooch, *supra* (10).

⁵² Union Co. vs. Adkins, 278 Fed. 856; Chaney vs. Ohio Co., 32 Ind. A. 193, 69 N. E. 477; Cassell vs. Crothers, 193 Pa. St. 359, 44 Atl. 446.

⁵³ Gilbert vs. Bolds, *supra* (36); but see Kirlicks vs. Texas Co., — Tex. C. A. —, 201 S. W. 687; see, also, Brewster vs. Lanyon Zinc Co., *supra* (28); Alford vs. Dennis, *supra* (16); Grubb vs. McAfee, *supra* (6).

⁵⁴ Brookshire Co. vs. Casmalia Co., 156 Cal. 211, 103 Pac. 927; Dickey vs. Coffeyville Co., 69 Kan. 106, 76 Pac. 398.

§ 35. Lessee Can Not Set Up His Own Default.

A lessee in an oil and gas lease can not set up his own default in order to terminate the lease or escape liability under its provisions. If he fails to perform the covenants of the lease it lies with the lessor to declare a forfeiture.⁵⁵

§ 36. Covenants Construed in Favor of the Lessee.

In oil and gas leases the compensation of the lessor generally is a royalty. The covenants to be performed by the lessee which relate to the right to drill or explore for oil or gas generally are construed most strongly in favor of the lessor. But this rule has its limitations. When a lessee has faithfully performed all his covenants and has discovered oil in paying quantities and the lessor is receiving the royalties as the lease contemplates, the lessor can not then invoke this rule to aid him in dispossessing the lessee. The lessee having performed his covenants he thereby obtained a vested interest in the oil and gas in the leased premises because of his exclusive right to drill, and the lessee holds such interest as security against the lessor.⁵⁶

§ 37. Forfeitures.

Forfeitures are not generally favored by the law; but forfeitures which arise in oil and gas leases by reason of the neglect of a lessee to develop or operate the leased premises are favored because of the peculiar character of the minerals sought to be produced. Perhaps in no other class of leases is prompt performance of contract so essential to the rights of the parties, or delay by one party likely to prove so

⁵⁵ Ohio Valley Co. vs. Irvin Co., *supra* (8); see Warren Co. vs. Gilliam, *supra* (5); Monarch Co. vs. Richardson, 124 Ky. 602, 99 S. W. 668; Maud Co. vs. Bodkin, 75 Okla. 6, 180 Pac. 959; see, also, Becker vs. Submarine Oil Co., *supra* (4). Where the lease provides that if the premises should not be operated the lease should be void the word "void" means "voidable" at the election of the lessor and he must do some act evincing an intention to avoid the lease before it can be considered void or terminated. Such provisions are for the benefit of the lessor and he has an option to discontinue the lease on default of the lessee, or affirm the continuance of the contract. If the lease provides that the lessee's failure to complete a well within a stated period or any default in the covenant thereof to pay a certain yearly rental should render the lease null and void and all rights and claims should therefrom cease, still the lessee by his own default can not relieve himself from the liability already incurred. Lavery vs. Mid-Continent Co., 62 Okla. 206, 112 Pac. 737; see, also, McKean Co. vs. Walcott, *supra* (2). By the terms of an oil and gas lease the lessee, an oil company for a valuable consideration, specifically undertook to commence and with diligence drill a well on the premises into a designated sand. The lease contained a clause providing that a failure to commence and complete said well should work a forfeiture and render the lease null and void. The forfeiture provision was for the benefit of the owner of the leasehold interest and gave him the option to declare a forfeiture upon the failure of the oil company to discharge its obligation to drill. The oil company could not, by virtue of the forfeiture clause and without the consent of the owner, terminate the contract by its own default and thereby escape liability for resultant damages. Lavery vs. Mid-Continent Co., *supra*.

⁵⁶ Burgan vs. South Penn Co., 243 Pa. St. 128, 89 Atl. 823. A covenant relating to the drilling of new wells, the erection of new derricks and buildings is a covenant running with the land. Bradford Oil Co. vs. Blake, 113 Pa. St. 83, 4 Atl. 218; Pierce Ass'n. vs. Woodrum, *supra* (42).

injurious to the other.⁵⁷ The lessee has a right to regard his own interest as well as that of the lessor. In short the diligence required of the lessee involves such a course of conduct upon his part as operators of ordinary diligence would pursue, having in mind the securing of the financial benefits sought by both lessor and lessee.⁵⁸

§ 38. What Warrants Forfeiture.

To warrant a forfeiture it must affirmatively appear from all the circumstances that the lack of diligence "is both certain and substantial."⁵⁹

§ 39. Forfeiture Can Not Be Arbitrarily Exercised.

The right of a lessor to forfeit the lease for nondevelopment can not be arbitrarily exercised. The lessor first must demand of the lessee that he develop in good faith the leased lands. If, after notice and demand, the lessee fails to begin the development within a reasonable time the lessor may then have the lease forfeited.⁶⁰ A mere discovery of a "dry hole" does not end the lease under a forfeiture clause for failure to drill a well within a stipulated time.⁶¹ The driving of a stake to indicate the location of a well and the driving of another stake locating a place to set a boiler to drive a drilling machine on the part of the lessee, do not constitute a commencement of operations to drill within the provision of the lease.⁶²

⁵⁷ Hughes vs. Busseyville, *supra* (6); Soaper vs. King, 167 Ky. 121, 180 S. W. 46; see, also, Alford vs. Dennis, *supra* (16); Rembarger vs. Losch, *supra* (16). An oil and gas lease will be strictly construed against the lessee and although under the general rule forfeitures are not favored, they are in fact favored in contracts of this character. Stephenson vs. Slitz, — Tex. C. A. —, 255 S. W. 812. A forfeiture clause, for the nonpayment of rent or for failure to fulfill a covenant, is for the benefit of the lessor, and is enforceable only at his option. Such a covenant is not self enforcing. Craig vs. Thompson, *supra* (8). The right of a lessor to forfeit the lease must be promptly asserted or it will be treated as a waiver. The tendency of the later judicial decisions is to frown on forfeiture where the rights of the parties insisting thereon can otherwise be adequately protected. Bloom vs. Rugh, *supra* (36); Wellsville Co. vs. Miller, 44 Okla. 493, 145 Pac. 344; Pierce Corp. vs. Schacht, *supra* (40); see, also, Indiana Co. vs. McCrory, *supra* (17). A person entitled to the forfeiture and the consequent right of re-entry may waive such right or he is estopped by his own conduct from asserting the right. And any fact properly evidencing the intention of a lessor to waive any right of forfeiture is admissible in an action by an assignee of the lessor to forfeit the lease. Munsey vs. Marnet Co., *supra* (10). The true rule undoubtedly is that the right to declare a forfeiture must be distinctly reserved; that the proof of the happening of the event on which the right is to be exercised must be clear; that the party entitled to do so must exercise his right promptly; and that the result of enforcing the forfeit must not be unconscionable. Craig vs. Cosgrove, — Pa. St. —, 121 Atl. 408. In Taylor vs. Hamilton, *supra* (2), the court says: "It is a general rule that forfeitures are discountenanced in the law; but where, as in the case of the exploration and development of oil territory, the profits to be derived frequently depend upon the exercise of diligent prosecution of the work and continuous operation of the completed plant, the only protection afforded the owner of such property is the cancellation of the permit where its possessor has been grossly neglectful of mutual interests as between him and such owner, or wilfully has been guilty of dilatory practices because of speculative or selfish interests, or otherwise, which amounts to an abandonment. (Acme Oil & Min. Co. vs. Williams, 140 Cal. 681, 74 Pac. 296.) Having to do with the subject of forfeiture of oil leases, it is said in Risch vs. Burch, 175 Ind. 621, 95 N. E. 123, that, "oil and gas leases or contracts are in a class by themselves, and the ordinary rule that forfeitures are not favored does not apply with full force to them if at all. The provisions for a forfeiture usually found in them are generally held to be for the benefit of the landowner and clearly enforceable by him where the lessee has done nothing to carry out the purpose of exploration, and has failed to make payments for the right to do so." And in this connection see, also: Gillespie vs. Bobo, 271 Fed. 641; Dill vs. Frazee, 169 Ind. 53, 79 N. E. 971; Bell vs. Kilburn (Ky.), 234 S. W. 730; Clutter vs. Wisconsin, etc., Oil Co., — Tex. C. A. —, 233 S. W. 322; Gasaway vs. Teichgraeber, 107 Kan. 340, 191 Pac. 282; Jenkins vs. Williams (Ky.), 229 S. W. 94."

⁵⁸ Young vs. Forest Co., *supra* (29); Priddy vs. Thompson, 204 Fed. 955; Lindlay vs. Raydure, 239 Fed. 928; see Huggins vs. Daley, *supra* (5); Backer vs. Penn. Co., 162 Fed. 627; Florence vs. Orman, 19 Colo. A. 79, 73 Pac. 628; Rawlings vs. Armel, 70 Kan. 778, 79 Pac. 683; Wagner vs. Mallory, 169 N. Y. 501; Frank Co. vs. Bellevue Co., 29 Okla. 719, 119 Pac. 260.

⁵⁹ Becker vs. Submarine Oil Co., *supra* (4).

⁶⁰ Brewster vs. Lanyon Zinc Co., *supra* (28); Becker vs. Submarine Oil Co., *supra* (4).

⁶¹ Ohio Oil Co. vs. Irvin Co., *supra* (8).

⁶² Henning vs. Wichita Co., 100 Kan. 255, 164 Pac. 298.

§ 40. Immediate Development Presumed.

From the fact that lessors in oil and gas leases usually receive no consideration except in royalties from oil and gas after their discovery, the presumption always is that such leases are made for the purpose of immediate development, unless the contrary appears from the terms of the lease itself.⁶³

§ 41. Abandonment.

When it is claimed that a right under an oil and gas lease has been lost by abandonment and upon which forfeiture of the lease is sought the issue of intention rarely is, if ever, absent. An intention to abandon is to be found by a jury from a consideration of the nature and extent of the undertaking, the conduct of the parties, and what they did do or failed to do in that respect. The rule does not mean that the jury shall find that a specific mental reservation was reached by the person so charged to so abandon the right, as such a finding never could have a basis in the testimony except by admission or confession.⁶⁴

⁶³ Where a lease of oil and gas lands, with royalty to the lessor on the product is the sole and only consideration therefor it necessarily is implied, as of the essence of the contract, that the lessee shall work the wells with reasonable dispatch, for their mutual advantage. *Acme Co. vs. Williams, supra* ⁽⁴⁾; *Daughetee vs. Ohio Oil Co., supra* ⁽¹³⁾; *Burgan vs. South Penn Co., supra* ⁽⁵⁶⁾; *Parish Fork Co. vs. Bridgewater Co., 51 W. Va. 583, 42 S. E. 655.* There is an implied condition or covenant of every lease of land for the production of oil therefrom that when the existence of oil in paying quantities is made apparent, the lessee shall put down as many wells as may reasonably be necessary to secure the oil for the common advantage of both the lessor and the lessee. *Highfield Co. vs. Kirk, supra* ⁽⁸⁾. The fluctuating and uncertain character and value of oil and gas lands render it necessary for the protection of the land-owners that the properties should be developed as speedily as possible. The lessee for such purpose will not be permitted to hold the land for speculative or other purposes an unreasonable length of time for a mere nominal rent when a royalty on the product is the chief object for the execution of the lease. *Hughes vs. Busseyville Co., supra* ⁽⁶⁾. See cited case as to the application of the rule to the effect that an oil lease contains an implied covenant on the part of the lessee to develop the leased premises, depends on circumstances and on the intention of the parties. An implied covenant to develop can not be read into a lease of land for oil and gas where the territory had not before been developed and its productive value was not known. Where the object of the operations contemplated by the lease is to obtain a benefit or profit for both lessor and lessee, neither is in the absence of a stipulation to that effect, the arbiter of the extent to which, or the diligence with which, the operation shall proceed, but both are bound by the standard of what in the circumstances, would reasonably be expected of an operator of ordinary prudence, having regard to the interest of both. *Indiana Co. vs. McCrory, supra* ⁽¹⁷⁾; *Wapa Co. vs. McBride, 84 Okla. 184, 201 Pac. 984; Cotner vs. Munday, supra* ⁽²⁰⁾.

⁶⁴ *Munsey vs. Marnet Co., supra* ⁽¹⁶⁾. The distinction between "forfeiture" and "abandonment" as applied to oil and gas conveyances and leases is so shadowy that in discussing the one necessarily the conditions of the other are involved. But one distinction is that "abandonment" rests on the intention of the parties, while "forfeiture" does not rest upon the intent to release the premises, but is an enforced release. A vested title can not ordinarily be lost by abandonment unless there is satisfactory proof of an intention to abandon. The existence of an intent to waive or abandon the right to drill for oil and gas under the lease is a question of fact, and the lessor must show an intention on the part of the lessee to abandon the lease. If the proof would authorize the conclusion that there was no such intention, then a court would not be justified in decreeing a forfeiture of the lease. *Fisher vs. Crescent Co., — Tex. C. A. —, 178 S. W. 905; Hall vs. McClesky, — Tex. C. A. —, 228 S. W. 1004; Garrett vs. South Penn. Co., 66 W. Va. 587, 66 S. E. 541; Wisconsin Texas Co. vs. Clutter, — Tex. C. A. —, 258 S. W. 265.* Abandonment may be more readily found in cases of oil and gas leases than in most other instances. The rights granted under such leases are for exploration and development. The title and interest are inchoate until oil or gas is found in quantities warranting operation, and accordingly a lessee will not be permitted to fail in development and hold the lease for speculative or other purposes except in strict compliance with his contract, and for a valuable and sufficient consideration other than the development. *Harris vs. Riggs, 63 Ind. 208, 112 N. E. 36.* When the lease has been abandoned by the lessee, the lessor has three remedies, any one of which he may pursue. The lessor may go into a court of equity to cancel the lease and recover incidental damages; he may in a separate action at law sue for damages for breach of the contract, or he may treat the lease as rescinded and sue to recover possession of the property. *Millar vs. Mauney, — Ark. —, 234 S. W. 498.* It may be accepted as a principle of law that even in the case of a lease creating a vested interest in the lessee, the doctrine of abandonment may be legally asserted and proved in the ordinary manner as a defense to the claim of prior lessee. Much stronger would be the ground for recognizing it as a defense if the instrument in a controversy in equity may not have created a vested interest. *Burke vs. North, 296 Fed. 259.*

§ 42. Intention.

Whether an oil and gas lease had been terminated by abandonment on the part of the lessee and the acceptance of or reentry upon the premises by the lessor is a question of intention. A lease so terminated is said to have come to its end by operation of law, the legal result arising from the act of the parties. The intention on the part of the lessee to abandon and on the part of the lessor to resume possession of the premises on his own account and treat the lease as having been surrendered and as ascertained from their acts and conduct is the test.⁶⁵ Unexplained cessation of work after sinking a dry well would be sufficient proof of abandonment.⁶⁶

§ 43. Cotenants.

Cotenants are owners of the whole or part and of the whole.⁶⁷ None of the cotenants has the exclusive right to any determinate part of the property. The owner of an undivided interest in a tract of land, nor a majority of such owners, has not the right to exploit such land for oil and gas by making a lease therefor without the consent of all the cotenants. Such right can not be conferred upon such a lessee. Such a lease may be valid as to the lessor but it is voidable as against the other cotenants.⁶⁸

§ 44. Rights of Cotenant.

Each cotenant may enter upon the premises and operate the same for oil and gas.⁶⁹ If his efforts result in a "dry hole" he must sustain the entire loss; but, if successful, he must proportionately share the profits with the excluded cotenants.⁷⁰

§ 45. Ratification of Voidable Lease.

The pretermitted cotenants may, if they so elect, permit the lessee to continue operations under the lease and require him to account for

⁶⁵ *Grubb vs. McAfee, supra* (6). Where an oil and gas lease is abandoned by the lessee, he can not thereafter revive the same nor claim nor enforce any rights thereon without first securing the consent of the lessor or procuring a renewal of the lease. *Harris vs. Riggs, supra* (64); see, also, *Ohio Oil Co. vs. Detamore*, 165 Ind. 243, 73 N. E. 906.

⁶⁶ *Foster vs. Elk Fork Co.*, 90 Fed. 178; *Strange vs. Hicks*, — Okla. —, 188 Pac. 347.

⁶⁷ *Gulf Co. vs. Carrol*, 145 La. 299, 82 So. 277; see *Gulf Co. vs. Hayne, supra* (1); *Paxton vs. Benedum-Trees Co.*, 80 W. Va. 187, 94 S. E. 472. A patent issued to two or more persons creates presumptively a tenancy in common as between them and third parties. *Frisbie vs. Marques*, 39 Cal. 451, affirmed in 101 U. S. 473.

⁶⁸ *Id.* *Zeigler vs. Brenneman*, 237 Ill. 15, 86 N. E. 597; see *Compton vs. Peoples Co.*, 75 Kan. 572, 89 Pac. 1039; *York vs. Warren Co.*, 191 Ky. 157, 229 S. W. 116. A lease of an entire tract made by one cotenant is binding on the other tenants when ratified by them. One method of ratification is acceptance of benefits under the lease by the cotenants. *Bessho vs. General Petroleum Corp., supra* (48).

⁶⁹ *Williamson vs. Jones*, 43 W. Va. 562, 27 S. E. 411; see, also, *McCord vs. Oakland Co.*, 64 Cal. 134, 27 Pac. 863. Several cotenants of an oil and gas lease assigned the lease to an operator who was to deliver to them a part of the product. One of the joint owners did not join in the assignment, and notified the assignee not to deliver any oil to his cotenants. The court held (1) that the party not joining in the assignment was not entitled to his share of the oil without proving that his cotenants had received more than their share; (2) that if he chose to affirm it, he must take his share with the others upon a distribution of the royalty after deducting all proper charges and expenses; (3) that if he did not affirm the lease, he had no claim to any share of the royalty, and could only look to the lessee as a cotenant who has not acquired his title. *Enterprise Co. vs. National Co.*, 172 Pa. St. 421, 33 Atl. 687; *Gillette vs. Mitchell*, — Tex. C. A., — *supra* (46).

⁷⁰ *Id.* See *Silver King Co. vs. Conkling Co.*, 255 Fed. 740; *Job vs. Potton*, L. R. 20 Eq. 84.

such proportion of the royalties as their interest in the oil in place bears to the whole.⁷¹

§ 46. Mining Partnership.

There is no presumption of a partnership from cotenancy.⁷² Drilling the well by their joint efforts—this fact of itself alone—whether as cotenants, or in order to become cotenants, does not make them mining partners. Such an arrangement lacks the elements of partnership.⁷³ Where tenants in common cooperate in developing a lease for oil and gas, each agreeing to pay his part of the expenses and to share in the profits or losses, they constitute a mining partnership.⁷⁴

§ 47. Life Estates.

Neither a widow owning a dower interest in land nor a life tenant has the power to make a lease of land under which oil or gas or other minerals can be removed from the land as against the remainderman.⁷⁵ Oil and gas well drilling by the lessee after the death of the lessor are regarded as open mines at the time of the lessor's death and the life tenant will be entitled to the rents, issues and profits reserved to the lessor accruing from such wells during the life tenancy.⁷⁶ An ante nuptial agreement by which after marriage the wife should hold and enjoy her separate estate does not cut the surviving husband out of his curtesy or his inheritance. It does not deprive him nor his legal heirs from the right to moneys received as royalties on oil for well drilled under a contract with and in the lifetime of the wife.⁷⁷

§ 48. Open Mines.

Mining leases do not constitute a sale of any part of the land, and the mineral derived from the usual operation of open mines constitutes the rents and profits of the land and belong to the tenant for life or years; but this rule does not apply to unopened mines in the absence of a contract for opening and leasing them.⁷⁸

§ 49. Assignees.

A right of action for a breach of the covenant of an oil and gas lease

⁷¹ Paxton vs. Benedum-Trees Co., *supra* (67)

⁷² Neill vs. Shamburg, 158 Pa. St. 263, 27 Atl. 992.

⁷³ Gillespie vs. Shufflin, — Okla. —, 216 Pac. 132.

⁷⁴ Barrett vs. Buchanan, — Okla. —, 213 Pac. 734; see, also, Madar vs. Norman, 13 Ida. 585, 92 Pac. 572.

⁷⁵ Prout vs. Hoy Oil Co., 263 Ill. 54, 105 N. E. 26; see, generally, Campbell vs. Lynch, *supra* (36).

⁷⁶ Bramer vs. Bramer, 84 W. Va. 168, 99 S. E. 329.

⁷⁷ Id. See, generally, Cochran vs. Gulf Co., 139 La. 1010, 72 So. 718.

⁷⁸ Von Baumbach vs. Sargent Co., *supra* (3). The lessee in an oil and gas lease after the death of the lessor entered upon the leased premises and drilled and produced oil and gas. Oil and gas wells so drilled are regarded as open mines at the time of the lessor's death. The life tenant will be entitled to the rents, issues and profits reserved to the lessor accruing from such wells during the life tenancy. Bramer vs. Bramer, *supra* (76). Under a will devising an interest in mineral lands under lease for mining operations, royalties under such a lease earned previous to but payable after the death of the decedent are payable to the life tenant. Poole vs. Union Trust Co., 191 Mich. 162, 167 N. W. 430; see, also, Seager vs. McCabe, 92 Mich. 186, 52 N. W. 299; and see Priddy vs. Griffith, 150 Ill. 562, 37 N. E. 999. The reason of the rule permitting dower in opened mines is that the land had been devoted to mining purposes by the owner of the fee during his life; and the mode of enjoyment and source of profit fixed and determined by him. In such case mining is a mode of enjoyment fixed by the owner and to extract and take the minerals is but to take the accruing profits from the land. Daniels vs. Charles, 172 Ky. 238, 189 S. W. 194.

is assignable. No particular form of words is essential to pass the right of action. Words manifesting a clear intention to assign are sufficient.⁷⁹

§ 50. Rentals.

An assignee of an oil and gas lease which contains a stipulation to the effect that all covenants and conditions therein shall be binding on the assigns of both parties, is liable for the rental payment prescribed in the lease so long as he retains possession under the lease.⁸⁰

§ 51. Liability of Assignee for Rent.

Where a lease of land for oil and gas provides that a certain sum shall be paid each year as royalty on the gas produced from each well and marketed off the premises, and the lessee operates the lease, markets the gas from wells thereon for a portion of the year, and thereafter assigns the lease, the assignee, in the absence of a special contract, is not liable for the royalties accruing on the wells, the product of which was marketed prior to the assignment of the lease, regardless of when these royalties became due and payable but the assignee of the lease is liable for the royalties accruing during the time he markets the product and enjoys the estate.⁸¹

§ 52. Action Against Assignee.

Where a lessor in an oil and gas lease brings an action against an assignee to recover damages for failure to drill wells upon the lease lands in order to prevent drainage of the oil in such leased lands through wells drilled upon adjacent land, it is necessary for the lessor to prove (1) the assignment and transfer of the lease to the assignee, the defendant in the suit; (2) that the assignee's operations on the lessor's land were under and by virtue of the lease. This, because the action being based upon a breach of an implied covenant to develop, it can not be maintained against any person not a party to the lease.⁸²

§ 53. Damages.

It has been held that in an action for damages for a breach of the contract the measure of damages which the well driller was entitled to recover was (1) the expense necessarily incurred in hauling his drilling rig and machinery from where they were to the well that he began drilling; (2) the expense necessarily incurred in rigging up and drilling to the point where drilling was stopped; (3) reasonable compensation for services in removing the rigging and drilling machinery; (4) reasonable compensation for the enforced idleness of the rig and machinery; (5) the reasonable value of the well driller's services lost

⁷⁹ Millan vs. Bartlett Co., 78 W. Va. 367, 89 S. E. 711.

⁸⁰ Ardizzone vs. Archer, — Okla. —, 177 Pac. 554, 178 Pac. 263; see, also, Oklahoma Co. vs. Winship, — Okla. —, 200 Pac. 849; Texas Co. vs. Bruce, — Tex. C. A. —, 233 S. W. 539; see, also, Gibson vs. Texas Co., — Tex. C. A. —, 239 S. W. 671. While an assignee of an oil and gas lease is not liable for the consequences of the failure of his assignor to drill a well on the leased premises before the assignment of the lease, yet if the assignee continues to pay the stipulated delay rental in lieu of drilling after the acceptance of the assignment after he acquires title, he is liable for the consequence of his own failure. Hefner vs. Light Co., *supra* ⁽⁶⁾; see Pierce Ass'n vs. Woodrum, *supra* ⁽⁴²⁾.

⁸¹ Columbus Co. vs. Knox Co., 91 Ohio St. 35, 109 N. E. 529.

⁸² Steele vs. American Co., *supra* ⁽⁶²⁾.

during the time he remained on the premises at the request of the lessee of the land.⁸³

§ 54. Invalid Lease.

Where a lessee, with no intention to violate any law or do any wrongful act, takes possession of land under a lease owned by him, and in good faith, believing in his title, proceeds to develop the premises for oil and gas purposes and it later develops that his lease was invalid, the measure of damages would be the price of the oil and gas at the surface or in the pipe line or tanks, less the reasonable cost of producing the same.⁸⁴

§ 55. Adverse Interest Established.

Where a lessee in good faith takes peaceable possession of the leased premises, believing that the lessor owned the entire title in the premises, and an action is brought by another person, who establishes an interest in the land, the measure of damages arising in favor of the party establishing a partial interest in the premises is the value of his share of the oil at the surface less the reasonable cost of production.⁸⁵

§ 56. Failure to Develop.

A lessor of lands for the production of oil and gas in an action against the lessee for failure to properly develop the leased premises, is entitled only to such damages as he sustained by any failure on the part of the lessee to exercise an honest judgment in proceeding with the necessary explorations on the leased lands and the extraction of oil therefrom, taking into consideration (1) the subject matter of the lease; (2) the character of the mineral products; (3) the nature of the oil-bearing sand, whether dense or soft and porous; (4) developments on contiguous lands, whether by the lessee or different operators; (5) the cost of drilling; (6) proximity to market; (7) facilities for marketing; (8) current prices, whether high or low; (9) location of lands; (10) and such other conditions attendant on the operations as may explain the necessity for prompt, or excuse for delayed action in prosecuting such development. In such case the lessor assumes the burden of showing, and by clear and convincing proof, must, to avail him, show by witnesses having experience, skill, and engaged in similar operations that the lessee, having due regard for the advantage and profit of him-

⁸³ Letcher vs. Maloney, 70 Okla. —, 172 Pac. 972. For cases involving damage to the surface by another's oil operations or negligence, see Duvall vs. White, 46 Cal. A. 305, 189 Pac. 324; Northrup vs. Eakes, — Okla. —, 178 Pac. 266; Walters vs. Prairie Co., 85 Okla. 77, 204 Pac. 906; Kay & Kiowa Co. vs. Moore, — Okla. —, 221 Pac. 511; Avery vs. Wallace, — Okla. —, 224 Pac. 515; Indiana Co. vs. Christensen, 188 Ind. 406, 123 N. E. 789; see, generally, Brennan Co. vs. Cumberland, 29 App. D. C. 554; Kuhn vs. Jewett, 32 N. J. Eq. 647; Texas Co. vs. Bellar, 51 Tex. C. A. 154, 112 S. W. 323; Texas Co. vs. Clark, — Tex. C. A. —, 182 S. W. 351. The value of the land immediately before the overflow and its value immediately afterwards is a proper way to arrive at the amount of damage to the land. Avery vs. Wallace, *supra*. In a suit for damages for the destruction of a growing crop, such damages are to be estimated as of the time of the injury, to be applied as compensation for the value of the crops in the condition in which they were at the time of the destruction. DeArman vs. Oglesby, 49 Okla. 118, 152 Pac. 356; Producers Co. vs. Maple Leaf Co., 82 Okla. 120, 198 Pac. 577.

⁸⁴ Barnes vs. Winona Oil Co., 83 Okla. 253, 200 Pac. 985.

⁸⁵ Minshall vs. Berryhill, 83 Okla. 100, 205 Pac. 932.

self, and the lessor, has not, surrounding circumstances considered, exercised ordinary diligence in conducting such operations.⁸⁶

§ 57. Liquidated Damages.

A covenant in a lease that the lessee should commence operations by a certain date and on failure to do so he should pay the lessor a stated sum for each and every month in which he fails to commence such operations is not a penalty but liquidated damages. In an action on such a lease to recover the amount of the monthly payments, proof of the amount of damages is unnecessary as the amount is fixed by the terms of the lease. Damages for breaches of contract touching future interests in oil wells of unknown value are of such remote and speculative value as to bring them peculiarly within the rule that the parties should have the right to fix them by mutual agreement. It would be impossible to calculate with any degree of certainty the amount of damage sustained by a lessor by reason of the breach of the covenant of such a lease by the lessee.⁸⁷

§ 58. Partition.

A lessee in an oil and gas lease can not contest the title of his lessor as an owner in indivision with others and compel him and his co-owners to make a judicial partition in kind of the leased property.⁸⁸

§ 59. Widow's Rights.

The owner of land leased the same for oil and gas purposes and died before any wells were drilled. Partition was had of the leased land and dower lands were assigned to the widow and to the other heirs, respectively. Subsequently drilling operations were commenced and numerous producing wells drilled. In such case the wells drilled by the lessee

⁸⁶ *Grass vs. Big Creek Co.*, 75 W. Va. 719, 84 S. E. 750; see *Clark vs. Cooper*, 197 Ky. 530, 247 S. W. 929. It was stipulated in an oil and gas lease that the lessee should develop the land by boring for oil and gas and should drill a well to a certain depth. The lessee failed to drill the well to the specified depth and abandoned the well before reaching such depth. The lessor was entitled to recover as damages for a breach of the lease the reasonable value of the lease, as this must be regarded as the actual value paid by the lessor to have the well drilled as specified. *Henry Oil Co. vs. Head*, — Tex. C. A. —, 163 S. W. 311. A lessor in an oil and gas lease may maintain a suit against the lessee to recover damages for injuries sustained by him because of the failure of the lessee to drill off-set wells necessary to save the oil and gas in the leased land and to prevent it from being drained by wells on adjacent lands. The damages sought in such an action is for diminution of the royalties by reason of such drainage. *Steele vs. American Co.*, *supra* ⁽³²⁾.

⁸⁷ *Allen vs. Narver*, *supra* ⁽⁴²⁾. There is some conflict in the decisions of the Courts of Civil Appeal of Texas as to whether or not, under any circumstances, a contract can specifically be performed when it carries with it a clause providing for "liquidated damages." Most of these courts hold that a contract of this sort is a mere option, where it provides for "liquidated damages" under conditions showing an express or implied agreement on the part of the vendor to accept such damages in lieu of a performance of the contract. *Texlouana Co. vs. Wall*, — Tex. C. A. —, 257 S. W. 875.

⁸⁸ *Gulf Co. vs. Hayne*, *supra* ⁽¹⁾; see *Campbell vs. Lynch*, *supra* ⁽³⁶⁾, as to partition between copartners. Known oil lands, like mines, can not be judicially partitioned in kind at the suit of one of the coowners or by a creditor of a coowner. A suit for partition usually results in a decree for the sale of the property. *Royston vs. Miller*, 76 Fed. 50; *Mitchell vs. Cline*, 84 Cal. 409, 24 Pac. 164. This particularly as to oil and gas lands. *Hall vs. Vernon*, 47 W. Va. 295, 34 S. E. 764; but see *Daingerfield vs. Caldwell*, 151 Fed. 554. The partition may be voluntary. *Dunlap vs. Jackson*, — Okla. —, 219 Pac. 314; see *Tonopah Co. vs. Tonopah Co.*, 125 Fed. 400; *Empire State Co. vs. Bunker Hill Co.*, 131 Fed. 591; *Mullins vs. Butte H. Co.*, 25 Mont. 525, 65 Pac. 1004.

on the portion of the land assigned to the widow as and for her dower are not mines nor wells worked by her, since the working right is held by the lessee even though they may be deemed mines opened in her husband's life. She is not entitled to the entire royalties and rents accruing from such wells nor is her dower right limited to such royalty and rents as subjects thereof. She is entitled to dower to whatever its extent may be when the royalties and rents accrue from all the wells drilled on the entire tract of land covered by the lease.⁸⁹

§ 60. Lessee's Rights.

On the death of a lessor of an oil and gas lease the leased lands descend to the lessor's heirs burdened by the right of the lessee. The latter is the complete master of the situation *quo ad* the oil and gas, having right to drill wherever he chooses on the leased premises. A partition of the land among the heirs in no way affects the lessee's right or liberty in that respect. A lease on a single tract of land subsequently broken into several subdivisions by a partition or by conveyances is not segregated and converted into as many distinct leases as there are subdivisions. That could be done only with the consent and cooperation of the lessee. As to him the lease and its subject, the tract of land, are entireties. After, as well as before, the division, there is one lease of one tract, yielding, when productive, one royalty or rental in the aggregate. The rent or royalty is an entire thing arising out of the whole tract of land. Though the royalty oil or gas rental comes from a certain well or wells, it is not legally the rent or return of the wells or the severed tract of land on which they are located. It is rent of the whole tract covered by the lease. In legal contemplation the wells are not drilled on the several portions as under the lease on that portion, but they are drilled under the lease as made, which binds and holds all the parties after the division as it did before.⁹⁰

§ 61. Purchaser's Rights.

A tract of land covered by an oil and gas lease was subdivided in a proceeding in bankruptcy. Each subdivision was sold separately by the trustee to different purchasers. The purchasers of these respective parcels of land from the trustee bought all of the estate therein subject only to the right of the oil and gas lessee to explore for and produce the oil and gas. This right conferred upon the lessee is the same as would have existed in the different purchasers had there been no lease. From this it follows that the purchaser of each subdivision is entitled to the royalties on all of the oil produced from wells drilled on his subdivision and royalties from the oil or gas must be paid to the owner of the subdivision upon which the wells are drilled from which the production is had.⁹¹

⁸⁹ Campbell vs. Lynch, *supra* (36).

⁹⁰ Id.

⁹¹ Pittsburgh Co. vs. Ankrom, *supra* (46); see Osborn vs. Arkansas Co., 103 Ark. 175, 146 S. W. 122; Fairbanks vs. Warrum, *supra* (33); Ohio Co. vs. Ullrey, 68 Ohio St. 259, 67 N. E. 494; Pierce Oil Co. vs. Schacht, *supra* (46); Wettengel vs. Gormley, *supra* (46); a case containing an extensive review of cases bearing upon this principle; see, also, Gillette vs. Mitchell, *supra* (46).

§ 62. Cancellation and Rescission.

A lessor of an oil and gas lease, invoking the jurisdiction of a court of equity to cancel and rescind the lease for the breach of an implied covenant, must come into court with clean hands. He must act with reasonable diligence after the discovery of his right to a forfeiture of the lease on account of its breach.⁹²

§ 63. Laches.

The doctrine is well settled, both in the English courts and the courts of this country, as to the relentless enforcement of the doctrine of laches where the subject of controversy is mining and oil property purely speculative in value.⁹³ Inexcusable delay for a period short of the time provided by the statute of limitations may constitute laches, and is an equitable defense wholly independent and outside of such statute, whenever the relief sought is wholly equitable.⁹⁴ Delay can not be excused except by some actual hindrance or impediment caused by the fraud or concealment of the party in possession.⁹⁵ Mere lapse of time never constitutes laches, but in addition the court must find that it would be inequitable to grant the relief prayed for.⁹⁶ The mere institution of a suit does not relieve the plaintiff of the charge of laches.

⁹² *Pierce Corp. vs. Schacht*, *supra* (46); see *Michigan Pipe Line Co.*, 111 Fed. 284; *Washburn vs. Gillespie*, 261 Fed. 41; *Indiana Co. vs. McCrory*, *supra* (17); *Wellsville Co. vs. Miller*, *supra* (57). In case of a breach of an implied covenant to properly develop an oil and gas lease the lessor must notify the lessee and demand that the lessee comply with the implied covenants before a court will grant a forfeiture. *Papoose Oil Co. vs. Tainey*, 89 Okla. 110, 213 Pac. 882. Mere inadequacy of consideration or other inequality in the terms of a lease does not of itself constitute a ground to avoid it in equity. See *Smith vs. McCullough*, 285 Fed. 699. In a suit to cancel an oil and gas lease for failure to operate an existing well and for other reasons, that lessor had received royalties from the well could not operate as an estoppel, nor affect his right to sue for cancellation for failure to comply with other obligations of the lease. *Louisiana Co. vs. Kendall*, 155 La. 1, 98 So. 862. In many of the cases it is pointed out that where the conditions of the instrument giving a right to explore for oil provide for the cancellation thereof at a fixed time unless a certain rent be paid for an extension of the time within which to commence operations, such extension becomes entirely optional with the licensee, and that equity will not relieve against his failure to exercise the option in strict accordance with its terms. *Taylor vs. Hamilton*, *supra* (2).

⁹³ *Twin Licks Co. vs. Marbury*, 91 U. S. 587; *Johnson vs. Standard Co.*, 148 U. S. 360; *Gaines vs. Chew*, 167 Fed. 630; *Taylor vs. Salt Creek Co.*, 285 Fed. 532; *Hodson vs. Federal Oil Co.*, 285 Fed. 552; *Beck vs. Finley*, 77 Okla. 213, 187 Pac. 488; see *Hazzard vs. Johnson*, *supra*. In some cases the diligence required is measured by months rather than by years. And in some others a delay of two, three or four years has been held to be fatal. *Patterson vs. Hewitt*, 195 U. S. 309; *Starkweather vs. Jenner*, 216 U. S. 524; *Bacon vs. Neill*, 283 Fed. 717. Under the general equity principles, not the time when the fraud is committed, but when it is discovered, or might have been discovered by the exercise of ordinary diligence, fixes the time when the cause of action accrues. *Tilden vs. Barber*, 168 Fed. 591; *Taylor vs. Salt Creek Co.*, *supra*. In *Jackson vs. Jackson*, 175 Fed. 719, a delay of three years in asserting an interest in oil lands was held laches.

⁹⁴ *Jewell vs. Trilby Mines*, 229 Fed. 298; *Scruggs vs. Decatur Co.*, 86 Ala. 173, 5 So. 440; *Great West Co. vs. Woodmas Co.*, 14 Colo. 90, 23 Pac. 908; *Morrow vs. Mathew*, 10 Ida. 423, 79 Pac. 196. When a suit is brought within the time limited by the statute of limitations the burden is upon the defendant to show, by demurrer or answer, that unusual conditions or extraordinary circumstances exist which require the application of the doctrine of laches. When suit is brought after the statutory time has elapsed, the burden is upon the plaintiff to show by suitable allegations in the complaint that it would be inequitable to apply it to his case. *Stevens vs. Grand Central Co.*, 133 Fed. 28; *Steinbach vs. Bon Homme Co.*, 152 Fed. 333; *Morse vs. Smythe*, 255 Fed. 981, 46 Colo. 199, 102 Pac. 1072.

⁹⁵ *Wagner vs. Baird*, 7 How. 234; *Lansdale vs. Smith*, 106 U. S. 391; *Westerman vs. Dinsmore*, 68 W. Va. 591, 71 S. E. 250. While the law imposes the requirement of reasonable promptness in all cases to avoid laches, it requires greater diligence and activity in seeking to rescind transactions with reference to oil values affected by extraordinary uncertainty and fluctuations as they are, than with reference to ordinary dealings. *Minchew vs. Morris*, — Tex. C. A. —, 241 S. W. 215. For instances of excusable delay, see *Mexico-Wyoming Co. vs. Valentine*, 237 Fed. 150; *Stone vs. Marshall Co.*, 188 Pa. St. 692, 41 Atl. 748, 1119.

⁹⁶ *O'Brien vs. Wheelock*, 184 U. S. 482; *Stevens vs. Grand Central Co.*, *supra* (94); *Mexico-Wyoming Co.*, *supra* (95); *Minnesota Co. vs. McGirr*, 263 Fed. 482.

Because of his failure to prosecute the suit, the consequences are the same as if no suit had been begun.⁹⁷ In other words, a party is as much open to the charge of laches for the failure to prosecute a suit diligently as if he had unduly delayed its institution.⁹⁸

§ 64. Injunction.

An injunction to prevent an alleged trespasser from drilling oil wells and appropriating and removing oil from the premises in controversy in effect permits the complainant to drill for, remove and market the oil from the land in dispute. If the complainant has no legal title to the land as claimed by the defendant and the defendant has in fact a duly approved oil lease from the rightful owner, the injunction might work an injustice to such lessee and the owner, but for the fact that the courts have ample authority to safeguard their interest if in a proper proceeding a probability of recovery is shown.⁹⁹

§ 65. Removal of Machinery and Fixtures.

The parties to an oil and gas lease may by their contract stipulate what machinery and fixtures may be removed upon the termination of the lease. Such a stipulation is controlling.¹⁰⁰

§ 66. Sale Under Foreclosure Proceedings.

An oil and gas lease executed subsequent to a mortgage will terminate upon the foreclosure of the mortgage, and a sale of the premises under the decree of foreclosure.¹⁰¹

§ 67. Deeds.

Independent estates may be carved out of the same land as where the owner of the surface grants only the right to the underlying minerals.¹⁰²

⁹⁷ Northrup vs. Browne, 204 Fed. 122; U. S. vs. Fletcher, 231 Fed. 326; Taylor vs. Salt Creek Co., *supra* (99); Grand Lodge vs. Graham, 96 Iowa 615, 65 N. W. 842; see, also, Mackall vs. Casilear, 137 U. S. 556; Willard vs. Wood, 164 U. S. 525; O'Brien vs. Wheelock, *supra* (60).

⁹⁸ U. S. vs. Fletcher, 242 Fed. 818. Where the defendant has not been prejudiced and there is a reasonable excuse for the delay, the suit is not barred. Central Co. vs. Jersey City, 199 Fed. 245; see Porto Rico Co. vs. Conklin, 271 Fed. 570. Where a party interposing a defense of laches has contributed to or caused the delay, he can not take advantage of it. N. P. R. Co. vs. Boyd, 177 Fed. 804.

⁹⁹ Collier vs. Bartlett. — Okla. —, 175 Pac. 247; see Washburn vs. Gillespie, 261 Fed. 41; Advance Oil Co. vs. Hunt, *supra* (60). A preliminary injunction should only be granted where injury to the property of plaintiff is imminent and, if committed, irreparable. And it generally will not be awarded where the plaintiff's right is not clear or, to turn the proposition around, where the wrong is not manifest. Courts of equity invariably, on a hearing for preliminary injunction, endeavor so far as possible to make such decree, however it may be framed, as will maintain the *status quo* until final hearing or judgment. Hicks vs. American Co., 207 Pa. St. 570, 57 Atl. 55; see, also, Pellissier vs. Whittier Co., 59 Cal. A. 1, 209 Pac. 593. The unlawful extraction of petroleum oil or gas from land, they being a part of the land, is an act of irreparable injury. Bettman vs. Harness, 42 W. Va. 433, 26 S. E. 271; Moore vs. Jennings, 47 W. Va. 181, 34 S. E. 793; see, also, U. S. vs. Dominion Oil Co., 241 Fed. 426.

¹⁰⁰ In re American Fork Co., 291 Fed. 746; see, also, Collins vs. Mt. Pleasant Co., 85 Kan. 483, 118 Pac. 54; see Wisconsin-Texas Co. vs. Clutter, *supra* (64) for a case in which no right was given to remove casing from the well.

¹⁰¹ Mercantile Trust Co. vs. Sunset Road Co., 176 Cal. 461, 195 Pac. 466.

¹⁰² Catron vs. South Butte Co., 181 Fed. 941; Stinchfield vs. Gillis, 96 Cal. 33, 30 Pac. 839; Smith vs. Jones, 21 Utah 270, 60 Pac. 1104; see note 106, *infra*. For rights of owner of surface as against owner of minerals thereunder, see West Pratt Co. vs. Dorman, and monographic note, 135 Am. St. Repts. 127. See, also, Vance vs. Clark, 252 Fed. 498; Midkiff vs. Colton, 252 Fed. 424. The carving out of a separate estate in the oil and gas in land is a common occurrence in oil- and gas-producing fields. A reservation or exception of the minerals in a tract of land is a separation of the estate in the minerals from the lease of the surface, and it makes no difference whether the word used is "excepted" or "reserved." DeMoss vs. Sample, *supra* (61); Mandle vs. Gharing, 256 Pa. St. 121, 100 Atl. 535.

§ 68. Construction of Deed.

A deed must be determined by the laws of the state in which the lands it conveys are situate, irrespective of where it may have been executed, or the grantors reside.¹⁰³

§ 69. Abstract of Title.

A contract for the purchase of an oil and gas lease required the lessor to submit to a certain named attorney a complete abstract of title to the land and that the lease should take effect and the obligations of the parties accrue "only in case such attorney should approve the title to the land." The contract provided that the lessee should deposit in a bank fifteen hundred dollars as earnest money and on the failure of the lessee to comply with the contract in beginning work, as agreed, the money should be paid to the lessor as liquidated damages. Upon the submission of the abstract of the title the attorney disapproved of the title. The reasonable conclusion from the language of the contract is that in the event of the approval of the abstract the contract should be effectual and binding but in the event of the disapproval of the title should not take effect. The mutual obligations of the parties should accrue only in case of the approval of the title. A bank was not authorized to pay the deposit to the lessor after the disapproval of the title and the lessee was entitled to recover from the bank and the lessor. In an action by the lessor to enforce the sale after the title has been rejected by the attorney, the burden was upon the lessor to prove that the lessee or the attorney acted in bad faith in rejecting the title.¹⁰⁴

§ 70. Income.

In legal effect the bonus, rentals, and royalty accruing under oil and gas leases are income from mineral resources. The Supreme Court of the United States has held that the bonus or down payment received by landowners at the time of making a lease is to be treated as a royalty, for the reason that it is income from the use of the mineral resources of the land.¹⁰⁵

§ 71. Taxation.

Mining rights and privileges under an oil lease are subject to taxation

¹⁰³ Plattner vs. Vincent, 187 Cal. 451, 202 Pac. 216; see, also, Rose's notes to McGoon vs. Scales, 76 U. S. 23. For construction of deed and agreement to develop mining property, see White vs. Hendley, 185 Cal. 614, 198 Pac. 22, 169 Pac. 710. For an elaborate discussion of the effect of a deed reserving a part of the royalty of all gas or oil or the proceeds therefrom, which may be produced from the deeded premises, see Dunlap vs. Jackson, *supra* (68); see, also, Dill vs. Rockwell, — Okla. —, 220 Pac. 620. It may be stated as a general proposition that if the deed or written instrument furnishes other sufficient means of identifying the property conveyed, the failure to state the town, county or state where the same is situate will not make the deed or instrument void nor inoperative. Miller vs. Hodges, — Tex. C. A. —, 260 S. W. 170. Where there is uncertainty in specific description, the quantity named may be of decisive weight. Ainsa vs. U. S., 161 U. S. 220; Producers Co. vs. Hanzen, 238 U. S. 338. If the property has a known descriptive name, it may be sufficiently described by such name. Glacier vs. Willis, 127 U. S. 471; Reed vs. Munn, 148 Fed. 737; Carter vs. Bacigalupi, 83 Cal. 187, 23 Pac. 361; Berquist vs. W. Virginia Co., 18 Wyo. 234, 106 Pac. 673. That a property is known by several names and only one of them is given is immaterial. Lebanon Co. vs. Con. Republican Co., 6 Colo. 371; Collins vs. McKay, 36 Mont. 123, 92 Pac. 295; see Shoshone Co. vs. Rutter, 87 Fed. 801.

¹⁰⁴ First Nat. Bank vs. Clay, — Okla. —, 177 Pac. 115; see, also, Merrill vs. Rocky Mt. Co., 26 Wyo. 219, 181 Pac. 972; St. Louis Co. vs. Nity, — Okla. —, 224 Pac. 982.

¹⁰⁵ Wright vs. Carter Oil Co., — Okla. —, 223 Pac. 835; and see Von Baumbach vs. Sargent Co., *supra* (3); U. S. vs. Biwabik Co., 247 U. S. 124; Work vs. U. S., 261 U. S. 352.

from and in addition to the interest or estate of the lessor,¹⁰⁶ whether the title be in the United States or in the state.¹⁰⁷

§ 72. Insurance.

An insurance policy covering oil in tanks provided that the company should not be liable beyond the actual cash value of the property at the time of the loss and the loss shall be ascertained according to such actual cash value, with proper deductions for depreciation. On the loss of the oil insured the actual cash value was to be the measure of damages, but it could not exceed what it would cost the insured to replace it. The cash value of an article is the amount of cash for which it will exchange in fact; and the cash value is the market value for which an article will sell for in cash on the market. Where a state had a state corporation which fixed the price of oil and no one had a legal right to sell oil in the state for less than the price so established, this is sufficient to establish the cash value of the oil, especially in the absence of countervailing evidence.¹⁰⁸

§ 73. State Inspection Laws.

A state may pass proper inspection laws for oils brought into its borders in interstate commerce. But a state may not impose burdens upon interstate commerce in the matter of oil inspection.¹⁰⁹

§ 74. Pipe Lines.

A pipe line company is a common carrier,¹¹⁰ may exercise the right of eminent domain,¹¹¹ is subject to control, and its rates to regulation, by the state.¹¹²

¹⁰⁶ Each of separate layers of strata becomes a subject of taxation, levy and sale, precisely like the surface. *Murray vs. Allred*, 100 Tenn. 100, 43 S. W. 355; see, also, *McGraw vs. Lakin*, 67 W. Va. 385, 68 S. E. 27; *Appeal of Colby*, 184 Iowa 1104, 169 N. W. 443. There may be several estates in the same land owned by different persons, one owning the surface, another the timber, and a third the minerals underground, each being a separate estate and each may be separately taxed. *N. P. R. Co. vs. Mjelde*, 48 Mont. 287, 137 Pac. 386; *Cobban Co. vs. Donlan*, 51 Mont. 58, 149 Pac. 487; see, also, *Stephens Co. vs. Mid-Kansas Co.*, — Tex. —, 254 S. W. 290; but see *Indian Co.*, — Okla. —, 142 Pac. 997.

¹⁰⁷ *Graciosa Oil Co. vs. Santa Barbara Co.*, 155 Cal. 140, 99 Pac. 483; see *Barnes vs. Bee*, 138 Fed. 476; *Con. Coal Co. vs. Baker*, 135 Ill. 545, 26 N. E. 651. A sale for taxes while the title still is in the United States is void, the land not being subject to taxation by the state. *Secret Valley Co. vs. Perry*, 187 Cal. 423, 202 Pac. 449. While unpatented, mining claim is not subject to taxation. *Doyle vs. Austin*, 47 Cal. 353. The possessory right thereto and the product from the location may be taxed and the lien enforced by a sale of the right of possession. The right of possession means the claim itself, that is, the right of possession of the land for mining purposes. The tax deed conveys merely such right without affecting the interest of the United States. *Elder vs. Wood*, 208 U. S. 226. An oil and gas lease by which the lessee is granted the privilege of drilling for and producing oil, if it can be found on the premises, is property and is regarded as a thing of value and is subject to taxation. *Raydure vs. Board*, 183 Ky. 84, 209 S. W. 19; see, generally, *Large Oil Co. vs. Howard*, 63 Okla. 143, 163 Pac. 537.

¹⁰⁸ *Globe & Rutgers vs. Prairie Oil & Gas Co.*, 248 Fed. 458.

¹⁰⁹ *Standard Oil Co. vs. Graves*, 249 U. S. 389; see *Pure Oil Co. vs. Minnesota*, 248 U. S. 158; *Bartels-Northern Oil Co. vs. Kackman*, 29 N. Dak. 236, 150 N. W. 576; *Castle vs. Mason*, 91 Ohio St. 296, 110 N. E. 463. For a review of state inspection laws, see *Red "C" Co. vs. Board*, 222 U. S. 380.

¹¹⁰ *Prairie Co. vs. U. S.*, 204 Fed. 798. That a pipe line company may be a common carrier though it transports oil only for a corporation owning its capital stock, see *Meischke-Smith vs. Wardell*, 286 Fed. 785; see *The Pipe Line Cases*, 234 U. S. 562; and see *Producers Co. vs. R. R. Comm.*, 251 U. S. 228, affirming 176 Cal. 499, 169 Pac. 59.

¹¹¹ *Producers Co. vs. R. R. Comm.*, *supra* (110); *Consumers Co. vs. Harless*, 131 Ind. 446, 129 N. E. 1062.

¹¹² *Producers Co. vs. R. R. Comm.*, *supra* (110).

§ 75. Interstate Commerce.

The transportation of oil or gas from state to state through the medium of pipe lines is interstate commerce.¹¹³ It is not the usual practice of railway companies to furnish tank cars for shippers of oil.¹¹⁴

¹¹³ Public Utilities Comm. vs. Landon, 249 U. S. 245; see West vs. Kansas Co., 221 U. S. 229. The question whether particular commerce is interstate or intrastate is ordinarily determined by what is actually done and not by any mere billing or plurality of carriers. Where cars or tanks are in fact destined from one state to another, rebilling or reshipping en route does not of itself break the continuity of the movement nor require that any part be classified differently from the remainder. It is the essential character of the commerce, not the extent of local or other bill of lading. Western Oil Co. vs. Lipscomb, 244 U. S. 349; see, also, Landon vs. Public Utilities Comm., 242 Fed. 683; and see State vs. Landon, 100 Kan. 593, 165 Pac. 1112.

¹¹⁴ Chicago Co. vs. Lawton Co., 253 Fed. 708; compare Illinois Co. vs. Mulberry Co., 238 U. S. 282; see Penn. Co. vs. Puritan Co., 237 U. S. 127.

APPENDIX—FORMS.

Form No. 1.

(The subjoined is an approved form of an oil and gas lease. It is commonly called the 'Texas Lease'.)

OIL AND GAS LEASE.

AGREEMENT, made and entered into the _____ day of _____, 19____, by and between _____ of _____ County of _____, State of _____, part _____ of the first part hereinafter called lessor (whether one or more) and _____, party of the second part hereinafter called lessee.

WITNESSETH, That the said lessor, for and in consideration of _____ DOLLARS cash in hand paid, receipt of which is hereby acknowledged, and of the covenants and agreements hereinafter contained on the part of lessee to be paid, kept and performed, ha_____ granted, conveyed, demised, leased and let, and by these presents do_____ grant, convey, demise, lease and let exclusively unto the said lessee, for the sole and only purpose of mining and operating for oil and gas, and of laying pipe lines, and of building tanks, power-stations and structures thereon to produce, save and take care of said products, all that certain tract of land situated in the County of _____, State of _____, Section _____, Township _____, _____ Range, _____, _____ M., and containing _____ acres, more or less.

It is agreed that this lease shall remain in force for a term of _____ years from this date, and as long thereafter as oil or gas, or either of them, is produced from said land by the lessee.

In consideration of the premises the said lessee covenants and agrees:
1st. To deliver to the credit of lessor, free of cost, in the tanks or pipe lines to which he may connect his wells, the equal _____ part of all oil produced and saved from the leased premises.

2d. To pay the lessor _____ DOLLARS each year in advance, for the gas from each well where gas only is found, while the same is being used off the premises, and lessor to have gas free of cost from any such well for all stoves and all inside lights in the

principal dwelling house on said land during the same time by making his own connection with the well at his own risk and expense.

3d. To pay lessor for gas produced from any oil well and used off the premises at the rate of _____ DOLLARS per year, for the time during which such gas shall be used, said payments to be made each three months in advance.

If no well be commenced on said land on or before the _____ day of _____, 19____, this lease shall terminate as to both parties, unless the lessee on or before that date shall pay or tender to the lessor, or to the lessor's credit in the _____ Bank at _____, or its successors, which shall continue as the depository regardless of changes in the ownership of said land, the sum of _____ DOLLARS, which shall operate as a rental and cover the privilege of deferring the commencement of a well for _____ months from said date. In like manner and upon like payments or tenders the commencement of a well may be further deferred for like period of the same number of months successively. And it is understood and agreed that the consideration first recited herein, the down payment covers not only the privileges granted to the date when said first rental is payable as aforesaid, but also the lessee's option of extending that period as aforesaid, and any and all other rights conferred.

Should the first well drilled on the above described land be a dry hole, then, and in that event, if a second well is not commenced on said land within twelve months from the expiration of the last rental period for which rental has been paid, this lease shall terminate as to both parties, unless the lessee on or before the expiration of said twelve months shall resume the payment of rentals in the same amount and in the same manner as hereinbefore provided. And it is agreed that upon the resumption of the payment of rentals, as above provided, that the last preceding paragraph hereof, governing the payment of rentals and the effect thereof, shall continue in force just as though there had been no interruption in the rental payments.

If said lessor owns a less interest in the above described land than the entire and undivided fee simple estate therein, the royalties and rentals herein provided shall be paid the lessor only in the proportion which _____ interest bears to the whole and undivided fee.

Lessee shall have the right to use, free of cost, gas, oil and water produced on said land for his operations thereon except water from wells of lessor.

When requested by lessor, lessee shall bury his pipe lines below plow depth. No well shall be drilled nearer than 200 feet to the house or barn now on said premises. Lessee shall pay for damages caused by his operations to growing crops on said land. Lessee shall have the right at any time to remove all machinery and fixtures placed on said premises, including the right to draw and remove casing.

If the estate of either party hereto is assigned—and the privilege of assigning in whole or in part is expressly allowed—the covenants hereof shall extend to the assigns and successive assigns, but no change in the ownership of the land or assignment of rentals or royalties shall be binding on the lessee until after the lessee has been furnished a written transfer or assignment or a true copy thereof; and it is hereby agreed that in the event this lease shall be assigned as to a part or as to parts

of the above described lands and the assignee or assignees of such part or parts shall fail or make default in the payment of the proportionate part of the rents due from him or them, such default shall not operate to defeat or affect this lease in so far as it covers a part or parts of said lands upon which the said lessee or any assignee thereof shall make due payment of said rental.

Lessor hereby warrants and agrees to defend the title to the lands herein described, and agrees that the lessee shall have the right at any time to redeem for lessor, by payment, and mortgages, taxes or other liens on the above described lands, in the event of default of payment by lessor, and be subrogated to the rights of the holder thereof.

 In TESTIMONY WHEREOF, We, in duplicate, sign, this the
 ----- day of -----, 19-----.

Witness: -----

For another form of lease see Washburn vs. Gillespie, 261 Fed. 42.

Form No. 2.

ASSIGNMENT OF LEASE.

(Precedent in Ratcliff vs. Paul, — Kan. —, 220 Pac. 279.)

Know all men by these presents: That -----, on this ----- day of -----, for and in consideration of one dollar and other considerations, the receipt whereof is hereby acknowledged, do hereby assign, sell, transfer and set over unto ----- all ----- right, title, and interest, in and to an oil and gas mining lease, the land assigned being described to wit: (Description) (Record reference to lease). That ----- are the lawful owner -- and holder -- of said oil and gas mining lease, and the same is free from all incumbrances and that ----- have good right and title to sell and assign the same. Witness ----- hand -- the day and year first above written.

I, -----, wife of the said -----, for the considerations aforesaid, do hereby join in this assignment and hereby release and relinquish all my rights of dower and homestead in and to the lease and rights above assigned and transferred.

Form No. 3.

EXTENSION OF LEASE.

(Precedent in Pellissier vs. Pan-American Co., 41 Cal. A. D. 415, 217 Pac. 570.)

The lessor -- hereby agree -- that in lieu of commencing and prosecuting operations, for the drilling of a well upon said land described in and leased by said indenture of lease, the lessee -- may, if ----- shall so elect, pay to the lessor -- on the ----- day of each and every calendar month, for an additional period of ----- months, commencing on the ----- day of -----, as and for rental for said land the

sum of _____ dollars per month, and such payments so made from month to month, shall relieve the lessee__ of and from all obligations to commence or prosecute any drilling or other operations upon said land during such month. In witness whereof the said lessor__ ha__ hereunto set _____ hand__ the _____ day of _____ State of _____,

Form No. 4.

CONJOINT DEED AND LEASE.

(Precedent in Wright vs. Carter Oil Co., — Okla. —, 223 Pac. 835.)

State of _____, County of _____ ss.

Know all men by these presents: That _____ and _____, parties of the first part, in consideration of the sum of _____ dollars, in hand paid, the receipt of which is hereby acknowledged, do hereby grant, bargain, sell and convey unto _____, the party of the second part, an undivided _____ interest in and to all of the mineral rights, including oil, natural gas and petroleum in _____ (description) in _____ County, State of _____, with the right and privilege to the grantors and grantee, or either of them, to go on said land and explore, operate, drill and mine for oil and gas, and other minerals, and to sell the products thereof and divide the same or the proceeds thereof as their interests appear and as provided herein. It is expressly understood, however, that this grant is subject to a certain oil and gas lease now on said premises, dated _____, made and executed by the grantors to the _____ Company.

Signed and delivered this the _____ day of _____.

Witnesses:

Form No. 5.

*OIL WELL DRILLING CONTRACT.

(Precedent in Cook vs. Columbian Co., 144 Cal. 670, 78 Pac. 287.)

This agreement, made and entered into this _____ day of _____, 19____, between _____, of _____, the party of the first part, and _____, of _____, the party of the second part, Witnesseth:

That the party of the second part will furnish at his own cost and expense all the machinery, tools, paraphernalia and materials of all kinds, including labor, fuel, water, and any and all things of whatsoever kind and nature that may be necessary and needful (except casing, pipe and shoes) to properly perform the work of drilling or boring not less than _____ feet of hole or wells, and to drill or bore the same at any one or more places on the following described land situate, lying and being in the County of _____, State of _____, and more particularly described as follows, to wit:

*NOTE.—Under the provisions of an act to prevent injury to oil, gas or petroleum-bearing strata or formations by the penetration or infiltration of water therein, it is provided in California that any well drilled and abandoned in violation of the terms of the statute is a public nuisance and may be abated by appropriate action of the board of supervisors of the county. The expenses so incurred are a charge against the owner of the well and a lien upon the well. Interference with official action is a misdemeanor. Cal. Stats. 1909, p. 586; see, also, Stats. 1921, Chap. 912, Sec. 16.

For capping of wells to prevent wasteful escape of natural gas into the atmosphere see Stats. 1911, p. 499.

(Description)

and may be desired and designated by the party of the first part, for the agreed price per foot sunk, as shown and set forth in the following scale of prices, at different depths up to ----- feet, and in accordance with the further terms and conditions herein contained. Provided, however, that in case the drilling of any well shall be stopped by the party of the first part for any cause after it has been begun, that the party of the first part will pay the net cost of moving the drilling outfit to any other place on the said property where another well is to be started, in addition to the amount earned for the number of feet sunk in accordance with the said scale of prices per foot and that should work be stopped on any well for any cause, after a depth of ----- feet has been sunk, then the said party of the second part shall move the rig at his own cost and expense to the place designated by the party of the first part. That in case of abandonment of any well or wells for any cause the party of the second part will pull and remove, in a careful manner, all casing, pipe and fittings used in said well or wells that can be got out by a reasonable and faithful effort by the use of all appliances and tools ordinarily used in performing such work.

That all casing, pipe and shoes of the proper sizes necessary to be used in the well or wells will be furnished and delivered on the ground by the party of the first part and shall be of such sizes as such party may select, and the same shall be properly inserted and used in the wells by the party of the second part and carried to the bottom, if possible, without diminishing the size except in cases where it is found absolutely unavailable after the use of under-reamers and other appliances, as may be necessary and proper for keeping the whole in proper shape.

That in case a body of asphaltum be encountered at any considerable depth and it is found impossible after a faithful and reasonable effort so to do that it can not be drilled through nor penetrated by the use of any of the known tools and appliances, then the said well will be considered as completed and a settlement made in full for the depth drilled according to the said scale of prices; provided, however, that the party of the first part shall have full and free right and privilege to use and operate the machinery and outfit of the party of the second part at his own cost and expense for a period not to exceed -----, or until satisfied that the hole can not be sunk any deeper.

That in case oil, gas or asphaltum shall be found at any depth in any well and the party of the first part shall elect to stop drilling in such well, the party of the second part shall properly test the well and leave the same in condition ready for the pump or other working appliance before moving the rig and outfit away.

It is understood by and between both parties hereto that this contract is for a total of ----- feet of hole or wells, and that the party of the second part agrees to put down any one hole to a total depth of ----- feet, if the ground is such that it can possibly be done, by reasonable effort, or that he will stop the drilling of any well at any depth, as directed by the party of the first part and in accordance with the said scale of prices per foot sunk, and the terms and conditions herein contained.

That the party of the first part will pay, or cause to be paid, to the party of the second part the amount earned for each foot of hole sunk in accordance with the said scale of prices at times and as follows, to wit:

An advance sum of ----- dollars, when the rig and outfit are on the ground and ready to commence the work of drilling; ----- per cent of the amount earned as per scale when the well has been sunk to a depth of ----- feet and a like ----- per cent of the amount earned at the completion of each ----- feet until the well is either completed or abandoned, or the work stopped by the party of the first part, when the balance in full shall be paid, after deducting the said advance payment of ----- dollars.

Done in duplicate, the day and year first above written.

NOTE.—Federal and state leases on oil and other mineral lands will be covered in a future issue of 'Mining in California.'—Editor.



NOTE ON ANDALUSITE FROM CALIFORNIA.

A NEW USE AND SOME THERMAL PROPERTIES.*

By ALBERT B. PECK.¹

The andalusite described here is found at an elevation of 10,000 feet on the southwestern slope of White Mountain in the White Mountains of the Inyo Range, Mono County, California. The deposit itself is located across a canyon about two miles east and north of an occurrence described by Knopf.² The andalusite reported by Knopf, however, is at present of no commercial value owing to the fact that it carries too large amounts of quartz.

MINERALOGY.

Occurrence and Physical Properties.

The main mass of the andalusite rock can probably best be described as coarse granular, and it is generally of a gray or light pinkish brown color. On exposed surfaces the color is yellow brown due to oxidation.

The texture of the rock varies greatly. Many large fragments show a very distinctly coarse radial or columnar structure, definite rough crystals four or five inches in length being noted. At the other extreme are smaller areas which have a very fine granular texture, sugary in appearance and very friable, breaking down readily into a fine sand. While the material is generally quite compact there are occasional large cavities in the mass, and in these are sometimes found excellent groups of large coarse crystals at times reaching five inches or more in length.

The color of the material shows variation also. Crystals are generally white on the exterior but when broken show directly beneath the surface a pale apple green color. Columnar or radial masses also show green or gray color but granular masses are usually white, gray, or pinkish brown. This latter color is in reality due to inclusions of scattered rutile grains or crystals, as can readily be observed when examined microscopically.

Crystallography.

The crystals appearing in cavities are generally rather simple in form but of uncommon habit for andalusite. This probably accounts for the fact that of all those to whom a group has been shown, no one has as yet named the crystals as andalusite. The crystals are usually covered with a thin white coating which is dull and somewhat rough, so that accurate measurements of the crystal angles are impossible. Contact goniometer measurements, however, show sufficiently close relation to the theoretical values to establish the forms present. The crystals usually occur in more or less parallel groups terminated at one end only and are also attached to each other by the prism faces so that the prism zone is generally only partly complete.

*Read before the annual meeting of the Mineralogical Society of America at Washington, D. C., December, 1923. To appear in the *American Mineralogist*, June 1924.

¹ Mineralogical Laboratory, University of Michigan.

² *Journal Wash. Acad. Sc.*, 7, 549 (1917).

Figure 1 shows the form of a typical crystal. The predominant prism is $k(210)$ and the end of the form is terminated by the dome $r(101)$. Measurements of the angles are as follows:

	Observed	Calculated	
kk''''	$62^{\circ}-51^{\circ}$	52°	$30'$
rr'	72	70	56

The prism faces on the larger crystals are somewhat rounded, hence the variation in the angles noted for this form. Faces of the smaller

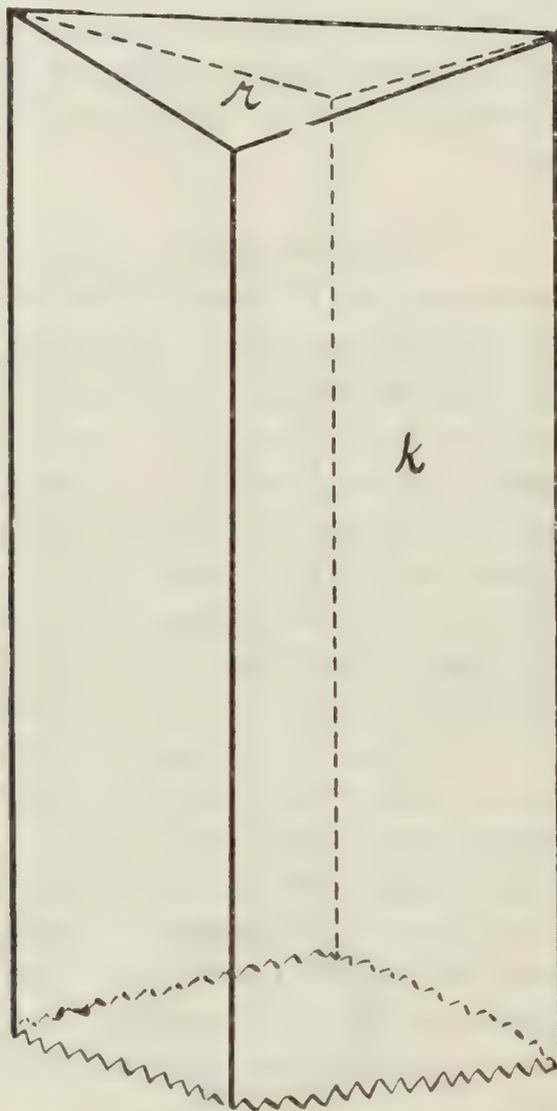


FIG. 1

crystals, however, give values close to those calculated for the form. Owing to the fact that the ratio of $a:b$ in andalusite is nearly 1:1, the angles for the forms (210) and (120) are very similar. It was necessary therefore in this case to make a thin section parallel to the base and determine the position of the optic plane. This was found to be in the short diagonal and being parallel to the a -axis, the prism then is established as $k(210)$. It follows that the dome is $r(101)$ and not $s(011)$, these two forms also being very similar in their angles.

Chemical Composition.

On the whole the rock material is a rather pure andalusite with comparatively small amounts of several other minerals. During mining; the material is constantly checked by specific gravity determinations on

a Jolly balance. Samples are taken over the face of the working and if favorable, the material is broken out, carefully hand selected, and sacked. Generally it runs at least 75–85 per cent andalusite upon microscopic examination. A typical chemical analysis from a sample representing a carload shipment recalculated to an Al_2SiO_5 basis will show over 90 per cent Al_2SiO_5 . Such an analysis follows:

SiO_2	33.78%	Equivalent to	
Al_2O_3	56.89	Al_2SiO_5	94.18%
H_2O	0.37	SiO_2	0.22
Ign. loss	3.67	Others	5.60
other deter.			
constituents	5.37	100.08	

The fact that the chemical analysis generally shows higher Al_2SiO_5 than is indicated by the microscopic examination is due to the very general presence of corundum in the material. In no case do the associated minerals assume any large proportion over any considerable area although locally they may occasionally outweigh the andalusite.

Associates.

The associates of the andalusite are also deserving of mention, especially because several are counted among the less common minerals.

Lazulite is perhaps the most unusual mineral associated with the andalusite. It occurs in small blue-green veinlets or masses scattered through the mass. Optically it shows a distinct light blue pleochroism. Chemical analysis usually shows small amounts of P_2O_5 present in the rock.

Pyrophyllite is another uncommon mineral found with the andalusite. It occurs in crusts of radial fibers on the walls of cracks or as radial masses in small cavities. Owing to its chemical composition, as soon as its water is lost it takes on nearly the same composition as andalusite and hence can hardly be considered as an impurity.

Muscovite also occurs in much the same manner as pyrophyllite and is somewhat more abundant but at no time reaches large proportions. It occurs in distinct plates, usually in divergent groups.

Corundum is a rather common associate of the granular andalusite and is usually deep sapphire blue in color. It is generally in small scattered plates or grains but occasionally may form lenses two or three inches in size. According to observation thus far it is always blue in color. In a few instances crystals of andalusite with blue corundum centers have been noted. For manufacturing purposes a small amount of corundum is favorable to the neutralization of the effect of any excess quartz in the rock.

Rutile is a rather constant associate, largely as microscopic inclusions in the andalusite. At times small free crystals can be found. The constant association of rutile and the blue color of the corundum would seem to confirm the theory that the color of sapphire is due to the presence of TiO_2 .

Pyrite is sometimes found locally, especially near open veins. When near the surface it has often weathered leaving a stained and porous rock.

The absence of quartz is very noticeable. It is almost never found in the andalusite proper but is confined to veins crossing the mass.

Barite also has been noted a few times, one large right angled twin having been found.

Lazurite also has been found, not in the andalusite but in veins of milky quartz adjacent to the mass. It is of interest to note that Knopf points out that the occurrence examined by him across the canyon and to the southwest was first staked as a silver mine, the bright blue lazurite being thought to be AgBr. After assay showed no silver the claim was dropped. Later the brown andalusite mass was staked again, this time under the impression that it was apatite. This in turn proved valueless and was relinquished.

USE.

This deposit of andalusite serves as an extremely good example of a comparatively useless, rare, or 'museum' mineral first becoming common enough to be available on a commercial scale, because it has heretofore been observed only in small scattered masses or crystals, and second, at the same time finding a commercial use, until at present about 70 tons per week are being mined. Both of these have been the result of patience and thorough scientific research.

For some years the manufacture of the porcelain core of the most modern type of automobile spark plug has tended toward the formation during the burning process of an increasingly higher content of a crystalline compound, thought to be an 'artificial sillimanite.' Bowen¹ has recently shown, however, that in artificial melts of Al_2O_3 and SiO_2 in varying proportions the compound $\text{Al}_2\text{O}_3\cdot\text{SiO}_2$ corresponding to natural sillimanite does not form as has been stated in the earlier work on the subject but that the compound formed has a composition $3\text{Al}_2\text{O}_3\cdot 2\text{SiO}_2$. Not only is this compound similar chemically to sillimanite but its physical and optical properties are remarkably similar as well.²

This 'artificial sillimanite' produced in ceramic ware results from the molecular changes taking place in clay under the influence of heat and various fluxes. The highest content of 'sillimanite' has been accomplished by introducing into the unburned body artificially prepared 'sillimanite' in the form of a calcine—a mixture of clay, alumina, and fluxes, heated to a high temperature of about 1500° C. This was of course an expensive method to obtain the desired end although it has been used for several years in the manufacture of spark plugs.

In order to eliminate the necessity of making an 'artificial sillimanite', the natural way out was to turn to one of the natural Al_2SiO_5 compounds, namely, sillimanite, andalusite, or cyanite, but here the difficulty of obtaining any of these in sufficiently large quantities and in a pure state presented itself until the California andalusite deposit was located.

¹ N. L. Bowen and J. W. Greig. J. Am. Cer. Soc., 7, 238-54 (1924).

² In the original manuscript of the present paper the writer regarded the crystalline compound formed by the inversion of andalusite and cyanite and the crystals formed in porcelain as sillimanite, following the earlier work of the Geophysical Laboratory on the system $\text{Al}_2\text{O}_3\cdot\text{SiO}_2$. Since the announcement of the work of Bowen and Greig it has been necessary in several cases to change 'sillimanite' to the new compound ' $3\text{Al}_2\text{O}_3\cdot 2\text{SiO}_2$.' This statement is made so that full credit may be given to them for the facts they have discovered and the writer's sincere thanks are due Dr. Bowen for his kindness in allowing this use of his manuscript before its actual publication.

Careful research was then able to substitute this natural material for the 'artificial sillimanite' with the result that not only was the manufacture less expensive but also that resulting article was better than the previous one.

Thermal Changes.

Although the material is introduced into the clay body of the unburned porcelain core as andalusite, certain changes take place during the burning process and as a result of these there is present no andalusite in the finished article but all of the andalusite undergoes a molecular change to a compound of the composition $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ with excess of a glass highly siliceous in composition.

This change is quite definite, taking place sharply and at a definite temperature. Under manufacturing conditions this temperature is in the neighborhood of cone 13 on the Seger scale (theoretically equal to 1390°C but actually probably considerably lower).³

Of interest from the microscopic standpoint is the behavior of andalusite during this change. Up to the inversion point andalusite retains all of its original optical properties except for the formation of small glass-like inclusions which apparently represent the fusion of included impurities. At the inversion point the clear homogeneous grains of andalusite give way to grains composed of fibrous or columnar crystals, each crystal parallel to the adjacent one with a narrow strip of glass between. The result is instead of a clear grain, a grain composed of a group of parallel crystals having all of the optical properties of $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, with glass between each. Traces of the remains of such structures can sometimes be seen in a section of a finished spark plug core.

Cyanite also changes to $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ and glass under heat but at a lower temperature of about cone 11 (theoretically 1350°C). The structure developed is also different from that shown by the change in andalusite. Cyanite yields a body consisting of groups of interlocking fibers of $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ which are not parallel over any considerable length. Along with these are areas of glassy matter, generally more abundant than in the andalusite and due no doubt to the fact that cyanite is less pure as a rule than andalusite. Cyanite has higher specific gravity therefore more substance per unit volume, which when breaking up would yield more matter from each previous unit but should this change the relative amounts?

The fact that andalusite changes to $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ at a temperature considerably below the final temperature to which the porcelain is burned has a very practical value because in this change from andalusite to $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ and excess siliceous glass there is an increase in specific gravity and a consequent decrease in volume. This volume change tends to produce strains in the porcelain, which can be absorbed if the inversion takes place well below the final burning temperature. If this were not true and the change took place near the final temperature, the decidedly weaker porcelain might result.

Incidentally, during this inversion the andalusite does not outwardly break down and lose its original form, so that good artificial pseud-

³ The statements made here are purely provisional. Investigation of the changes with temperature is to be made in more detail at a later date.

omorphs of this mixture of $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ and glass after andalusite is readily obtained by simply heating for a sufficiently long period above the inversion temperature. This can not be done with cyanite because the expansion at the inversion point is so great that the cyanite breaks down into a chalky friable mass.

The writer here wishes to acknowledge his sincere thanks to Dr. J. A. Jeffery, president, and Mr. F. H. Riddle, research director of the Champion Porcelain Company, whose interest and cooperation have made this note possible.

NOTE.—The foregoing paper was received through the courtesy of Dr. Joseph A. Jeffery, president of the Champion Porcelain Company, and published by permission of Professor Peck. Dr. Jeffery adds, in his letter accompanying:

“It just occurred to me that you might be interested in knowing that the pyrophyllite possesses very valuable properties which aid us very greatly in the processing of the material through the plant. It is not only valuable in the wet-grinding process, but also greatly assists in maintaining a uniform moisture content during the working and pugging operations.”—EDITOR.



ADMINISTRATIVE DIVISION.

WALTER W. BRADLEY, Deputy State Mineralogist.

Personnel.

The State Mining Bureau and particularly the Petroleum and Gas Department has been signally honored in the appointment of Mr. R. D. Bush, state oil and gas supervisor, by the President of the United States, to be a member of a commission of three to study and report on the Naval Oil Reserves and the leases thereon. The appointment will not require Mr. Bush to sever his connections with the State Mining Bureau.

New Publications.

During the period covered by this issue (January 15th to April 15th) the following Bureau publications have been made available for distribution:

Mining in California (quarterly), January 1924, being Chapter No. 1, of State Mineralogist's Report XX. Price 25 cents.

Summary of Operations, California Oil Fields: Vol. 9, Nos. 4, 5, 6 and 7, October, November, December, 1923, and January, 1924, respectively.

Commercial Mineral Notes: Nos. 10, 11, 12, January-March, inclusive.

These 'notes' carry the lists of 'mineral deposits wanted' and 'minerals for sale,' issued in the form of a mimeographed sheet, monthly. It is mailed free of charge to those on the mailing list for 'Mining in California.'

Owing to the very considerable increase in our mailing list for 'Mining in California,' which had grown beyond the ability of the present funds of the State Mining Bureau to pay the printing bills without additional revenue, it became necessary to place a subscription price on this quarterly of 25 cents per issue, or \$1 per year paid in advance.

Mail and Files.

The Bureau maintains, in addition to its correspondence file, a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the period of January 15-April 15, there were 2091 letters received and answered at the San Francisco office alone, covering a wide range of subjects concerning prospecting, mining and developing mineral products, reduction problems, and marketing of refined products.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Deputy State Mineralogist.

STATISTICS.

California continues to produce commercially, as for a number of years past, at least fifty different mineral substances, the total annual value of which has averaged over \$250,000,000 the last four years. The estimated value for 1923, as shown in the January issue of 'Mining in California' (see page 50 *ante*), was \$270,472,000.

At the present writing (April 15), reports are in hand from most of the producers. Data for several substances are now complete and have been compiled, being presented herewith.

The data at hand indicate that there was no production in California in 1923 of the following substances, which have at one time or another in the past been on the active list here: Antimony, bismuth, cadmium, fluorspar, graphite, lithia, mica, molybdenum, serpentine, slate, strontium, and tin. In addition to the above, there are potential deposits of ores of the following which have not as yet yielded a commercial output: aluminum, arsenic, cobalt, nickel, nitrates, and vanadium.

BARYTES.

The output of crude barytes in California during 1923 amounted to a total of 2925 tons valued at \$16,058 f. o. b. rail-shipping point, as compared with 3370 tons valued at \$18,925 in 1922. The 1923 product came mainly from Nevada County, with smaller amounts from Mariposa and Shasta counties, and was consumed principally in the manufacture of lithopone. More than half of the total tonnage of barytes utilized in the United States is taken in the manufacture of lithopone, which is a chemically-prepared, white pigment containing approximately 70 per cent barium sulphate and 30 per cent zinc sulphide. This is one of the principal constituents of 'flat' wall paints.

Total Barytes Production of California.

The first recorded production of barytes in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910 -----	860	\$5,640	1918 -----	100	\$1,500
1911 -----	309	2,207	1919 -----	1,501	18,065
1912 -----	564	2,812	1920 -----	3,029	20,795
1913 -----	1,600	3,680	1921 -----	901	4,809
1914 -----	2,000	3,000	1922 -----	3,370	18,925
1915 -----	410	620	1923 -----	2,925	16,058
1916 -----	1,606	5,516			
1917 -----	4,420	25,633	Totals -----	23,595	\$129,260

BITUMINOUS ROCK.

Small amounts of bituminous rock are still occasionally used for road dressing in those districts adjacent to available deposits, though the

manufacture of asphalt at the oil refineries has almost eliminated the direct use of the native material. During 1923, a total of 2945 tons valued at \$11,780 was shipped from quarries in Santa Barbara and Santa Cruz counties, compared with 4624 tons and \$13,570 in 1922. This material is essentially an uncemented sandstone which is saturated with and held together by a natural asphaltic constituent probably the residue from the evaporation of a petroleum deposit.

Bituminous Rock Production of California, by Years.

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

Year	Tons	Value	Year	Tons	Value
1887	36,000	\$160,000	1906	16,077	\$45,204
1888	50,000	257,000	1907	24,122	72,835
1889	40,000	170,000	1908	30,718	109,818
1890	40,000	170,000	1909	34,123	116,436
1891	39,962	154,164	1910	87,547	165,711
1892	24,000	72,000	1911	75,125	117,279
1893	32,000	192,036	1912	44,073	87,467
1894	31,214	115,193	1913	37,541	78,479
1895	38,921	121,586	1914	66,119	166,618
1896	49,456	122,500	1915	17,789	61,468
1897	45,470	128,173	1916	19,449	66,561
1898	46,836	137,575	1917	5,590	18,580
1899	40,321	116,097	1918	2,561	9,067
1900	25,306	71,495	1919	4,614	18,537
1901	24,052	66,354	1920	5,450	27,825
1902	33,490	43,411	1921	8,298	43,192
1903	21,944	53,106	1922	4,624	13,570
1904	45,280	175,680	1923	2,945	11,780
1905	24,753	60,436			
			Totals	1,175,770	\$3,617,233

BORATES.

During 1923, there was produced in California a total of 118,601 tons of borate materials, compared with a total of 74,998 tons for the year 1922. The material shipped included crude and selected colemanite ores from Inyo, Los Angeles, and San Bernardino counties, varying from 18.29% to 28.24% anhydrous boric acid ('A. B. A.'), also crystallized borax recovered from evaporation of brines at Searles Lake, San Bernardino County.

As the crude ore is not sold, as such, and is almost entirely calcined before shipping to the refinery for conversion into the borax of commerce, it is difficult to arrive at a valuation of the crude ore as mined. For this reason and the fact that the material varied in boric acid content, we have recalculated the tonnage to a basis of 40% A. B. A., which is approximately the average A. B. A. content of the colemanite material after calcining for shipment to the refinery. A valuation of 50¢ per unit of 'anhydrous boric acid' was reported for the calcined material. Recalculated as above, the 1923 production totals 62,667 tons valued at \$1,893,798, an increase over the similar figures for 1922 which were 39,087 tons and \$1,068,025.

Total Production of Borate Materials in California.

The total production of borate materials in California is shown in the following table:

Year	Tons	Value	Year	Tons	Value
1864	12	\$9,478	1894	5,770	\$807,807
1865	126	94,099	1895	5,959	595,900
1866	201	132,538	1896	6,754	675,400
1867	220	156,137	1897	8,000	1,080,000
1868	32	22,384	1898	8,300	1,153,000
1869			1899	20,357	1,139,882
1870			1900	25,837	1,013,251
1871			1901	22,221	982,380
1872	140	89,600	1902	^a 17,202	2,234,994
1873	515	255,440	1903	34,430	661,400
1874	915	259,427	1904	45,647	698,810
1875	1,168	289,080	1905	46,334	1,019,158
1876	1,437	312,537	1906	58,173	1,182,410
1877	993	193,705	1907	53,413	1,200,913
1878	373	66,257	1908	22,200	1,117,000
1879	364	65,443	1909	16,628	1,163,960
1880	609	149,245	1910	16,828	1,177,960
1881	690	189,750	1911	50,945	1,456,672
1882	732	201,300	1912	42,135	1,122,713
1883	900	265,500	1913	58,051	1,491,530
1884	1,019	198,705	1914	62,500	1,483,500
1885	942	155,430	1915	67,004	1,663,521
1886	1,285	173,475	1916	103,523	2,409,375
1887	1,015	116,689	1917	109,944	2,561,958
1888	1,405	196,636	1918	88,772	1,867,908
1889	965	145,473	1919	66,791	1,717,192
1890	3,201	480,152	1920	127,065	2,794,200
1891	4,267	640,000	1921	50,136	1,096,320
1892	5,525	838,787	1922	^b 39,087	1,068,025
1893	3,955	593,292	1923	66,667	1,893,798
			Totals	1,379,679	\$46,821,508

^aRefined borax. ^bRecalculated to 40% 'anhydrous boric acid' equivalent beginning with 1922.

CEMENT.

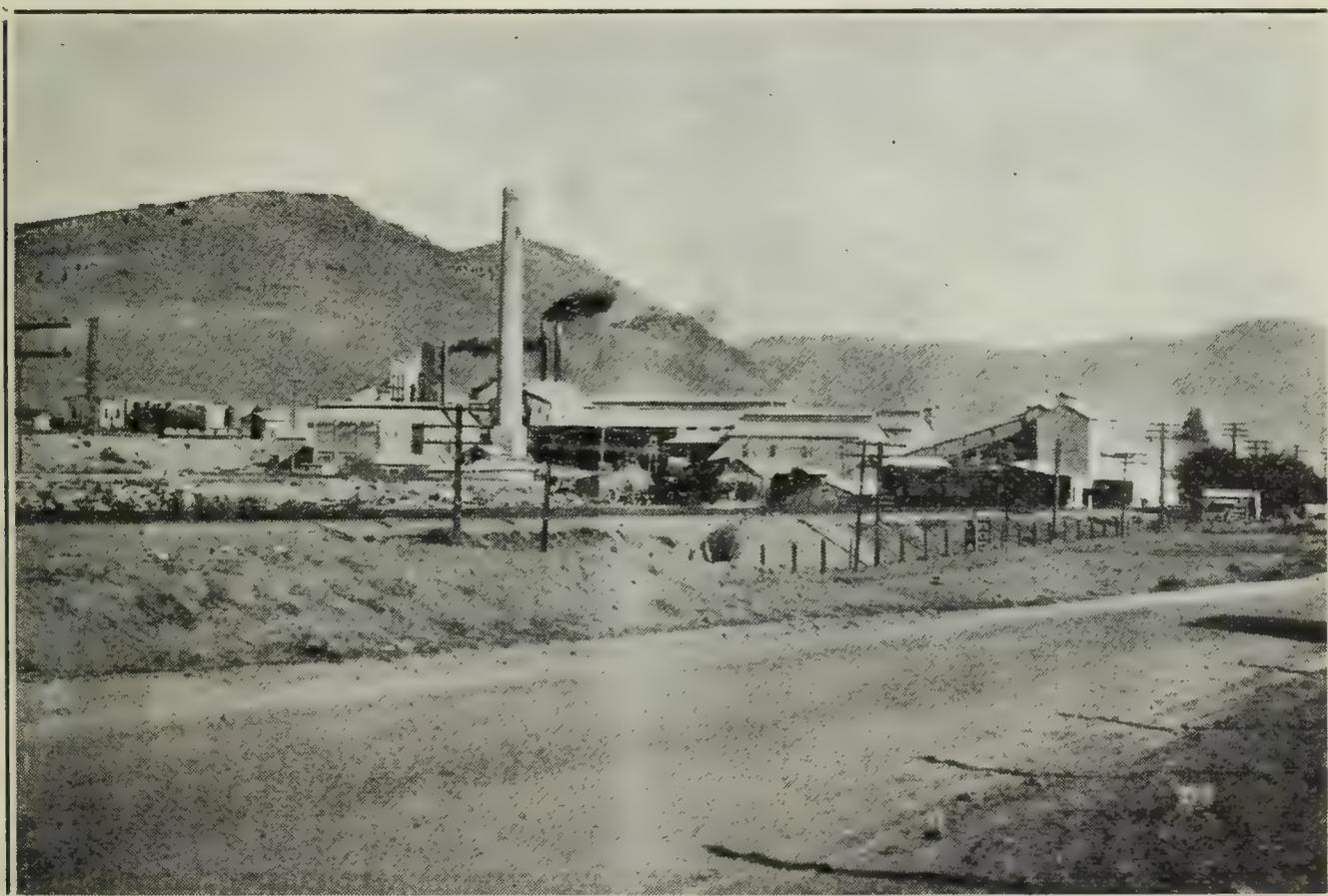
Cement is the most important single structural material in the output of this state. During 1923, there was produced a total of 10,825,405 barrels, valued at \$25,999,203 f. o. b. plant, being an increase both in quantity and value over that of any previous year in the history of the cement industry in California. As in the preceding two years, the output came from nine operating plants in seven counties, and in 1923 employing a total of 3448 men.

The three plants in San Bernardino County, in 1923, made a total of 3,554,764 barrels of cement, valued at \$8,478,612, the balance of the state's product coming collectively from a single plant in each of the following counties: Contra Costa, Kern, Riverside, San Benito, Santa Cruz, and Solano. A tenth plant is at present under construction at Merced, in Merced County, and will probably be in operation before the close of the current year.

Cement Production of California by Years.

Annual production of cement in California has been as follows:

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	\$15,000	1908	1,629,615	\$2,359,692
1892	5,000	15,000	1909	3,779,205	4,969,437
1893			1910	5,453,193	7,485,715
1894	8,000	21,600	1911	6,371,369	9,085,625
1895	16,383	32,556	1912	6,198,634	6,074,661
1896	9,500	28,250	1913	6,167,806	7,743,024
1897	18,000	66,000	1914	5,109,218	6,558,148
1898	50,000	150,000	1915	4,918,275	6,044,950
1899	60,000	180,000	1916	5,299,507	6,210,293
1900	52,000	121,000	1917	5,790,734	7,544,282
1901	71,800	159,842	1918	4,772,921	7,969,909
1902	171,000	423,600	1919	4,645,289	8,591,990
1903	640,868	968,727	1920	6,709,160	14,962,945
1904	969,538	1,539,807	1921	7,404,221	18,072,120
1905	1,265,553	1,791,916	1922	8,962,135	16,524,056
1906	1,286,000	1,941,250	1923	10,825,405	25,999,203
1907	1,613,563	2,585,577			
			Totals	100,278,892	\$166,236,165



Plant of Monolith Portland Cement Company, at Monolith, Kern County, California.

CHROMITE.

Chromic iron ore, or chromite, to the amount of 78 short tons of all grades (or 84 tons, recalculated to a basis of 45% Cr_2O_3), valued at \$1,658 f. o. b. shipping point, was sold in California during the year 1923. The ore shipped analyzed from 45% to 50% Cr_2O_3 and came from mines in Placer and San Luis Obispo counties, being utilized for refractory purposes.

As will be noted from the tabulation below, chromite mining in California since the World War has all but become extinguished; and the

immediate future is not encouraging, unless a local or Pacific Coast market develops for it. Development of the steel industry and the resumption of copper smelting may create some demand for California chromite.

Total Chromite Production of California.

Production of chromite in California began, apparently, about 1874, principally in San Luis Obispo County. There was considerable activity from 1880 to 1883, inclusive, and a total of 23,238 long tons (or 26,028 short tons), valued at \$329,924 was shipped from that county up to the beginning of 1887. Some ore also was shipped from the Tyson properties in Del Norte County. The tabulation herewith shows the output of chromite in California, annually, including the earliest figures so far as they are available. The figures from 1887 to date are from the records of the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1874-1886 (San Luis Obispo Co.)	26,028	\$329,924	1905	40	\$600
1887	3,000	40,000	1906	317	2,859
1888	1,500	20,000	1907	302	6,040
1889	2,000	30,000	1908	350	6,195
1890	3,599	53,985	1909	426	5,309
1891	1,372	20,580	1910	749	9,707
1892	1,500	22,500	1911	935	14,197
1893	3,319	49,785	1912	1,270	11,260
1894	3,680	39,980	1913	1,180	12,700
1895	1,740	16,795	1914	1,517	9,434
1896	786	7,775	1915	3,725	38,044
1897			1916	48,943	717,244
1898			1917	52,379	1,130,298
1899			1918	73,955	3,649,497
1900	140	1,400	1919	*4,314	97,164
1901	130	1,950	1920	1,770	43,031
1902	315	4,725	1921	347	6,870
1903	150	2,250	1922	379	6,334
1904	123	1,845	1923	84	1,658
			Totals	242,374	\$6,412,485

*Recalculated to 45% Cr₂O₃, beginning with 1919.

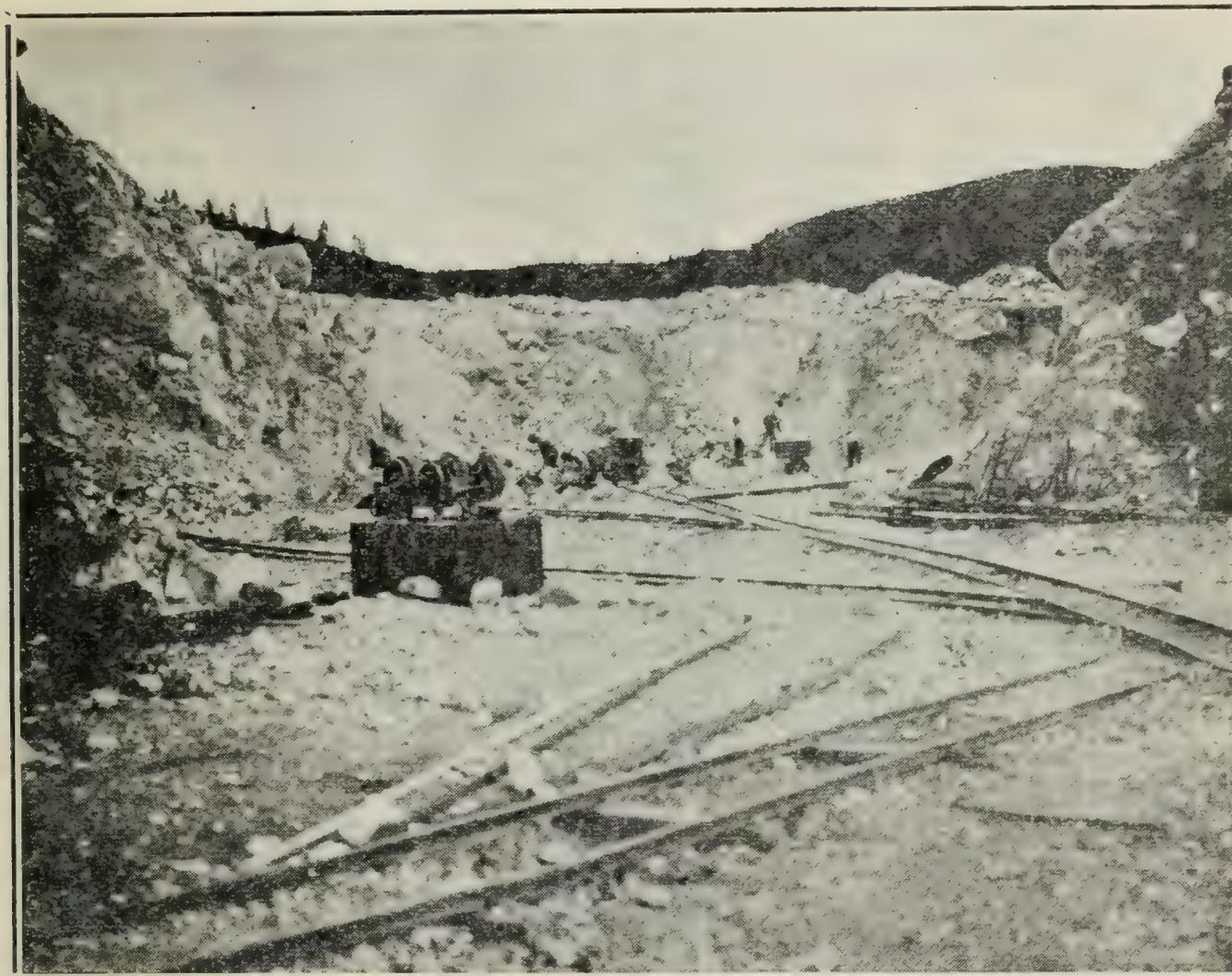
MAGNESITE.

The production of magnesite in California during 1923 amounted to a total of 73,963 tons of crude ore valued at \$946,643. Only a small part of it was sold 'crude,' however, as it is practically all shipped in the calcined form. The reports at hand show a total of 30,294 tons shipped calcined, of which 3475 tons were dead-burned and sold for refractory purposes, the balance going to the plastic trade. From 2 to 2½ tons of crude material are mined to make one ton of the calcined. The 1923 output is an increase both in quantity and value over the 1922 figures of 55,637 tons crude valued at \$594,665.

The more important producing properties in 1923 were: Maltby No. 1 (Western Magnesite Development Company, operated under lease by C. S. Maltby) on Red Mountain, Santa Clara County; and the Sierra Magnesite Company's group near Porterville, Tulare County; followed, in order, by the Sampson Peak Mine (Maltby No. 3), San Benito

County, Maltby No. 2 in Chiles Valley, Napa County, and the California Magnesite Company (old Harker mine) at Porterville. Lesser amounts were reported mined in Stanislaus, Tuolumne and Fresno counties, in the order named. Descriptions of recent operations at most of the above-mentioned properties were given by the writer, in the January issue of 'Mining in California'.¹

The increase in value for 1923 is due in part to the somewhat higher prices prevailing as compared to 1922. On the whole, the magnesite industry is in a fairly satisfactory condition; the market is firm, and the use of this material, particularly the plastic form, is increasing on the Pacific Coast. Because of high freight rates, California can not



Open cut at Sampson Peak (Maltby No. 3) Magnesite Mine, near New Idria, San Benito County, California.

compete in the Atlantic seaboard states with foreign importations, but can at least hold its own as far east as the Mississippi River, under present conditions.

Distribution of the 1923 product, by counties, was as follows:

County	Tons	Value
Santa Clara -----	36,390	\$472,620
Tulare -----	24,058	298,272
Fresno, Napa, San Benito, Stanislaus, Tuolumne*-----	13,515	175,751
Totals -----	73,963	\$946,643

*Combined to conceal output of a single operator in each.

¹ See pp. 23, 26-31, *ante*.

Total Magnesite Production of California.

The first commercial production of magnesite in California was made in the latter part of 1886 from the Cedar Mountain district,¹ southeast of Livermore, Alameda County. Shipments amounting to 'several tons' or 'several carloads' were sent by rail to New York; but there is apparently no exact record of the amount for that first year. The statistical records of the State Mining Bureau began with the year 1887, and the table herewith shows the figures for amount and value, annually, from that time. Shipments of magnesite from Napa County began in 1891 from the Snowflake Mine; from the Red Mountain deposits in Santa Clara County, in 1899; and from Tulare County in 1900.

Production of Magnesite in California, Since 1887.

Year	Tons	Value	Year	Tons	Value
1887	600	\$9,000	1906	4,032	\$40,320
1888	600	9,000	1907	6,405	57,720
1889	600	9,000	1908	10,582	80,822
1890	600	9,000	1909	7,942	62,588
1891	1,500	15,000	1910	16,570	113,887
1892	1,500	15,000	1911	8,858	67,430
1893	1,093	10,930	1912	10,512	105,120
1894	1,440	10,240	1913	9,632	77,056
1895	2,200	17,000	1914	11,438	114,380
1896	1,500	11,000	1915	30,721	283,461
1897	1,143	13,671	1916	154,052	1,311,893
1898	1,263	19,075	1917	209,648	1,976,227
1899	1,280	18,480	1918	83,974	803,492
1900	2,252	19,333	1919	44,696	452,094
1901	4,726	43,057	1920	83,695	1,033,491
1902	2,830	20,655	1921	47,837	511,102
1903	1,361	20,515	1922	55,637	594,665
1904	2,850	9,298	1923	73,963	946,643
1905	3,933	16,221			
			Totals	903,465	\$8,927,866

MAGNESIUM SALTS.

The production of magnesium chloride and sulphate in California during 1923 totaled 3662 tons, valued at \$116,031, an increase both in quantity and value over the 1922 figures of 3036 tons and \$89,788. This was nearly all chloride, sold for use in magnesite stucco and cement mixtures (Sorel cement), and was prepared from residual bitterns at salt plants in Alameda, Los Angeles, San Diego, and San Mateo counties. It was in part marketed in the liquid form. With the use of magnesite cement and stucco coming more into vogue in building construction on the Pacific Coast, the demand for magnesium chloride is increasing here; but the domestic article has to meet the competition of the cheaper, imported German chloride.

Total Production of Magnesium Salts in California.

The total production of magnesium salts in California since the beginning of the industry here, is shown in the following tabulation:

¹See U. S. Geol. Surv.; Mineral Resources of U. S., 1886, pp. 6 and 696.

Year	Tons	Value
1916	851	\$6,407
1917	1,064	34,973
1918	1,008	29,955
1919	1,616	82,457
1920	3,150	107,787
1921	4,153	106,140
1922	3,036	89,788
1923	3,662	116,031
Totals	18,540	\$573,528

MANGANESE.

Manganese ore shipments in California in 1923 amounted to a total of 690 tons of all grades, valued at \$10,620, being a slight increase in both quantity and value over the 1922 yield which totaled 540 tons and \$7,650 value. These ores were utilized mainly by the brick, paint, and glass trade, with a small tonnage of high-grade ore going to electric dry-battery manufacture.

Manganese Ore Production in California, by Years.

Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Tesla District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5000 tons had been produced by that property. For some years following that, the output was small. The tabulation herewith shows the California output of manganese ore, annually, since 1887, when the compilation of such figures was begun by the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1887	1,000	\$9,000	1906	1	\$30
1888	1,500	13,500	1907	1	25
1889	53	901	1908	321	5,785
1890	386	3,176	1909	3	75
1891	705	3,830	1910	265	4,235
1892	300	3,000	1911	2	40
1893	270	4,050	1912	22	400
1894	523	5,512	1913		
1895	880	8,200	1914	150	1,500
1896	518	3,415	1915	4,013	49,098
1897	504	4,080	1916	13,404	274,601
1898	440	2,102	1917	15,515	396,659
1899	295	3,165	1918	26,075	979,235
1900	131	1,310	1919	11,569	451,422
1901	425	4,405	1920	2,892	62,323
1902	870	7,140	1921	1,005	12,210
1903	1	25	1922	540	7,650
1904	60	900	1923	690	10,620
1905			Totals	85,329	\$2,333,619

Domestic Manganese Resources.

The subcommittee on manganese of the Mining and Metallurgical Society of America has recently made public its findings on the situation in the United States as regards apparent domestic resources of manganese ores. We quote, herewith, a summary¹ of portions of their report and conclusions:

"To determine the adequacy or inadequacy of the domestic resources the committee first considers domestic requirements, putting them under two heads, metallurgical and chemical. About 95 per cent of the total amount consumed is used in making steel and, to a small extent, in foundries and for special alloys. It is used principally in three forms: ferromanganese, spiegeleisen, and manganiferous pig iron. The availability of an ore for making any one of these alloys is governed largely by its ratio of manganese to iron.

"The committee, in its estimate, assumes that an output of 50,000,000 tons of steel will be reached in the United States between 1930 and 1935, requiring an amount of metallic manganese estimated at 13 lb. per ton, or 290,000 long tons. To this it adds 10,000 tons metallic manganese for the foundry business and special alloys.

* * * * *

"The remaining 5 per cent of total manganese consumed is used in chemical industries, and the ore is therefrom termed 'chemical' ore. Most of it goes into dry batteries. Total pre-war requirements were about 35,000 tons.

"In estimating the adequacy of domestic resources the committee first had to define 'ore.' With changing conditions as to cost and price, the report points out, the measure of ore reserved must also change, there being a constant shifting back and forth across the border line between ore and waste. Before the war, save for a few thousand tons, the United States had no high-grade manganese ores. With artificial war conditions, however, prices soared and standards lowered, so that in 1918 the United States produced 305,000 tons of ferro-grade ore, furnishing 23.6 per cent of the manganese used. In addition to this, 86 per cent of the manganese used in low-grade products came from domestic sources. This proved that under *artificial war conditions* the United States possessed considerable domestic resources of high-grade as well as low-grade ores.

"Since the armistice, there has been a strong tendency to revert to the pre-war situation, though impeded by unsettled conditions, particularly in Europe and the Near East, and more recently by the tariff set up by Congress.

"In brief, says the report, *under natural conditions* the United States has practically no commercial high-grade manganese ores.

"The committee, therefore, has sought to find out how highly artificial conditions need be to shift important quantities of manganese-bearing material across the border line from waste to ore. It has reviewed 1850 manganese deposits and prospects and studied all information as to their history, production, and possibilities. It was first necessary to determine upon a yard-stick for measuring ore.

"The committee became convinced that a price equivalent to at least 50 per cent more than the highest price obtaining during the late war would be needed to make really considerable quantities of ferro-grade ore commercially available.

* * * * *

"Applying these assumptions to its study of ore deposits the committee arrived at the estimates of ore reserves, by classes of ore and by states, that are given in detail in the report.

* * * * *

"Study of these figures shows that the reasonably probable ferro-grade reserves, measured by the high price adopted, would last the country two years, or, if reasonable probabilities are included, a little over four years. Geological conditions are sufficiently well known to make it unlikely that other amounts of importance will be found.

"Of chemical ores there would appear to be about eight years' supply, measured by the \$50 index price. Much of this could be produced at lower prices.

"Domestic reserves of spiegel and high manganese pig ores are more abundant, indicating thirty-five to forty years' supply.

"The committee concludes that:

"1. Domestic resources of ferro-grade ores are totally inadequate. No conceivably reasonable legislation can remedy this.

"2. Reserves of chemical ores are adequate for tiding over an emergency, but inadequate from the point of view of continuous supply. Legislation might cause domestic needs to be furnished from domestic sources for a limited time, but the resulting depletion would seriously endanger the country in a time of possible future critical need.

"3. The comparative adequacy of the reserves for spiegel and high-manganese-pig ores fairly raises the question whether some measure of protection, designed to foster their adaptation to industry, would be reasonable.

"Discussing this last question, the report talks of a tariff not high enough to bring about any considerable production of domestic ferro-grade ores, but still high enough to increase the price of ferromanganese to a point where there would be a strong inducement to steelmakers to substitute leaner materials, made from the more or less abundant lean domestic ores.

"The conservation of high-grade manganese by substituting high-manganese pig iron for ferro in making additions to the charge is commendable, says the report, but, being already recognized as a possible economy in steel making, the practice will

¹ See Engineering & Mining Journal-Press, Vol. 117, No. 13, p. 545, Mar. 29, 1924.

proceed of its own momentum, and it is doubted if it can be speeded up by a tariff on high-grade materials, which would place a burden on the steel industry.

"Substitution of spiegel for ferro, on the other hand, could no doubt, be increased by a high tariff on ferro and ferro ores, says the report. Possibly as much as a half of the total steel output could be made with spiegel. But the report points out that among steel makers there is strong prejudice against changing practice in this direction, because ferro is easier to use, surer in its results, and for these reasons cheaper.

"A brief description of foreign resources, at the end, serves to show the comparative insignificance of domestic reserves, and demonstrates why the United States has drawn its supplies from these outside sources.

"The subcommittee concludes:

"1. The domestic resources of ferro-grade and chemical ores are so out of balance with the major foreign resources that, under natural conditions of foreign exchange, imports of such ores can be efficiently stopped only at great cost.

"2. Should legislation be passed which should effect a measurable substitution of domestic for foreign ferro ores, the chief result, aside from cost, would be the dangerous depletion of reserves, which as it is are inadequate for domestic needs,

"3. Domestic resources of low-grade reserves, on the other hand, are comparatively adequate. Any effective attempt, however, to force their adaptation to the country's needs beyond the normal development which may be looked for through increase in skill and a vigorous educational campaign would result in a cost so enormous as to be quite disproportionate to the purpose to be served."

The report is signed by C. M. Weld, chairman; J. W. Furness, D. F. Hewett, Robert Linton, John A. Mathews, J. V. W. Reynders, and Bradley Stoughton.

POTASH.

During 1923, a total of 29,597 tons of potash salts of all grades was produced in California, valued at \$709,836, compared with 17,776 tons and \$584,388 in 1922. This included potassium chloride from salt-works bitterns and from Searles Lake brine, and sulphate from Portland-cement dust. The quality varied from 34% to 60.5% equivalent K_2O content, the salt being produced at plants in San Bernardino, San Mateo, and Santa Cruz counties. Some potassium chloride was also made at one plant in Alameda County, but not sold as it is intended to convert it into other forms. The product sold was utilized for the manufacture of fertilizers.

Total Production of Potash in California.

The annual amounts and value of these potash materials since their beginning in California in 1914, are shown by the following table:

Year	Tons	Value
1914	10	\$460
1915	1,076	19,391
1916	17,908	663,605
1917	129,022	4,202,889
1918	49,381	6,808,976
1919	28,118	2,415,963
1920	26,298	1,465,463
1921	14,806	390,210
1922	17,776	584,388
1923	29,597	709,836
Totals	313,992	\$17,267,181

PYRITES.

A total production of 148,004 short tons of pyrites, valued at \$555,308, was reported shipped in California during 1923, from properties operated in Alameda, Mariposa, and Shasta counties. This was a slight decrease in both tonnage and value from the figures of 151,381 tons and \$570,425 in 1922. The material was mostly used in the manufacture of sulphuric acid, but a portion was utilized directly in the

preparation of agricultural fertilizer and insecticide. The sulphuric acid made is mainly used in the manufacture of explosives and of fertilizers.

Pyrites Production in California, by Years.

The total recorded pyrites production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	\$30,000	1911	54,225	\$182,954
1899	5,400	28,620	1912	69,872	203,470
1900	3,642	21,133	1913	79,000	218,537
1901	4,578	18,429	1914	79,267	230,058
1902	17,525	60,306	1915	92,462	293,148
1903	24,311	94,000	1916	120,525	372,969
1904	15,043	62,992	1917	111,325	323,704
1905	15,503	63,958	1918	128,329	425,012
1906	46,689	145,895	1919	147,024	540,300
1907	82,270	251,774	1920	146,001	530,581
1908	107,081	610,335	1921	110,025	473,735
1909	457,867	1,389,802	1922	151,381	570,425
1910	42,621	179,862	1923	148,004	555,308
			Totals	2,265,970	\$7,877,357

SOAPSTONE and TALC.

The total output of talc and soapstone in California in 1923 amounted to 17,439 tons valued at \$252,661, compared with 13,378 tons valued at \$197,186 in 1922. More than two-thirds of the product was high-grade talc from Inyo and San Bernardino counties, which material was utilized mainly in toilet powders, paint, paper, and rubber manufacture, and in part in magnesite flooring and stucco. The 'soapstone' grades were used mainly for roofing and as a filler in roofing paper, and part also in magnesite cement.

A detailed description of the classification and uses of talc and soapstone is given in Bulletin No. 93¹ issued by the State Mining Bureau in 1923, copies of which may be had on application.

Talc Production of California, by Years.

Production has been intermittent in the state since 1893, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893	400	\$17,750	1909	33	\$280
1894			1910	740	7,260
1895	25	375	1911		
1896			1912	1,750	7,350
1897			1913	1,350	6,150
1898			1914	1,000	4,500
1899			1915	1,663	14,750
1900			1916	1,703	9,831
1901	10	119	1917	5,267	45,279
1902	14	288	1918	11,760	85,534
1903	219	10,124	1919	8,764	115,091
1904	228	2,315	1920	11,327	221,362
1905	300	3,000	1921	8,752	130,078
1906			1922	13,378	197,186
1907			1923	17,439	252,661
1908	3	48	Totals	86,125	\$1,131,331

¹ Bradley, W. W., California mineral production for 1922: Cal. State Min. Bur., Bull. 93, pp. 132-137, 1923.

LABORATORY.

FRANK SANBORN, Mineral Technologist.

Letters are frequently received at this bureau from prospectors who seek information as to how certain minerals can be identified in the field. It is not always easy to give simple and satisfactory replies to these inquiries, for some minerals, such as the aluminum silicates which are now in demand, are not always readily identified even when a well-equipped laboratory is at hand. Many of the samples received at the bureau's laboratory are merely more or less decomposed or altered rocks having no commercial value.

There are some of the physical properties of minerals that can be easily learned by a prospector, and by learning these properties it is possible that the worth-while minerals can be identified and prospecting made more interesting.

Hardness. With a little practice the hardness of a mineral can be estimated rather closely by the ease with which it can be scratched with a knife blade.

In the scale of hardness generally used a knife blade has a hardness of a little over 5, while ordinary window glass is usually a little harder, having a hardness of about 5.5; therefore a knife blade will not readily scratch glass. Quartz has a hardness of 7, consequently a knife blade will not scratch quartz, but the quartz will readily scratch glass.

Moh's scale of hardness is as follows: Talc (1), Gypsum (2), Calcite (3), Fluorite (4), Apatite (5), Feldspar (6), Quartz (7), Topaz (8), Corundum (9), Diamond (10).

Gypsum with a hardness of 2 can be scratched with the finger nail. A copper coin has a hardness of 3, and a pin point has a hardness of about 3.5. Care must be taken to distinguish between a *mark* left by one mineral on another and a *scratch*.

Cleavage. Many minerals when struck a sharp, quick blow with a hammer, have the property of breaking with smooth surfaces in certain directions which are parallel to actual or possible crystal faces. This property is called cleavage, and it may be exhibited in only one direction as in mica, or in several directions as in calcite.

Common cleavages are: 'cubic' as shown when a cube of galena is fractured, and 'rhombohedral' as when a piece of calcite is cleaved. Mica exhibits a good example of 'basal' cleavage, and feldspars have a cleavage in two directions, at, or nearly at right angles, while quartz has no cleavage.

Specific Gravity. The specific gravity of a substance is the ratio of its weight to the weight of an equal volume of water, the weight of water being taken as 1.0. Thus quartz has a specific gravity of approximately 2.6 which means that it is 2.6 times heavier than the same volume of water. Lead has a specific gravity of 11.37 and is therefore 11.37 as heavy as an equal volume of water. The mineral barite has a specific gravity of 4.5 and can be distinguished from limestone and other common minerals which it resembles by its 'heavy feeling,' calcite having a specific gravity of 2.72.

Streak. The 'streak' of a mineral is merely the color of its powder. A piece of chert or quartz will often answer as a streak-plate. By rubbing a piece of hematite on a piece of quartz a red powder will adhere to the quartz, yellow for limonite, brown for chromite, etc.

Panning. Many minerals of value though disseminated through a rock can be concentrated by panning. The material to be tested in this way should be ground to a uniform size if possible, and panned carefully in a clean pan (a small frying or egg pan, free from grease, makes an excellent gold pan). In panning, care should be taken not to mistake little fragments of the mortar or pestle for a mineral. It is a good policy to use a magnet on the concentrates, if there is any doubt as to whether or not they are of iron. By careful panning a great many minerals can be concentrated and subsequently identified. Panning should not be considered merely as a method for detecting only gold in rock, for when carefully manipulated, a gold pan can bring to light most of the minerals having a higher gravity than quartz.

The State Mining Bureau endeavors to assist prospectors in every way, and will gladly advise in specific cases. During the four-month period covered by this report 1292 samples were received and determined at the laboratory.



LIBRARY.

FOREST L. CAMPBELL, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey:

Bulletin No. 750-B—Origin of Certain Rich Silver Ores Near Chloride and Kingman, Arizona. By E. S. Bastin.

Bulletin No. 752—Coal Resources of the Raton Coal Field, Colfax County, New Mexico. By W. T. Lee.

Water Supply Paper No. 489—The Occurrence of Ground Water in the United States. By O. E. Meinzer.

Water Supply Paper No. 492—Summary of Hydrometric Data in Washington, 1878-1919. By G. L. Parker.

Water Supply Paper No. 498—The Lower Gila Region, Arizona. By Clyde P. Ross.

Water Supply Paper No. 502—Surface Water Supply of the United States, 1919 and 1920. Part II, South Atlantic Slope and Eastern Gulf of Mexico Basins. By Nathan C. Grover.

Water Supply Paper No. 505—Part V, Hudson Bay and Upper Mississippi River Basins. By Nathan C. Grover.

Water Supply Paper No. 511—Part XI, Pacific Slope Basins in California. By N. C. Grover.

Water Supply Paper No. 524—Part IV, St. Lawrence River Basin. By Nathan C. Grover.

Water Supply Paper No. 528—Part VIII, Western Gulf of Mexico Basins. By N. C. Grover.

Water Supply Paper No. 497—The Salton Sea Region, California. By John S. Brown.

Mineral Resources of the United States :

Copper in 1922.

Gold, Silver, Copper, Lead and Zinc in Nevada in 1922.

Iron Ore, Pig Iron and Steel in 1922.

Manganese and Manganiferous Ores in 1922.

Gold, Silver, Copper, Lead and Zinc in Montana in 1922.

Gold, Silver, Copper, Lead and Zinc in Utah in 1922.

Gold, Silver, Copper, Lead and Zinc in Arizona in 1922.

Gold, Silver, Copper, Lead and Zinc in Oregon and California in 1922.

Cobalt, Molybdenum, Nickel, Tantalum, Titanium, Tungsten, Radium, Uranium and Vanadium in 1922.

U. S. National Museum (Smithsonian Institution) :

Bulletin 100—The Polyclad Turbellarians from the Philippine Islands. By Tokio Kaburaki.

Proceedings of the U. S. National Museum, Vol. 62.

Annual Report of the National Museum, 1923.

U. S. Bureau of Mines :

Bulletin No. 221—Production and Briquetting of Carbonized Lignite. By E. J. Babcock and W. W. Odell.

Bulletin No. 212—Analytical Methods for Certain Metals Including Cerium, Thorium, Molybdenum, Tungsten, Radium, Uranium, Vanadium, Titanium and Zirconium. By R. B. Moore and others.

Bulletin No. 230—Analysis of Samples of Delivered Coal. By N. H. Snyder.

Bulletin No. 223—An Investigation of Powdered Coal as Fuel for Power Plant Boilers. By Henry Kreisinger and others.

Technical Paper No. 310—Recovery of Gasoline from Uncondensed Still Vapors. By D. B. Dow.

Technical Paper No. 324—Uses of Water in the Oil-Shale Industry. By J. J. Lakosky.

Technical Paper No. 344—Analysis of Ohio Coals.

Technical Paper No. 350—Accidents at Metallurgical Works in the United States During 1922. By W. W. Adams.

Technical Paper No. 354—Metal-Mine Accidents in the United States in 1922. By W. W. Adams.

Technical Paper No. 337—Carbon Monoxide Hazards from House Heaters Burning Natural Gas. By G. L. Jones.

Reports of Investigations :

Serial No. 2550—The Paraffin Problem in Oil Wells. By R. Van A. Mills.

Serial No. 2551—Distribution of Air in Metal-Mine Ventilation With Especial Reference to Flexible Tubing Methods. By D. Harrington.

Serial No. 2552—Explosives Used in October, 1923. By W. W. Adams.

Serial No. 2553—Gaseous Content of Ground Waters as an Aid to the Petroleum and Natural Gas Prospector. By G. W. Jones, W. P. Yant, and E. P. Buxton.

Serial No. 2554—Cooling of Mine Air. By T. T. Read and F. C. Houghten.

Serial No. 2555—Oxygen-Oil Explosions. Preliminary Report III. Spontaneous Ignition of Oils in Oxygen Under Pressure. By S. H. Brooks.

Serial No. 2556—Ferric Sulphate and Sulphuric Acid from Sulphur Dioxide and Air. By Edmund S. Leaver and R. V. Thurston.

Serial No. 2557—Industrial Accidents in the California Oil Fields. By H. C. Miller.

Serial No. 2558—Methods of Testing Detonators. By C. A. Taylor and C. E. Munroe.

Serial No. 2559—Coal-Mine Fatalities in November, 1923. By W. W. Adams.

Serial No. 2560—The Effect of Silica in Iron Ore on Cost of Pig Iron Production. By T. T. Read, T. L. Joseph, and P. H. Royster.

Serial No. 2561—Additions, Removals and Changes in Permissible List of Explosives from January 1, 1923, to December 31, 1923. By J. E. Crawshaw.

Serial No. 2562—Explosives Used in November, 1923. By W. W. Adams.

Serial No. 2563—Effective Temperatures for Still Air Conditions and Their Application to Mining. By F. C. Houghten, C. P. Yaglaglou, and R. R. Sayers.

- Serial No. 2564—Conductivity and Specific Heat of Refractories at High Temperatures. By Mayo D. Hersey and Edward W. Butzler.
- Serial No. 2565—The Kata Thermometer; its Value and Defects. By W. J. McConnell and C. P. Yaglaglou.
- Serial No. 2566—Third Mine-Rescue Maneuvers at Globe, Arizona. By F. C. Gregory.
- Serial No. 2567—The Danger of Open Lamps in Coal Mines. By L. C. Hsley, and M. W. von Bernewitz.
- Serial No. 2568—Subject List of Reports of Investigations Issued During 1923.
- Serial No. 2569—Lignite Carbonization. By W. W. Odell.
- Serial No. 2570—A Float-and-Sink Method and Apparatus for Testing Coarse-Size Coal. By Earl R. McMillan and Byron M. Bird.
- Serial No. 2571—Ash in Anthracite. By O. P. Hood.
- Serial No. 2572—Carbon Monoxide Fatalities from Natural-Gas Heaters Investigated by the Bureau of Mines in the Pittsburgh District During the Past Year. By G. W. Jones and W. P. Yaut.
- Serial No. 2573—Explosives Used in December, 1923. By W. W. Adams.
- Serial No. 2574—Coal-Mine Fatalities in January, 1924. By W. W. Adams.
- Serial No. 2575—Tests of Lignite Char as Reduction Fuel in the Smelting of Zinc Ores. By B. M. O'Harra.
- Serial No. 2576—Underground Signalling for Mines by the Ground-Conduction or "T.P.S." Method. By J. J. Jakosky.
- Serial No. 2577—Ninth Semi-Annual Motor Gasoline Survey. By N. F. LeJeune, I. H. Nelson, and L. P. Calkins.
- Serial No. 2578—A Process for the Production of Sponge Iron. By Clyde E. Williams, Edward P. Barrett and Bernard M. Larsen.
- Serial No. 2579—Mine-Accident Statistics. By W. W. Adams.
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- Bulletin No. 4—Water Resources of California.
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- Mississippi State Geological Survey: Ninth Biennial Report of the Director, 1921–1923.
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- Vol. XVII—The Devonian of Missouri. By E. B. Branson.
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- Bulletin No. 33—The Deep River Coal Field of North Carolina. By M. R. Campbell and K. W. Kimball.
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- Bulletin No. 26—Coal Formation Clays. By Wilbur Stout.
- Bulletin No. 27—Geography of Ohio. By R. J. Peattie.
- Washington Geological Survey:
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- Bulletin No. 21—The Mineral Resources of Washington with Statistics for 1919. By E. N. Patty and S. L. Glover.
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Report of the Mines Branch Investigations for 1922.

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Report of the Department of Mines for the Fiscal Year Ending March 31, 1923.

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Temperatura en los Motores Asincronicos. By D. Bernardo Lassaletta y
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Vol. XVII, Num. 4—Monographia de los Limonidos de las Islas Canarias. By
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A Guide to the Mineral Gallery.

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Bulletin No. 166—Vol. XVII, No. 1.

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Poowong East, County of Buln Buln.
Warragul, County of Buln Buln.
Jerralang, County of Buln Buln.
Longwarry, County of Buln Buln.
Moe, County of Buln Buln.

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Alderson (West Virginia) Quadrangle.
Buda (Illinois) Quadrangle.
Bullard (California) Quadrangle.
Cattaraugus (New York) Quadrangle.
Clintonville (West Virginia) Quadrangle.
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Levis (California) Quadrangle.
Malaga (California) Quadrangle.
Marshall (Michigan) Quadrangle.
Richwood (West Virginia) Quadrangle.
Shippenburg (Pennsylvania) Quadrangle.
Sultana (California) Quadrangle.
Trout Run (Pennsylvania) Quadrangle.
Tupelo (Mississippi) Quadrangle.
White Sulphur Springs (West Virginia) Quadrangle.
Ketchum Mountain (Texas) Quadrangle.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.
Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
Brick and Clay Record, Chicago.
Cement, Mill and Quarry, Chicago, Illinois.
Chemical Engineering and Mining Review, London, England.
Engineering and Mining Journal-Press, New York.
Financial Insurance News, Los Angeles, California.
Graphite, Jersey City.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil News, Galesburg, Illinois.

Oildom, New York.
 Oil, Paint and Drug Reporter, New York.
 Oil Trade Journal, New York.
 Oil Weekly, Houston, Texas.
 Petroleum Age, New York.
 Petroleum Record, Los Angeles.
 Petroleum World, Los Angeles.
 Queensland Government Mining Journal, Brisbane, Australia.
 Rock Products, Chicago, Illinois.
 Safety News, Industrial Accident Commission, San Francisco.
 Salt Lake Mining Review, Salt Lake City, Utah.
 Southwest Builder and Contractor, Los Angeles.
 Standard Oil Bulletin, San Francisco.
 Stone, New York.
 The Record, Associated Oil Company, San Francisco.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
 Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
 Bakersfield Morning Echo, Bakersfield, Cal.
 Blythe Herald, Blythe, Cal.
 Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
 Calaveras Prospector, San Andreas, Cal.
 California Oil World, Los Angeles, Cal.
 Colusa Daily Sun, Colusa, Cal.
 Daily Commercial News, San Francisco, Cal.
 Daily Midway Driller, Taft, Cal.
 Del Norte Triplicate, Crescent City, Cal.
 Gateway Gazette, Beaumont, Cal.
 Goldfield News, Goldfield, Nevada.
 Guerneville Times, Guerneville, Cal.
 Healdsburg Enterprise, Healdsburg, Cal.
 Humboldt Standard, Eureka, Cal.
 Inyo Independent, Independence, Cal.
 Inyo Register, Bishop, Cal.
 Lake County Bee, Lakeport, Cal.
 Mariposa Gazette, Mariposa, Cal.
 Mining and Financial Record, Denver, Colo.
 Mining Topics, Sacramento, Cal., and Unionville, Nev.
 Mountain Democrat, Placerville, Cal.
 Mountain Messenger, Downieville, Cal.
 Nevada Mining Press, Reno, Nevada.
 Oatman Mining Press, Oatman, Arizona.
 Oregon Observer, Grants Pass, Oregon.
 Oroville Daily Register, Oroville, Cal.
 Petroleum Reporter, Taft, Cal.
 Placer Herald, Auburn, Cal.
 Plumas Independent, Quincy, Cal.
 Plumas National Bulletin, Quincy, Cal.
 San Diego News, San Diego, Cal.
 Shasta Courier, Redding, Cal.
 Siskiyou News, Yreka, Cal.
 Stockton Record, Stockton, Cal.
 Tuolumne Prospector, Tuolumne, Cal.
 Ventura Daily Post, Ventura, Cal.
 Weekly Trinity Journal, Weaverville, Cal.
 Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of MINING IN CALIFORNIA was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of MINING IN CALIFORNIA, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes.'



EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

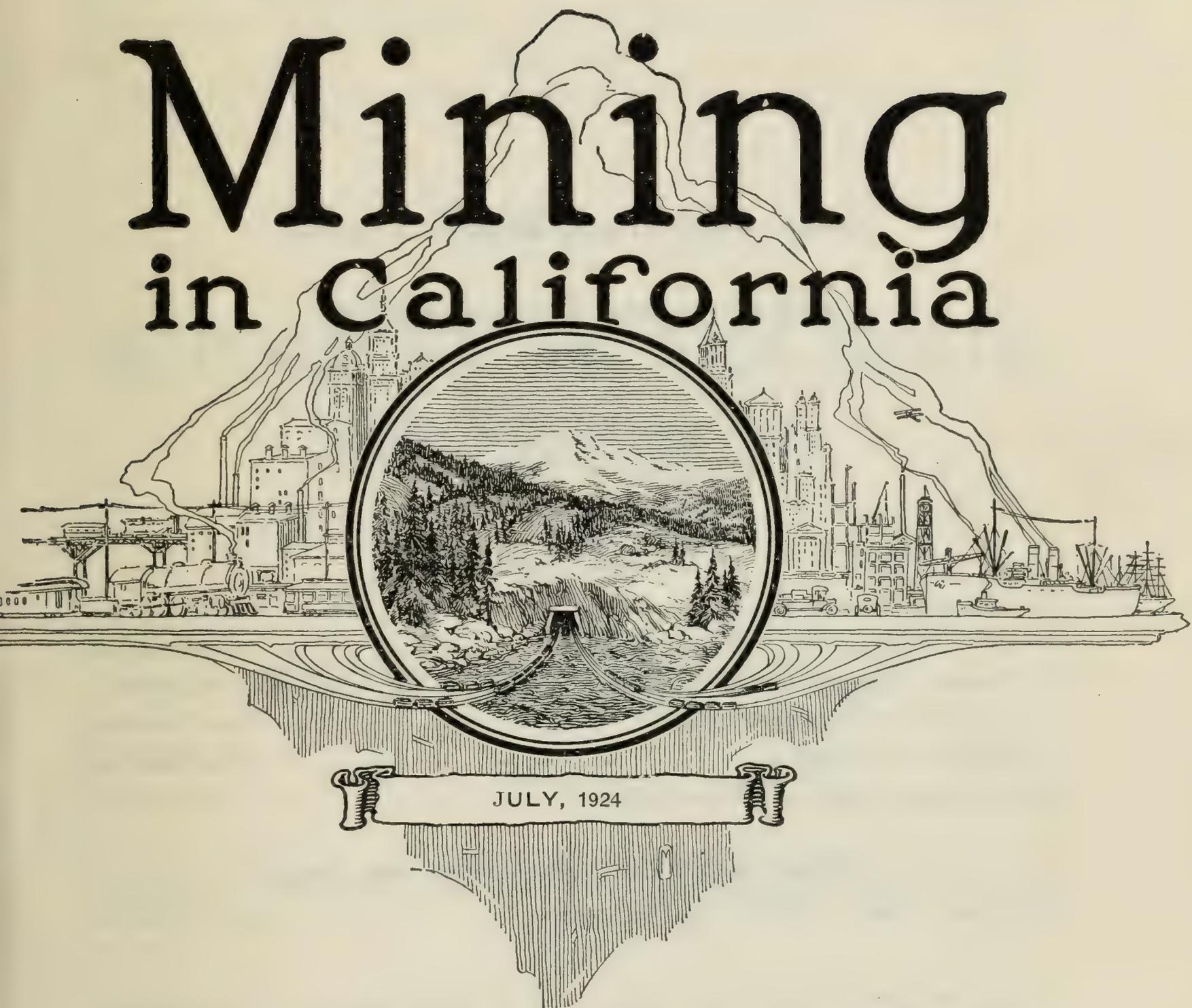
The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of current applications for positions and 'positions open' is carried in each issue. Notices are designated by a key number, and the name and address corresponding to any number will be supplied upon request, without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss. Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

- 21-19 Draftsman. Technical education. Sixteen years' experience, mostly foreign, construction, mining and railroad work. Age 36; married. References. Salary wanted, \$300.
- 21-20 Mine Foreman. Sixteen years' experience, Colorado and Nevada. Age 43; married. References. Salary open.
- 21-21 Exploration and examination. Three and one-half years as engineer, Malay States. Age 28; single. References. Salary wanted, \$200.
- 21-22 Mine Superintendent. Technical graduate. Sixteen years' experience. Age 38; married. References. Salary open.
- 21-23 Construction Engineer. Two and one-half years' experience. References. Salary open.
- 21-24 Mining Engineering. Technical graduate. Some experience. Age 24. Salary open.
- 21-25 Chemical or electrical work. Experience electrical and cyanide work. Age 47; single. References. Salary wanted, \$150.
- 21-26 Chemist. Seventeen years' experience, cement, fertilizer and sulphuric acid plants. Age 38; married. References. Salary wanted, \$175.
- 21-27 Foreman or Master Mechanic.
- 21-28 Mining Engineering. Main experience in metallurgical end.
- 21-29 Mine Superintendent. Specialty, quicksilver reduction. Experience in Scott and rotary furnace operation. Married. References. Salary open.
- 21-30—Mill work. Graduate metallurgical engineer. No experience except a little mining at Butte, Montana. Four years' banking experience. Age 28; single. References.
- 21-31 Position with mining enterprise or irrigation project. Graduate mining engineer. Varied and extensive experience in executive positions in British Columbia, Alaska and California, 1896 to date. Age 48; married. Excellent recommendations. Salary open.

Mining in California



JULY, 1924

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CALIFORNIA STATE MINING BUREAU.

EXECUTIVE AND TECHNICAL STAFF

LLOYD L. ROOT

State Mineralogist

WALTER W. BRADLEY

Deputy State Mineralogist

MINING DIVISION

C. A. LOGAN, District Mining Engineer	- - - - -	Sacramento
C. McK. LAIZURE, District Mining Engineer	- - - - -	San Francisco
W. BURLING TUCKER, District Mining Engineer	- - - - -	Los Angeles
CHAS. S. HALEY, Mining Engineer	- - - - -	San Francisco
C. D. HULIN, Geologist	- - - - -	San Francisco
FRANK SANBORN, Mineral Technologist	- - - - -	San Francisco

DEPARTMENT OF PETROLEUM AND GAS

R. D. BUSH, State Oil and Gas Supervisor	- - - - -	San Francisco
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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the State Mining Bureau, entitled 'Summary of Operations, California Oil Fields.'

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

LLOYD L. ROOT

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No. 3

CHAPTER OF
REPORT XX OF THE STATE
MINERALOGIST

COVERING

MINING IN CALIFORNIA

AND THE

ACTIVITIES OF THE STATE MINING BUREAU



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CALIFORNIA STATE MINING BUREAU
LLOYD L. ROOT
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



- LEGEND -

- Mining Division Boundaries.
- Mining Division Offices.

MEXICO

PREFACE.

The State Mining Bureau is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing, quarterly publication was begun in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the State Mining Bureau.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the Bureau will not discontinue its practice of issuing from time to time technical reports on special subjects. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Mining Bureau is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively.

This move brought the Bureau into closer personal contact with operators, and it has many advantages over former methods of conducting field work.

To continue this system most effectively with the limited funds available for the present biennium, the Redding and Auburn field offices were consolidated and moved to Sacramento on June 1, 1923.

The boundaries of each district were adjusted and the counties now included in each of the three divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

SACRAMENTO FIELD DIVISION.

C. A. LOGAN, Mining Engineer.

The increased amount of work at the Sacramento office, due to its central location and the enlarged district, and incidental to the livelier interest in mining, has raised the question as to whether or not the best service could be given the public, under present circumstances, by devoting time to work in the field or in the office, and less time has been available for field work than in the past. There have been few important changes to record in the general mining situation since the last report.

Amador County.

Sinking is going on at several of the deep mines on the Mother Lode in this county. Extended prospecting of a new orebody in the present bottom of the Plymouth Mine, through a winze and under difficult conditions, gave such gratifying results that the directors of the company decided to sink the shaft about 1000 feet or to the 4300 ft. level, inclined depth. The lowest level of the Argonaut Mine is at 4800 feet on the incline, where an orebody is being worked south of the shaft, and sinking is going on. The Kennedy is developing its orebody on the bottom level, which is a few feet deeper than the bottom of the Argonaut. The Moore Mine is sinking from the 800 level to 1000 level.

A new prospecting venture is under way on some claims in Drytown district known as the Consolidated Virginia group. These claims had previously been prospected at various shallow depths of a few hundred

feet by shafts which the present company plans to unwater. B. I. Hoxie is in charge.

A coal property in the lignite belt near Buena Vista has lately been under development by Morris and Darling Brothers.

Calaveras County.

COBALT.

Work was resumed upon the cobalt prospect near Sheep Ranch, since the publication of our January report, in which the prospect is mentioned. Boulders of smaltite ore have been encountered in sinking.

GOLD.

Finnegan Mine on Carson Hill has resumed work since the last report and the 10-stamp mill has been steadily operated lately.

A new compressor of greater capacity than the last has been installed at the *Jolly Tar* prospect near Altaville, but the unwatering of the workings had not been completed late in June.

Washington (Oslin) Mine, last operated by Bullion Hill Mining Co., is being reopened by a new company who plan to sink below the present adit level from which last operations were carried on.

Victor Land and Mineral Company temporarily suspended operation of their gravel mine near Altaville late in June.

On the *Bishop Estate*, between Vallecito and Angels Camp, A. H. McKenzie and associates are preparing to sink a shaft to explore the Central Hill channel which they have been drilling during the past year.

Work has been continuing at the *Slab Ranch Mine* on the Central Hill channel between the above mentioned properties, but the channel had not yet been bottomed late in June.

El Dorado County.

Victoria Lode Mine is a prospect in the Rescue district near the old Boulder Mine. A shaft has lately been sunk 30 feet and a drift run 50 feet. The owners report that 20 tons of ore recently crushed in the 2-stamp mill yielded \$8 a ton in free gold and that the vein is of good width. Grimshaw, Ferris and Cornelius, owners.

Vandalia Mining Co. N. C. Busby, president. Fred McCall, secretary-treasurer. Office, Sutter Hotel, Sacramento. The *Vandalia* was an early producer and was described by W. H. Storms in our Bulletin 18. It is about four miles south of Shingle Springs near the Oro Fino Mine and the ore deposit is distinguished from the ordinary vein deposits, being described as a "highly siliceous felsite impregnated with iron sulphide." The present company have been developing and testing the ore and preparing for operation. They claim to have considerable ore developed.

Hines Gilbert Gold Mines Co. Office in Sacramento. The property is in American River Canyon near Spanish Dry Diggings. Work has been financed for a number of years by local sales of stock. There is an adit about 450 feet long and other shorter workings and a depth

of 110 feet has been reached. Some small lots of very good ore have been milled during the past year, returns as high as \$40 a ton having been reported. The property is on the course of the Mother Lode and only one of the veins has been developed by the recent work. It was described in the 1920 report.

Nevada County.

It has just been reported that Empire Mines and Investment Company will take over and operate the *Sultana Mine*, adjoining the Empire. The positions of the workings of the two mines are such that this can be done advantageously from the Empire.

Golden Center Mine has been completely unwatered and is being explored for new orebodies.

Idaho-Maryland Mines Company continues work and has been making surface improvements, including a new hoist and strengthening of the headframe.

The report of *North Star Mines Company* for the year 1923 shows that the production fell from the usual figure of about a million dollars to \$741,336.67 and that there was a loss resulting from the year's operations. A large sum was spent searching for new orebodies.

Depressed financial conditions have been partly responsible for retarding development of some of the smaller properties in the Grass Valley district and a few of the operators have announced that they are giving up their options on account of the difficulty of raising money.

Placer County.

A test run of between 45 and 50 tons of ore was made early in June from the *American Bar Mine* near Michigan Bluff. The company reported this test showed an average of over \$32 a ton, with a loss of \$1.45 a ton in the tailing, and with concentrate worth only \$26.25 a ton. The test was made in the company's old 10-stamp mill on the property and seems to show that the ore is amenable to ordinary stamp-milling and concentration methods. The ore carries coarse gold. A previously reported average of assays of the exposed ore was about \$20 a ton. The property has been described in our June, 1922, report and in the April, 1924, issue.

Big Oak Mine near the Rising Sun Mine, just west of Colfax, is reported in course of being reopened. The *Providence* claims in the Iowa Hill district have lately been taken under lease and option.

Siskiyou County.

A trip to the southern part of the county late in May permitted the gathering of information regarding a few properties not heretofore mentioned in Bureau reports. These are all in the Callahan and Scott Mountain district at the head of the South Fork of Scott River. This section of Scott River and the larger tributaries have some interesting gravel deposits but practically no gravel mining is being attempted at this time. The district was once the scene of dredging operations, and it is more than likely that dredging may be resumed at some

future time, if means can be found to overcome the difficulty of handling the large boulders. Another setback to mining in the district has been the hostile attitude of the largest landowner toward other operators who have tried to put properties in operation.

Ballinal Placer. R. F. Ballinal, Callahan. This mine is at the junction of Jackson Creek with the South Fork of Scott River, six miles south of Callahan, four and one-half miles of the distance being over a good road and the balance trail. Elevation is 4000 feet or more. The gravel lies between the two streams and may have been deposited by either of them when at a higher level. The bank is of moderate depth without overburden and there is a fairly good dump. There are some large boulders, characteristic of this section of the river, where the size of the wash is out of all proportion to the present size of the streams. A derrick would be required to handle these boulders. The gravel is free wash and has been ground sluiced in a small way by the owner, who has realized a small yearly return in coarse gold but has been able to handle only a very little gravel. Water is available under good head for hydraulicking and there are several acres that could be worked in the one piece, with other similar areas on the claim.

Chapman Prospect (quartz). This is on Scott Mountain seven miles from Callahan and one-half mile from the Callahan-Carrville road. In 1922 a 5-stamp mill was built at the foot of the mountain four miles or more from the prospect and ore was hauled down the mountain at great expense. About 40 tons milled are reported to have yielded \$856. This came from a narrow seam in a shaft 80 feet deep with about 20 feet of drift, where the pay was reported lost. Previous work in an adit had produced about an equal amount. Idle.

Fippen & Hayden (Boulder Creek) Placer. This comprises 60 acres on and near the contact of serpentine and granite. A decomposed dike along the contact carries seams and veins of quartz. Some rough gold, occasionally coarse, has been recovered from hydraulic mining operations in two pits opened on the dike, the total area worked being perhaps two acres. The total production has been small.

The property is equipped with 150 feet of 8-inch and 11-inch pipe and one giant and has two ditches, one of which is about two miles long and is in repair. Water is bought from the McKeen Mine at \$1 a year. There is a good head of water at the lower pit and the flow was probably 600 inches or more at the end of May this year. The claims are three miles from Callahan on Boulder Creek. M. E. Gardner, Callahan, is the lessee.

Six-Mile Creek Placer. A. E. Westover, 480 Pine street, San Francisco. This comprises 40 acres and lies at the junction of Six-Mile Creek and East Fork of Salmon River, eighteen miles from Callahan on the Callahan-Cecilville trail. It adjoins the old Root & Salsberg placer. As yet it has been only slightly prospected, having been found only last year. It is reported to be high ground, about 300 feet above the East Fork and believed to run parallel to it for about 1500 feet, though this is not certain on account of obscuring slides from the adjacent hill. Where exposed it is stated to be 200 feet wide and 14

feet deep. About two miles of ditch would be needed to supply water for hydraulicking. There is a cabin, blacksmith shop, three giants, 800 feet of 11-inch and 15-inch pipe and one-fourth mile of 2 ft. by 3 ft. flume belonging to the same owner on the adjoining property and available for use on this ground, and the water of Six-Mile Creek is available for piping under good head. Westover states a test of 200 cubic yards was encouraging.

Sugar Hill Mine. This property is about five and one-half miles southwest from Callahan on the same dike mentioned under the Fippen & Hayden placer. It also has been worked in the past as an hydraulic mine. During the present season Wolfskill & Lidstone have taken a lease and option and have begun prospecting the quartz possibilities of the ground. A quartz vein four feet thick is found in the dike and drifting to explore this vein was being started late in May.

LEAD.

On the Fippen & Hayden placer, described above, an adit of unknown length was run many years ago to prospect for lead. A small amount of good galena ore had been brought out of this adit and dumped. The present lessee, M. E. Gardner, sluiced off the soil overburden and exposed the edge of the vein in place above the old adit. The exposed section is about 30 feet long and the width of vein is from a few inches to one foot. It consists of barite carrying lumps and stringers of galena. Assays of the ore indicate a high lead content, sufficient to make the best samples a good shipping ore, and with a fair content of silver. The location of the vein so close to the igneous intrusive and the contact is a favorable factor. Ore could be concentrated by jigging and would have to be hauled to the railroad at Gazelle, about twenty-seven miles by road.

Other prospects of lead ore have been reported in the region eight to ten miles east of Callahan near the Gazelle road, but so far as could be learned, nothing but float has been found there yet.

REPORTED TIN PROSPECT.

During the past two years some publicity has been given an alleged discovery of tin ore near Kangaroo Lake in this county. This is a small mountain lake penned up behind an ancient moraine and covering an area of about 20 acres at an elevation of 6000 feet or more, sixteen and one-half miles by road and trail east of Callahan. The lake and immediate vicinity were visited late in May in order to learn something about this reported prospect if possible. So far as could be found by examination and inquiry, no work was being done there and none of the parties supposed to have located the claims were to be found.

The most interesting geologic feature of the region is the high cliff of coarsely crystalline rock rising on the southeast side of the lake. This rock, according to report from our laboratory, is composed almost entirely of soda-lime feldspar and hornblende with very little quartz. The crystal aggregates of hornblende and feldspar are in some cases several inches in the longest dimension, and the rock would probably be classed as a diorite pegmatite. Two places were found where a very little prospecting had been done in this formation

but samples taken at these places and tested in our laboratory failed to show any tin.

OTHER MINES.

Lack of time prevented extending the trip to other parts of the county which it is hoped can be reached in time for the next quarterly report. Mention should be made, however, of the difficulties of the placer miners this season on account of lack of water. Interesting developments are going on at the *Big Buzzard Quartz Prospect* near Happy Camp under the direction of H. C. Cutting. Machinery for a mill, which will use the Vandercook mercuric cyanide process, is on the ground, but the water shortage is given as a reason for delay in setting up the plant. At the *Independence Mine*, on the east side of Klamath River ten miles downstream from Happy Camp, very satisfactory production has been made this season from a short drift and a series of shallow winzes sunk below it. The production has been high grade gold ore.

Trinity County.

Parts of the county were visited in May and it was found that gold mining had been very quiet the past year, with very little work being done at the time of visit.

Hydraulic mining suffered from the extreme shortage of water. B. R. Brown, lessee of *La Grange Mine*, had only sufficient water for 60 hours run. The splendid water supply system maintained while the mine was fully active has been allowed to fall partly into decay. *Lorenz Bros.* closed down early in May. *Red Hill Placer*, near Junction City, had only eight days water supply for piping during the past season. *Nugget Bar Placer*, above Minersville, closed down in March after a short effort to operate.

The gold dredgers described in our December, 1922, report have been producing most of the gold mined in the county lately. These dredgers are on Trinity River from near Lewiston to above Trinity Center. The site of the town of Trinity Center has in part been given over to one of these dredging companies which has been getting satisfactory results.

Assessment work and prospecting for quartz ore is quite active, but so far as could be learned no quartz mills were being operated in the county during May. On the East Fork of North Fork of Trinity River eight to twenty miles from Junction City, a number of quartz prospectors are working. Work was started in May at the *Bully Choop Mine* in the southern part of the county sixteen miles southeast of Douglas City. At the *Trinity Bonanza King Mine*, United Trinity Mines, a corporation, had a crew of about twelve men employed in May retimbering some of the old workings and prospecting. A few men were also employed at the *Strode Mine* east of Carrville.

Tuolumne County.

Clio Vindicator Mines Co. completed their new 10-stamp mill and cyanide plant at the end of June and have begun making test runs. The ore is crushed in cyanide solution and the new Vandercook mercuric cyanide process is used. Runs so far made are reported to have given a satisfactory recovery.

Eagle Shawmut Mining Co. is sinking a winze, in which they plan to go 600 feet deeper than their present bottom level, which is at 2780 feet. The mill is being operated at part capacity and over 100 men are employed.

Further transactions have been announced concerning the *Experimental Gulch Mine* above Columbia. The United Mines Co. of California have undertaken to operate the property and announcement has been made that new territory will be explored. Work is planned on the *Gandolfo* and *Rocca* claims near Stent and on the *Josephine Prospect* four miles from that place. A recent strike has been reported from the *McCormick Mine* on the Tuolumne River above Jacksonville. There is also activity at a number of properties on the East Belt, with a few men employed in each case.

Springfield Tunnel and Development Company is persistently continuing the exploration of their large drift mining holdings near Sonora. The latest announcements are of an optimistic character and indicate the hope of the operators that they are about to enter a profitable section of the buried channels. The underground geology of the property was found to be unexpectedly complicated on account of the character of the bedrock.

Pacific Lime and Plaster Co. of Sonora has lately been adding to its plant in order to manufacture a greater variety of limestone products including hydrated products.



SAN FRANCISCO FIELD DIVISION.

C. MCK. LAIZURE, Mining Engineer.

Alameda County.

Industrial Chemical Corporation. E. M. Vail, president; H. H. Vail, secretary; Carl W. Beckman, treasurer; home office, 3221 San Fernando Bldg., Los Angeles; local address, Newark, California. The company formerly operated a plant at San Diego, producing magnesium chloride, epsom salts, magnesite, and potash under the name California Chemical Company, Inc. The San Diego plant was sold in 1923 to the National Kellastone Co. of Chicago, Illinois, and Porterville, California, and since then activities have been transferred to Newark, Alameda County. A new plant has been erected on property leased from the Arden Salt Works at Newark, and bittern waters from the Arden works and other salt companies are purchased under contract.

This 'mother liquor' brine, or bittern, remaining after the sodium chloride (common salt) has crystallized out through solar evaporation and been removed mechanically at the salt works, is the raw material treated in the Industrial Chemical Corporation plant. By a carefully regulated process of evaporation in vacuum, using artificial heat, various other salts originally contained in the sea water are recovered in crystal form. Salts being produced on a commercial scale at the present time are magnesium chloride, epsom salts (hydrous magnesium sulphate), magnesium bromide, and potassium chloride.

Mission Lime Marl Deposit. This deposit is situated about one-quarter mile east of Mission San Jose. The property is under lease to T. D. Witherly, Box 52, Mission San Jose. The limestone, which is somewhat soft and decomposed, outcrops at the base of a small hill easily reached by good road. Mining is by open cut. The material is suitable for agricultural use, but the production to date has been small. Equipment consists of grizzly, small jaw crusher, Grundler mill, bucket elevator and



Industrial Chemical Corporation's Plant, Newark, California.

bin. An analysis of the material, as reported by the Pacific Chemical Laboratories, was as follows :

Nitrogen -----	0.46%
Limestone -----	83.10%
Lime phosphate -----	0.59%
Potash (soluble) -----	0.46%
Undetermined -----	15.39%

Similar material is said to occur at other points on the Witherly property, but no development has been done at these localities.

LOS ANGELES FIELD DIVISION.

W. B. TUCKER, Mining Engineer.

Inyo County.

Cerro Gordo Mine (lead, silver, zinc) is situated in the Inyo range of mountains, near the summit of Cerro Gordo Peak, eight miles east of Keeler. Elevation 8500 feet. Owner, *Cerro Gordo Mines Company*, San Jose, Cal. In February, 1923, the mine was taken over under lease by the Natural Soda Products Company, Keeler, California. W. W. Waterson, president; J. S. Henderson, secretary; C. A. Stockton, manager.

GEOLOGY:

According to Knopf,¹

"The prevailing rock at the mine is a dense; fine-grained, white marble; with this are associated some interstratified slate, and a number of dikes of diorite and of monzonite porphyry which lie approximately parallel to the stratification of the inclosing beds.

"The rocks in the immediate vicinity of the mine are part of a formation of the Carboniferous Age which is extensively developed in the surrounding area. This formation consists principally of limestone, with some interstratified shale or slate and quartzite. A belt of shale, probably 300 feet thick, lies northwest of the mine, and is underlain by fine-grained, white quartzite, 100 feet thick. The strike is N. 30° W., and dip 45° W. * * *

"The intercalated beds of shale and quartzite prove useful horizon markers, and show faulting of complicated character has taken place, centering particularly at the Cerro Gordo Mine. * * *

"East of the mine the limestones as a rule dip eastward, the dip averaging 45° E. on Cerro Gordo Peak, and flattening farther east. * * * The examination of the geologic structure around Cerro Gordo therefore shows that the rocks have been subjected to severe faulting. Some of this faulting took place prior to the formation of the ore bodies, and some after the ore bodies had been formed, but the post-mineral faults are probably of much smaller magnitude than those of pre-mineral origin. Many faults are exposed in the underground workings of the Cerro Gordo Mine. * * *

"Northwest of Cerro Gordo monzonite porphyry forms a small mass intrusive in the surrounding shale. * * * In the mine occur dikes which appear to have been originally similar to the monzonite porphyry northwest of Cerro Gordo. These dikes are altered by shearing, primary mineralization, by oxidation, and by the downward percolation of sulphate solutions. * * *

"One of the most prominent dikes in the mine is that cut in the Union tunnel, in the footwall crosscut of the Santa Maria pit, where it is 50 feet wide, and in the Zero level. The dike apparently conforms in the main with the strike and dip of the bedding of the inclosing rocks. In the Union tunnel, however, the contacts are much shattered. The west contact strikes N. 15° W., and the east contact N. 35° W., both being nearly vertical. The dike is overlain by a shale belt 105 feet wide and is underlain by massive white marble. In the Zero level, which is several hundred feet south of the Union tunnel, the dike lies within the shale belt, and therefore probably cuts across the trend of the formation at a narrow angle. * * *

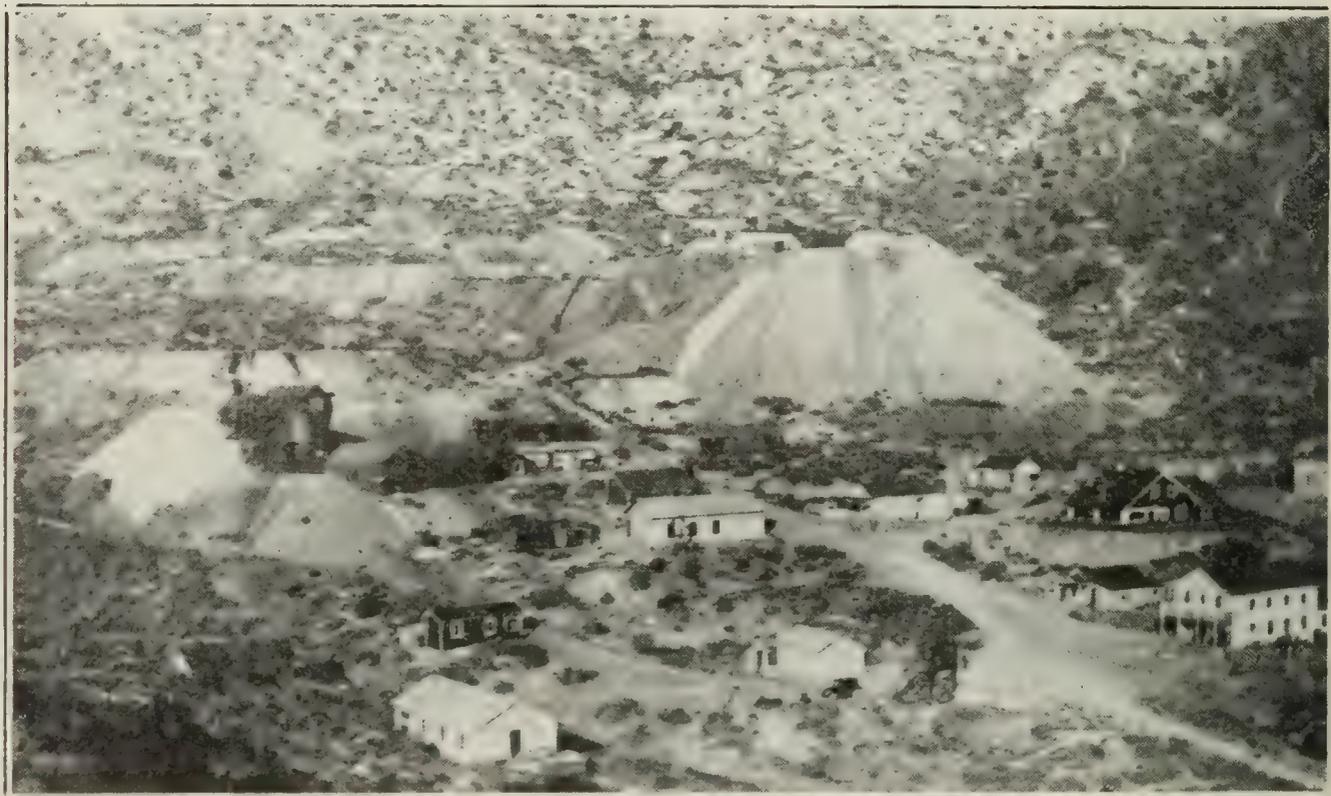
"Other dikes differing considerably from the monzonite porphyry were noted in the underground workings. They range in different dikes from 4 to 25 feet in thickness; on 900-foot level one of these dikes was found to be an intrusive into the monzonite porphyry. They are gray, fine-grained, granular diorites."

¹Knopf, Adolph, Mineral resources of the Inyo and White Mountains, California: U. S. Geol. Surv., Bull. 540, pp. 100-103, 1912.

DEVELOPMENT:

The present company's development work is confined to the lead orebodies, on the 400', 700', 900', and 1000' levels.

The lead orebodies of Cerro Gordo consist of lenticular masses distributed through a zone 2000 feet long and several hundred feet wide. The predominant rock of the ore-bearing zone is a white marble. Slate and igneous rock—the dikes of diorite and porphyry—occur also within the ore-bearing zone, but the orebodies that have been worked are inclosed principally in the marble. The rocks of the ore-bearing zone strike in a north to northwesterly direction, and dip on the average 70° S.W.; the orebodies conforming to the trend of the inclosing rocks. The lead orebodies formerly worked were from 3 to 20 feet wide, and about 70 feet in length. The ore consists largely of galena, cerrusite, anglesite; also some sphalerite, tetrahedrite and pyrite. The San Felipe vein cuts diagonally across the silver-lead ore-bearing zone, trending



Belshaw Shaft, Cerro Gordo Mines, Inyo County.

N. 35° W., and dipping 70° to 80° S.W. It traverses both marble and porphyry, and is about 12 inches to 2 feet in thickness. The main ore mineral noted is tetrahedrite, with its oxidation products, azurite and malachite inclosed in a gangue of barite and quartz.

The ore now mined is worked through the Belshaw shaft, 900 feet deep, with levels at 200', 400', 500', 700', and 900'. A winze is being sunk from the 900-foot level, 160 feet north of the Belshaw shaft. At a depth of 100 feet (1000-foot level), a crosscut has been driven west 30 feet, cutting a vein of quartz 2 to 6 feet wide, which strikes N. 35° W. and dips 70° to 80° S.W. The quartz is mineralized with tetrahedrite, galena, azurite, and malachite.

The ore mined is said to assay 25 ozs. silver, $1\frac{1}{2}\%$ to $2\frac{1}{2}\%$ lead, and $2\frac{1}{2}\%$ copper. This vein lies about 250 feet south of the San Felipe vein, and has a course parallel to it. The vein has been drifted for a distance of 100 feet. The present company plans to sink the winze to a depth of 250 feet below the 900-foot level. On the 1000-foot level a

drift has been driven southeast several hundred feet, developing a lens of lead carbonate ore. The 400-foot level, in the vicinity of the China stope, has been subleased to Cooper Shapley and B. S. Hook of Bishop, who have also a lease on the Cerro Gordo mill. The fills of the old stopes are being drawn and the fines are to be treated in the mill at Keeler. The ore is stated to assay 13% lead, 7 ozs. silver, 1½% copper, and 50 cents in gold. From concentration test it is stated a product assaying 45% lead and 60 ozs. silver can be produced with a recovery of 60% of the lead and silver. The company is shipping 150 tons of ore per month. The siliceous ore from the 1000-foot level is shipped to the Mammoth Copper Company's smelter at Kennett, Shasta County. Freight on this ore from Keeler to Kennett costs \$3.90 per ton. The lead ore is shipped to the Midvale Smelter, Utah.

Limestone is being mined through the Union tunnel, and 80 tons per day are transported over a tramway to bunkers at Keeler, from which it is loaded in railroad cars and hauled to the plant of the Natural Soda Products Company.

Mine equipment: Single drum hoist driven by 100-h.p. motor; 1 Ingersoll-Rand compressor (16" x 12") (9" x 12") driven by 75-h.p. motor; 1 Ingersoll-Rand compressor (21" x 16") (12" x 16") driven by 100-h.p. motor. A Leschen aerial tramway 29,560 feet long carries ore and limestone to bunkers on the railroad at Keeler. Capacity of tramway is 16 tons per hour. Electric power is furnished by the Southern Sierras Power Company.

Mill equipment: 9" x 15" Blake crusher, No. 54 Marcy mill in closed circuit with Dorr duplex classifier, elevators, 1 Colorado impact screen, 1 Burchart concentrator, and 3 Wilfley concentrators. Mill driven by 50-h.p. motor. Forty men employed.

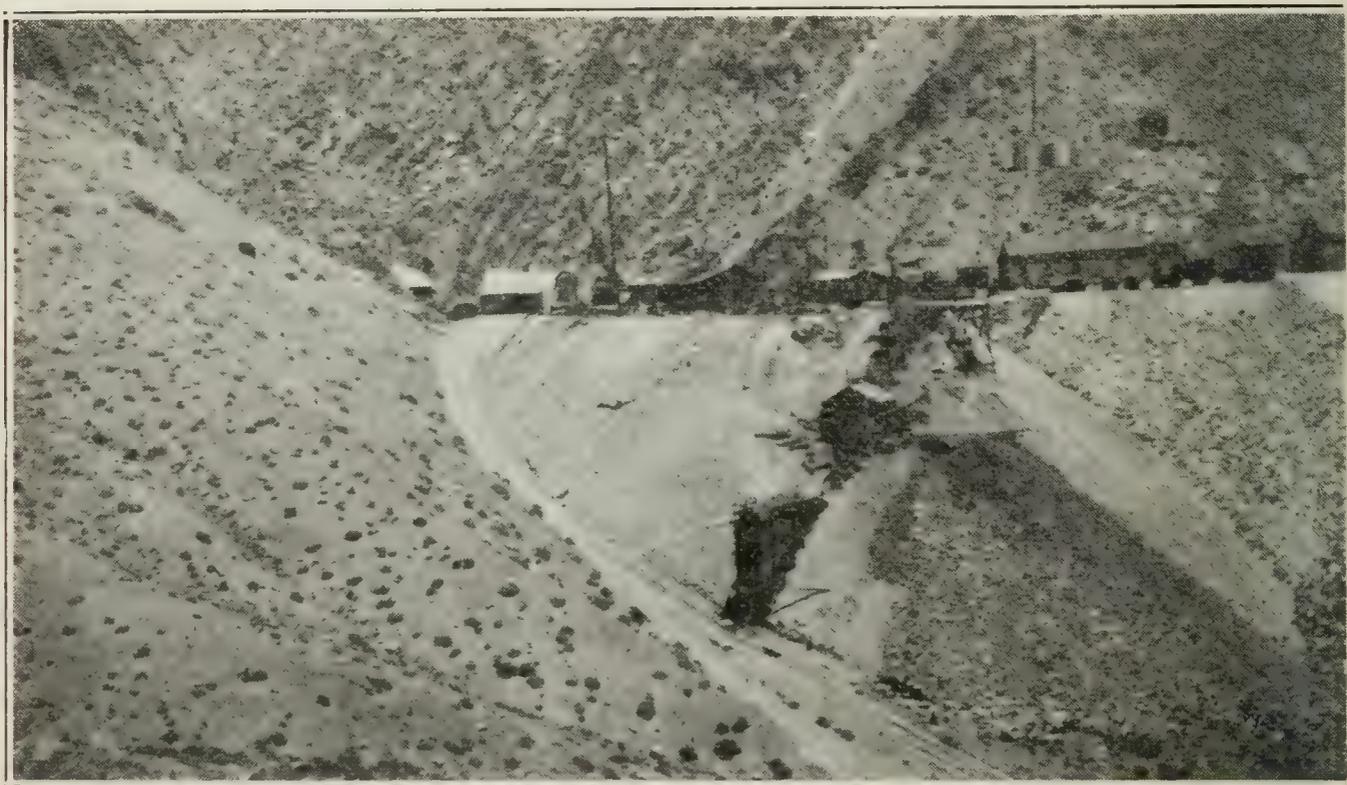
Bibl: U. S. Geol. Survey Bull. No. 540, pp. 97-109; Professional Paper 110, pp. 106-116; State Mineralogist Report XV. pp. 90-92.

Estelle Group of Mines, Cerro Gordo district, is five miles east of Keeler on the western slope of Cerro Gordo Mountain. Holdings comprise 11 claims. Elevation 6100 feet. Owner, *Estelle Mining Company*; Adolph Ramish, president; Roy C. Troeger, secretary; Thomas L. Chapman, general manager. Offices, Keeler, Cal.

Since the publication of Report XVII of the State Mineralogist (1920), the energies of the company have been devoted to driving the Dellaphene tunnel, which has been driven N. 60° E. 9000 feet, intersecting the vein on the Morning Star claim at a depth of 1700 feet, and also said to have cut the San Felipe vein developed in the Cerro Gordo Mine, at depth of 2400 feet below the Cerro Gordo Mine. The tunnel intersects carboniferous rocks consisting mainly of limestone. At 5929 feet from the portal, a drift has been driven southeast 900 feet along a fault fracture, which is evidently a post-mineral fault as no ore was developed. Near the face of this drift a crosscut is being driven southwest to cut the Morning Star vein. At 6772 feet from the portal a drift has been driven southeast 800 feet on a fault fissure; a small lens of lead carbonate and galena ore being developed. Average width of ore 18 inches. At 7676 feet from the portal it cut the San Felipe vein. Drifts have been driven on this vein 300 feet northwest,

and 300 feet to the southeast. The vein strikes N. 35° W. and dips 70° to 80° S.W. It traverses the limestone and ranges from 18" to 4 feet wide. The gangue is quartz mineralized with galena and pyrite, occasionally with tetrahedrite.

In a drift to the north from the main crosscut tunnel, which is located 100 feet west of the San Felipe vein, a 3-compartment raise has been put up in the limestone a distance of 200 feet. At 40 feet it cut a small lens of lead carbonate and galena ore and at 160 feet cut another lens of ore 20 feet long and 12 feet wide. Other orebodies have been developed in the limestone east of the San Felipe vein. This indicates that the silver-lead ore-bearing zone has been cut by the San Felipe vein and probably occurs in the limestone about 100 feet east and west of the San Felipe vein. These orebodies consist of lenticular masses of lead carbonate, the ore being inclosed in marbleized limestone. The ore is principally reddish yellow lead carbonate and galena,



Troeger Tunnel, Estelle Group of Mines, Cerro Gordo District, Inyo County.

said to carry 30 ozs. silver, and 30% lead. These orebodies occur on or near the intersections of north-south and east-west fissures on bedding planes of limestone, which dip 25° to 35° east. Ore mined is trammed in twelve 25-cubic-foot ore cars hauled by an electric storage battery locomotive to ore-bins at the mouth of the tunnel, where it is sorted, then hauled by trucks to Keeler. Ore shipments to the smelter at Midvale, Utah, average 250 tons per month.

The *Morning Star Mine*, owned by the company, is under lease to Harry Hildeman of Keeler. The Morning Star workings are situated at an elevation of 8000 feet.

Developments: Consist of crosscut tunnel driven N. 40° E. 450 feet where it cut a lead-silver ore-bearing zone in limestone. A winze was sunk on ore to a depth of 225 feet, with levels at 40', 70', 120', and 220'. The ore-bearing fissure strikes N. 30° W., dipping 75° S.W. Galena and carbonate ore is being mined, carrying 30 ozs. silver, 10%

to 12% lead and some gold values. Five men are employed on the Morning Star lease.

Equipment: Ingersoll-Rand compressor (17" x 14") (10" x 14") driven by 100-h.p. motor, Root's No. 8 pressure blower driven by 25-h.p. motor, fifteen 25-cubic-foot ore cars, aerial tramway 7000 feet in length from the Morning Star Mine to ore bunkers below the Dellaphene tunnel, storage battery locomotive, blacksmith shop, assay office, and buildings for employees. Electric power is supplied by the Southern Sierras Power Company. Twenty men are employed.

Bibl: U. S. Geol. Survey Bull. No. 540, p. 110; State Mineralogist Report XVII, p. 286.

Lucky Jim Mine (lead-silver). Situated in the Darwin district, two miles north of Darwin, and twenty-four miles southeast of Keeler. Owners, *Darwin Silver Company*, Chicago, Illinois. The mine is under lease to A. G. Kirby of Darwin, Cal. The ore mined from the Lucky Jim is being concentrated in a mill on the property. Fifteen men are employed.

Bibl: Mineral Resources West of Rocky Mountains, 1876, p. 25; Report of Director of Mint, Precious Metals in U. S. 1883, p. 163; State Mineralogist Reports VIII, p. 226; X, p. 211; XII, p. 24; XV, pp. 100-101; XVII, pp. 289-290; U. S. Geol. Survey Bull. No. 580, pp. 12, 18.

Santa Rosa Mine (lead-silver) is located in the Lee Mining district, east of Cerro Gordo, and twenty-six miles by road from Keeler. Elevation 7000 feet. Owner, *Independent Lead-Silver Mining Company*, Syndicate Building, Oakland, Cal. Under lease to Scruggs & Yake, Howard & Wilson, and Joe La Cyr of Keeler.

The country rock is limestone intruded by dioritic-porphry dikes. The ore occurs on the contact of limestone with diorite intrusions, and is composed of galena and lead carbonate, carrying values in silver. Six cars of ore were shipped during the month of April to the Midvale Smelter, Utah. Eight men are employed.

Bibl: State Mineralogist Reports XV, pp. 107-108; XVII, p. 294.

MARBLE.

Inyo Marble Company, D. H. Dunn, president; Robert H. Tune, secretary; offices 1014 Hibernian Building, Los Angeles. The property of the company is located six miles north of Keeler, on the southwestern flank of the Inyo Range of Mountains. Two quarries are under operation. The company is supplying the Inyo Chemical Company with dolomite. Six men are employed.

Bibl: State Mineralogist Reports X, p. 215; XII, p. 392; XIII, p. 628; XV, p. 111; XVII, p. 295; State Mining Bureau Bull. 38, pp. 99-100.

POTASH AND SODA.

Inyo Chemical Company of Detroit, Michigan, on May 1, 1924, purchased the plant of the *California Alkali Company*, which is situated at Cartago, a station on Owenyo branch of the Southern Pacific Rail-

road. The plant is located on the western shore of Owens Lake. Officers of the present company are H. W. Carr, president; W. H. Lowery, plant superintendent. Pacific coast office, 910 Santa Fe Building, San Francisco.

This plant has been idle since 1922, and the present company plans to remodel and increase its capacity. Due to Owens Lake drying up, a pipe line eight miles in length and pump will have to be installed to pump brine to the vats for solar evaporation. The concentrated brine will be treated in the plant for extraction of potash, borax, sodium carbonate (soda ash), sodium bicarbonate, and crude trona. The plant is expected to treat 600 tons per day of brine, producing 200 tons of dry salt. The company also owns the *Deep Springs Lake deposit*, Inyo County. One hundred men are employed

Bibl: State Mineralogist Report XVII, p. 298.



Inyo Chemical Company's Plant (formerly California Alkali Company), at Cartago, Owens Lake, Inyo County.

Inyo Development Company. This plant is situated one mile northwest of Keeler, on the eastern shore of Owens Lake. The plant was purchased in 1923 by the *Great Western Chemical Company*, Pittsburg, Cal. Idle.

Bibl: State Mineralogist Reports VIII, p. 226; XII, p. 409; XIII, p. 646; XV, pp. 124-125; XVII, p. 299.

Natural Soda Products Company. Plant situated on the east shore of Owens Lake, two miles south of Keeler. Owners, *Natural Soda Products Company*; W. W. Waterson, president; J. S. Henderson, secretary; Paul Waterson, superintendent, Keeler, California.

Since the publication of Report XVII of the State Mineralogist (1920), the plant has been under continuous operation. The company is producing sodium bicarbonate, sodium carbonate (soda ash), and crude trona (a double salt of sodium carbonate and sodium bicarbonate.) Limestone is secured from the Cerro Gordo Mine, for the

generation of carbon dioxide, replacing dolomite formerly secured from the Inyo Marble Company. The burned lime is being sold by the company as a by-product. One hundred men are employed.

TALC.

Inyo Talc Company, P. H. Booth, president; Franklin Booth, secretary; offices, Equitable Bank Building, Los Angeles. Operating *Simons Talc Mine*, and also grinding plant. The mine is located seventeen miles southeast of Keeler, while the grinding plant is at Keeler.

Bibl: State Mineralogist Reports XV, pp. 126-127; XVII, pp. 300-301.

TUNGSTEN.

Pine Creek Tungsten Mine. Situated forty-five miles by road northwest of Laws, on the south slope of Mount Morgan, in the Sierra Nevada Range. Elevation 11,200 feet. The property was recently taken over under lease by the *Tungsten Products Company*; W. W. Waterson, president; E. Cooper Shapley, secretary and manager. At present writing the mine and mill are being put in shape for operation. Thirty men are employed.

Kern County.

GOLD.

King Solomon Consolidated Mines consist of 90 acres in Sec. 35, T. 29 S., R. 40 E., three-fourths of a mile west of Johannesburg, in the Rand district. Owners, *Shipsey Mining Company*, of Los Angeles. Edward Shipsey, president; Thos. D. Nestor, secretary; Ray Drain, superintendent. Elevation 3900 feet.

The vein strikes northwest and southeast. Width 3 feet. Granite footwall and porphyry hanging wall.

Developments consist of shaft 520 feet deep, with levels every 50 feet. Present development work confined to the 300-foot level.

Equipment consists of 25-h.p. electric hoist and 5-stamp mill.

Ore mined from the 300-foot level is reported to assay \$50 per ton, and during the month of April 100 tons were treated in the mill. Six men are employed.

LIMESTONE.

Kramer Limestone Deposit is located in T. 8 N., R. 20 W., about six miles west of Chandler, a station on the Ridge Route. Elevation 5300 feet. Owner, *Henry Kramer*, La Crescenta, Cal. Holdings comprise 3 claims; 60 acres.

A massive belt of limestone is exposed on the ridge northeast of Cuddy Canyon, the general strike being northwest and southeast, with a dip to the northeast. The limestone is exposed for a distance of 4500 feet in length and about 300 feet in width. The material is white and crystalline. Analysis reported as 96% CaCO₃. Idle.

Riverside County.

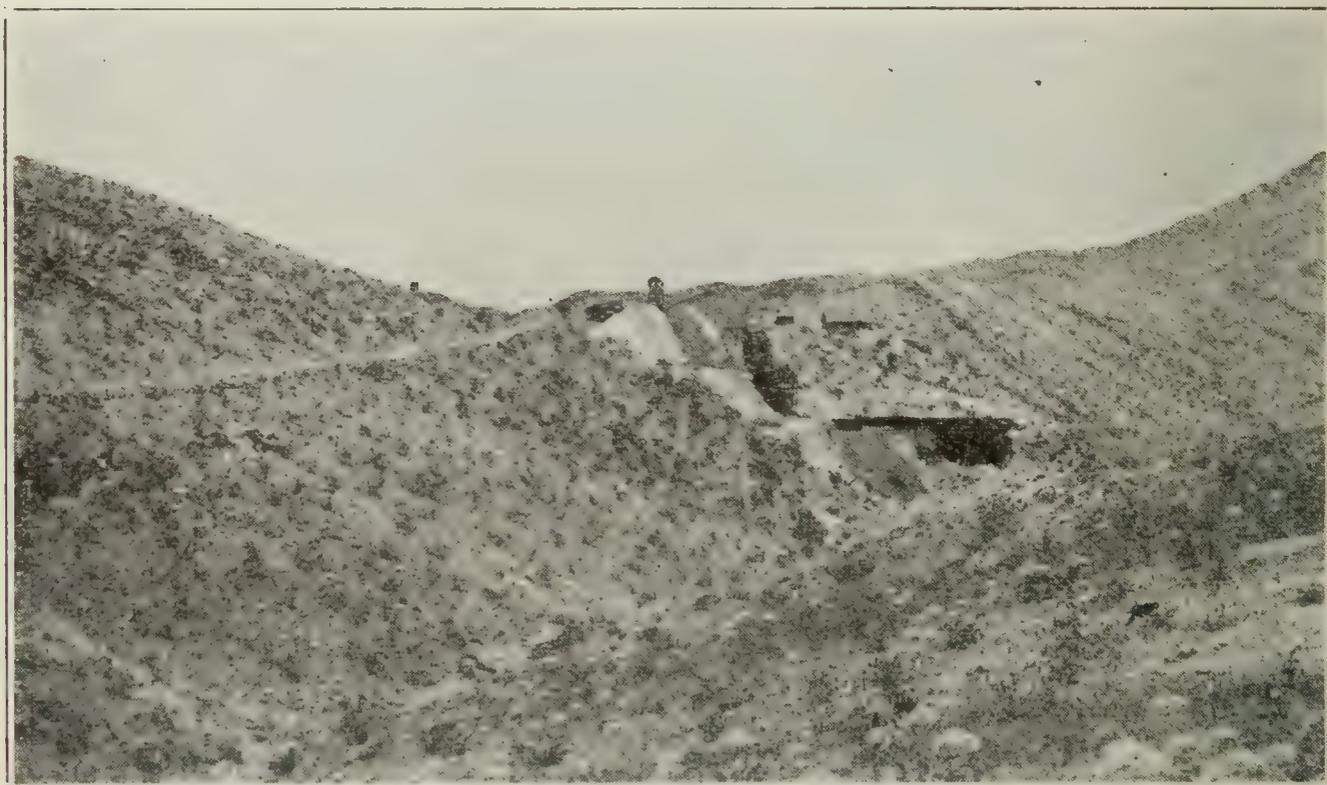
EAGLE MOUNTAIN DISTRICT.

Iron Chief Mine (gold). Situated in the northern part of Eagle Mountains, forty miles northeast of Mecca, a station on the Southern

Pacific Railroad. Elevation 2500 feet. Owner, *Southern Pacific Railroad Company*. Holdings comprise six patented claims known as the *Gray Eagle Group*.

The property was originally located by William Stevens and Thomas Dolfflemeyer of San Bernardino. In 1897 the mine was sold to Mr. Charles Lane of San Francisco, who installed a small mill on the property and operated it for several years. The ore milled is said to have had a value of \$40 per ton, of which about 50 per cent was recovered. It is stated that the production was \$50,000. Mr. Lane did not complete payments on the property and the original owners then installed a 50-ton cyanide plant, operating the mine and mill until about 1902, when sulphide ore was encountered and operations were suspended. The ore milled is said to have had an average value of \$10 gold per ton. The production is reported to have been \$150,000.

The ore is largely hematite which carries free gold. It occurs as a



Iron Chief Gold Mine. View of Dumps and Cyanide Plant, Eagle Mountains, Riverside County.

replacement along the contact of dolomite and quartz-monzonite. This contact strikes N. 70° W., dipping 50° N.

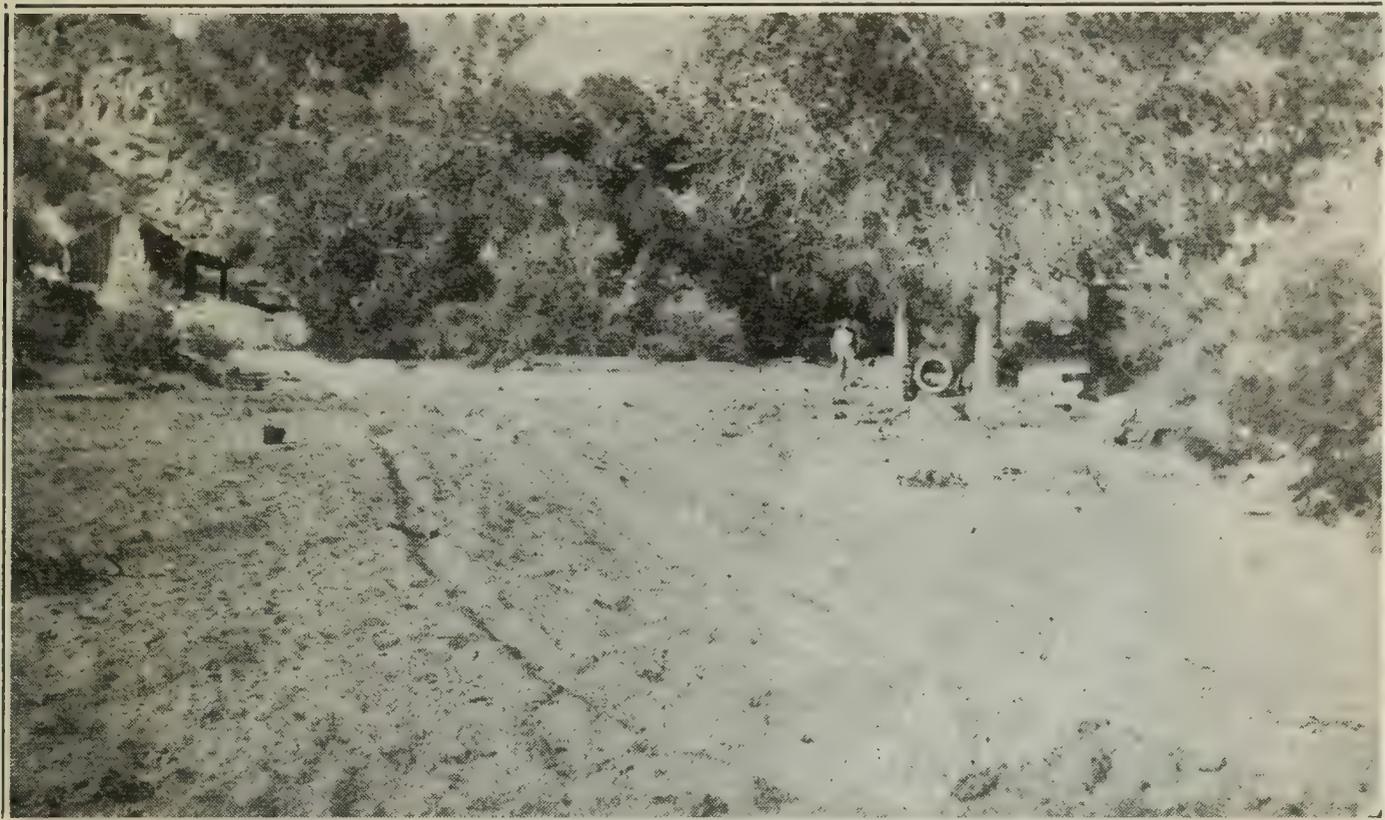
Developments: Consist of vertical shaft 140 feet deep. About 500 feet west of the shaft a tunnel has been driven east 1000 feet along the contact, cutting the vertical shaft at a depth of 100 feet. On the north slope of the hill, a crosscut tunnel has been driven south 500 feet to the contact. The ore cut in these lower workings was heavy pyrite ore, with some chalcopyrite. Only the oxidized ore above this level was worked. The ore along the contact fissure had a width of from 2 to 10 feet.

Mine equipment: 25-h.p. Foos gas engine.

Mill equipment: Two Blake crushers, Gates rolls, eight 4' x 18' steel cyanide tanks.

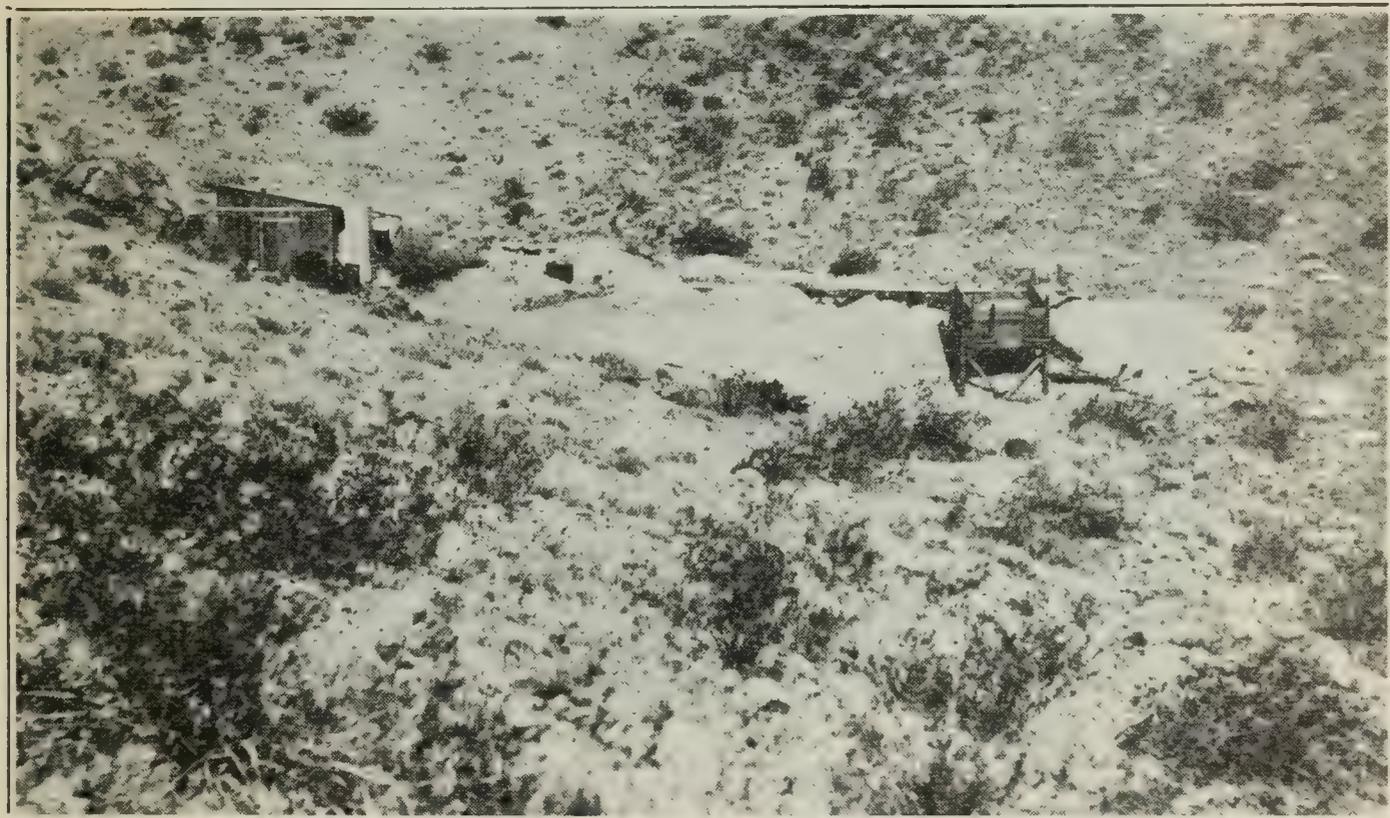
Water was secured from Cottonwood Springs, situated eighteen miles south of the mine. Idle.

Black Eagle Mine (lead, silver, copper, gold). Situated in the northern part of the Eagle Mountains, forty-seven miles northeast of Mecca, a station on the Southern Pacific Railroad. Elevation 2100 feet.



Cottonwood Springs, Eagle Mountains, Riverside County.

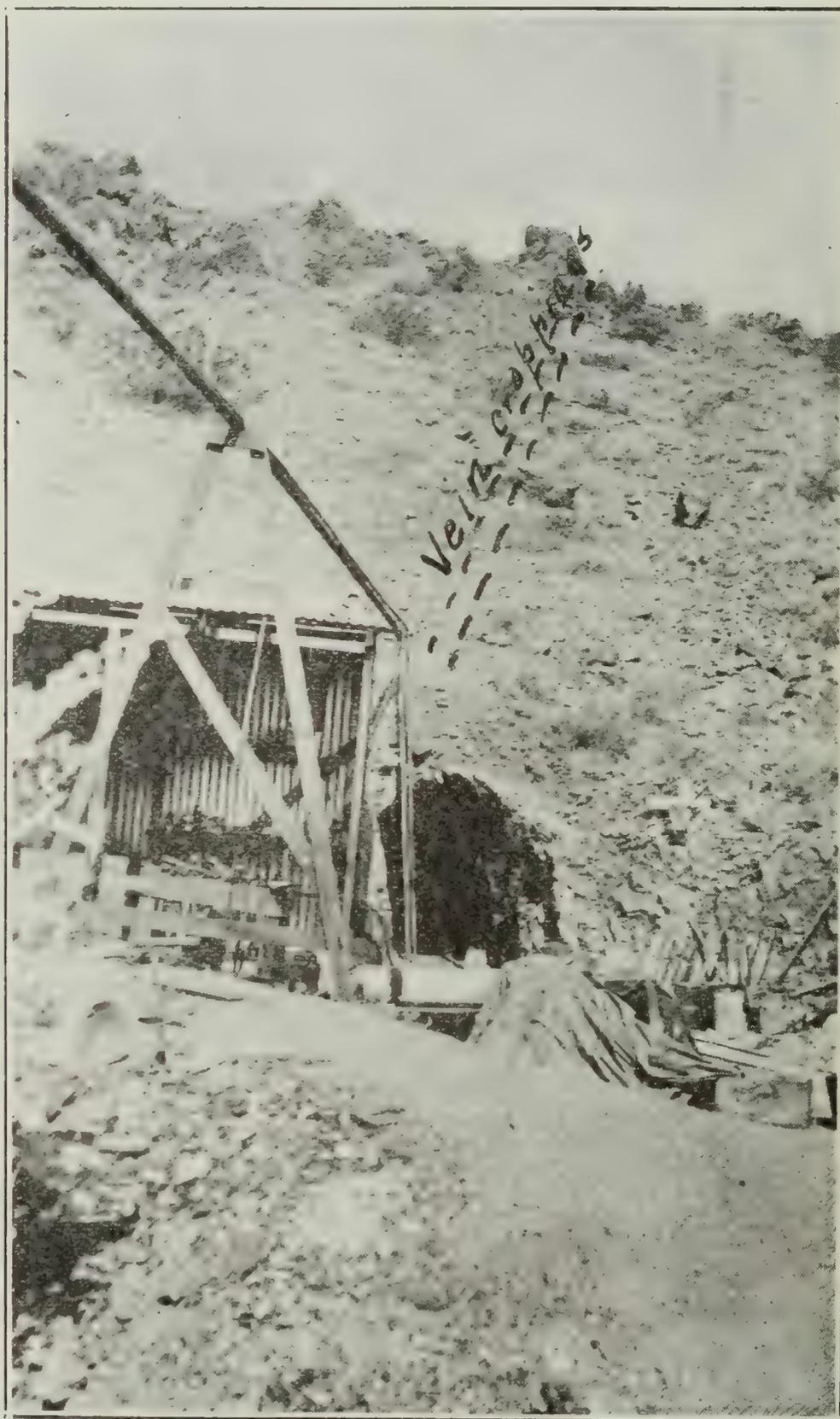
Owner, *Edward Harmon* of San Bernardino, California. Under option to A. W. Scott and George Hayden of Los Angeles. The property comprises three unpatented claims known as Maleta No. 1, No. 2, and No. 3. Area 60 acres.



Compressor Plant and Dumps at Black Eagle Mine, Eagle Mountains, Riverside County.

The Black Eagle vein courses through the center of Maleta No. 1 and No. 2 claims, its strike being N. 70° W., with a dip of 85° to the north. At approximately the middle of Maleta No. 2, the vein inter-

sects a cross vein which has been formed along a fault fracture. The intersection of these two veins show a mineralized fracture at least 15 feet in width. The Black Eagle vein occurs along the contact of quartzite and diorite, forming a contact fissure. Several hundred feet north of the diorite and running parallel to it are strata of dolomitic



Portal of Tunnel, showing outcrop of vein.
Black Eagle Mine, Eagle Mountains, Riverside County.

limestone, which in many places are replaced by iron oxide, mainly hematite.

Development: The present development is on Maleta No. 1. On this claim an adit tunnel has been driven N. 70° W. for a length of 255 feet. At a distance of 162 feet, a winze has been sunk to a depth of

100 feet. From the bottom of the winze, drifts have been run 40 feet east and 100 feet west. The adit tunnel was driven along the hanging wall of the vein for a distance of 196 feet, where it cut into the vein at what is known as Stope No. 3, and then continued along the vein to the face of the tunnel. The orebody, as exposed by these workings,



Mixed Iron Ore and crystalline Dolomite in canyon northwest of Black Eagle Mine. Iron Chief Mine, Eagle Mountains, Riverside County.

is 150 feet long, with an average width of 4 feet, and is stated to have an average value of \$21 per ton in gold, silver, lead, and copper. The vein varies from 3 to 9 feet in width. The ore occurs in lenticular form in the vein. The vein filling is quartz, mineralized with galena, malachite, azurite, cuprite, anglesite, cerrusite, cupro-plumbite, and lead vanadate.

Three carloads of sorted ore have been shipped from the property to the Selby Smelting Works. Average gross value of shipments was \$65 per ton. Smelter assay returns on ore: Au, 0.53 ozs.; Ag, 16 ozs.; Pb, 23.3% ; Cu, 5.7%.

Equipment: 25-h.p. Fairbanks-Morse, style H gas engine driving 9" x 8" Ingersoll-Rand compressor, 3-h.p. Fairbanks-Morse gas engine driving No. 4 Buffalo blower; 1 Tugger hoist, two auto trucks.

Water is hauled from Cottonwood Springs in a 450-gallon tank. Six men are employed.

IRON.

Iron Chief Mine. The Eagle Mountain iron ores are located in the northern part of the Eagle Mountains, northern Riverside County. They are forty miles northeast of Mecca, a station on the Southern Pacific Railroad.

The deposits extend over an area about eight miles long and from a quarter of a mile to two miles wide, running across the summit of the Eagle Mountains in a general east-west direction. The area in which iron ores occur is in T. 3 S., R. 14 E. Holdings comprise 187 patented claims, owned by the *Iron Chief Mining Company*, which company is controlled by the *Southern Pacific Railroad Company*.

The iron ores with associated metamorphic minerals occur as replacements in the dolomite which is found in beds and lenses at two principal horizons in the dolomite and quartzite series. The trend of the iron-bearing belt is approximately N. 70° W. Width of outcrops varies from a few feet to 500 feet. The largest body of mixed ore and gangue material exposed is 6000 feet in length and has a maximum width of outcrop of 500 feet. The ore is predominantly hematite, but here and there consists of magnetite. A considerable percentage is very pure and of high grade, containing between 62% and 67% metallic iron and less than 0.06% phosphorus. E. C. Harder, in Bulletin No. 503 of the U. S. Geological Survey, estimates tonnage at from 40,000,000 to 70,000,000 tons. The iron ore deposits of the Eagle Mountains are fully described in that bulletin.

The only development work noted on the iron deposits, consists of a large number of shallow shafts and tunnels on the different claims. Owing to the limited amount of time at my disposal, only the most prominent outcrops in the neighborhood of the Iron Chief and Black Eagle mines were visited.

Water from Cottonwood Springs was originally piped into the deposits, near the Iron Chief Mine, a distance of eighteen miles.

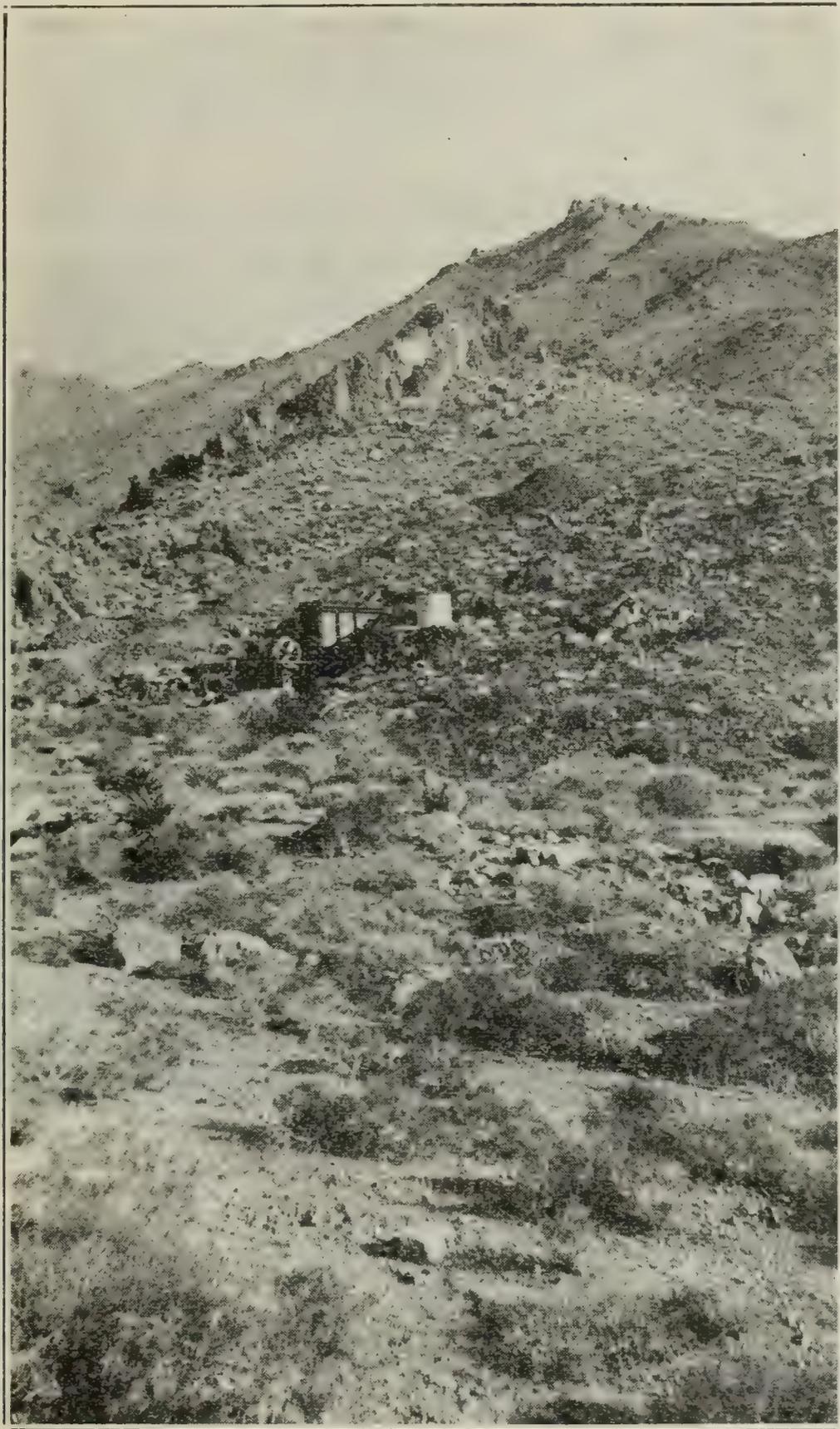
San Bernardino County.

GOLD.

Mabel, Contention, and Investment Group of Mines. Comprises 12 claims located in the Arrow mining district, twenty-three miles northwest of Fenner, on the eastern slope of the Providence Range of mountains. Elevation 3750 feet. Owner, *Thomas A. Gannon*, Fenner, Cal. Since publication of Report XVII of the State Mineralogist (1920), considerable development has been done on the different claims by Mr.

Gannon and associates of Los Angeles. This work is being confined mainly to the Contention, Mabel and Subway claims.

Developments: The Contention shaft has been sunk on a vein which strikes east and west, with dip 65° S. The vein varies in width from 12 inches to 4 feet. At a depth of 100 feet sulphide ore appears. The



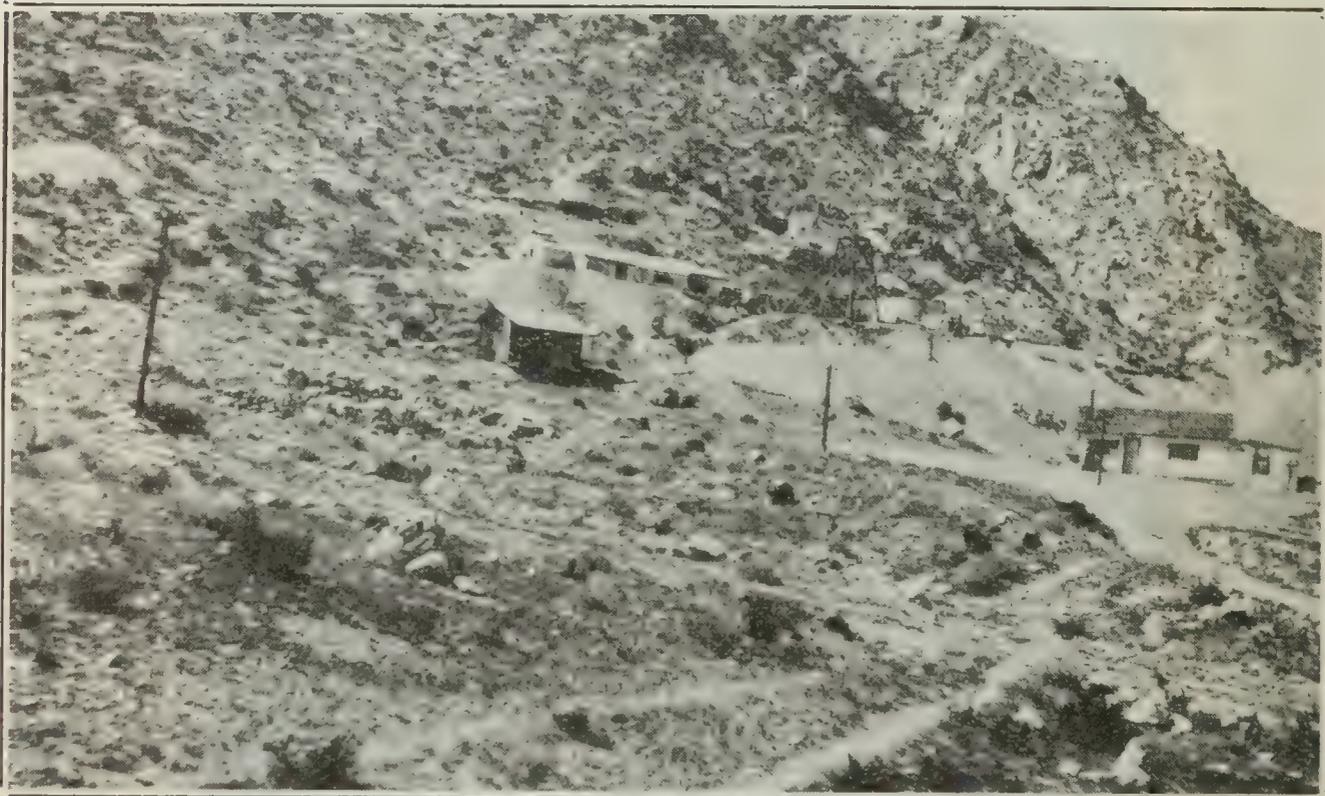
View of Dike and Mill. Mabel-Contention Mines, Providence Mountains, San Bernardino County.

principal production came from ore in the oxidized zone above the 100-foot level. It is stated that sorted ore shipped had a value of \$100 per ton. The principal development has been on the 200-foot level, where the vein has been drifted on about 340 feet. Estimated tonnage of ore on dump is 6000 tons, and it is said to assay \$5 per ton in gold.

The drift on the 50-foot level of the Subway shaft is being extended north to intersect the workings from the Contention shaft. Approximately 2500 feet north of the Contention shaft, are two shafts known as Mabel No. 1 and No. 2. The vein here strikes N. 20° E., and dips 70° W. Mabel No. 1 shaft is 140 feet deep. Mabel No. 2 shaft is 40 feet deep. The vein exposed in these workings varies in width from 2 to 9 feet. The distance between the two shafts is 750 feet. Ore extracted from these workings is said to have milled \$35 per ton. Ore shipped to smelter from these workings is stated to carry over \$100 per ton. Two men are employed.

Bibl: State Mineralogist Report XVII, p. 349.

Bonanza King Mine (silver). In the Trojan mining district. It is situated on the eastern slope of the Providence Range of mountains, twenty-five miles east of Fenner, a station on the Santa Fe Railroad.



Bonanza King Mine. Providence Mountains, San Bernardino County.

Elevation 4200 feet. Holdings comprise 12 claims. Owners, *Hall, Rawitser and Company*, Acton, Massachusetts. Property taken over under lease and bond during 1923 by the Bonanza King Consolidated Mines Company. O. B. Bachman, president; Wade Hampton Williams, vice president; A. E. Kinney, secretary.

Orebodies occur along a series of parallel north-south fissures in carboniferous limestone. The fissures are near the contact of limestone and monzonite, and run parallel to the contact. The ore occurs as chloride of silver, and chloro-bromide of silver, with a small percentage of galena.

Present development work is confined to the 3d, 4th, 5th, and 6th levels, where some lenses of ore have been exposed. One car of ore was extracted during May 1924. The present company plans to unwater the winze from the 600-foot level, which is 200 feet deep. Six men are employed. For detailed description of the property see State Mineralogist Report XVII, pp. 360-361.

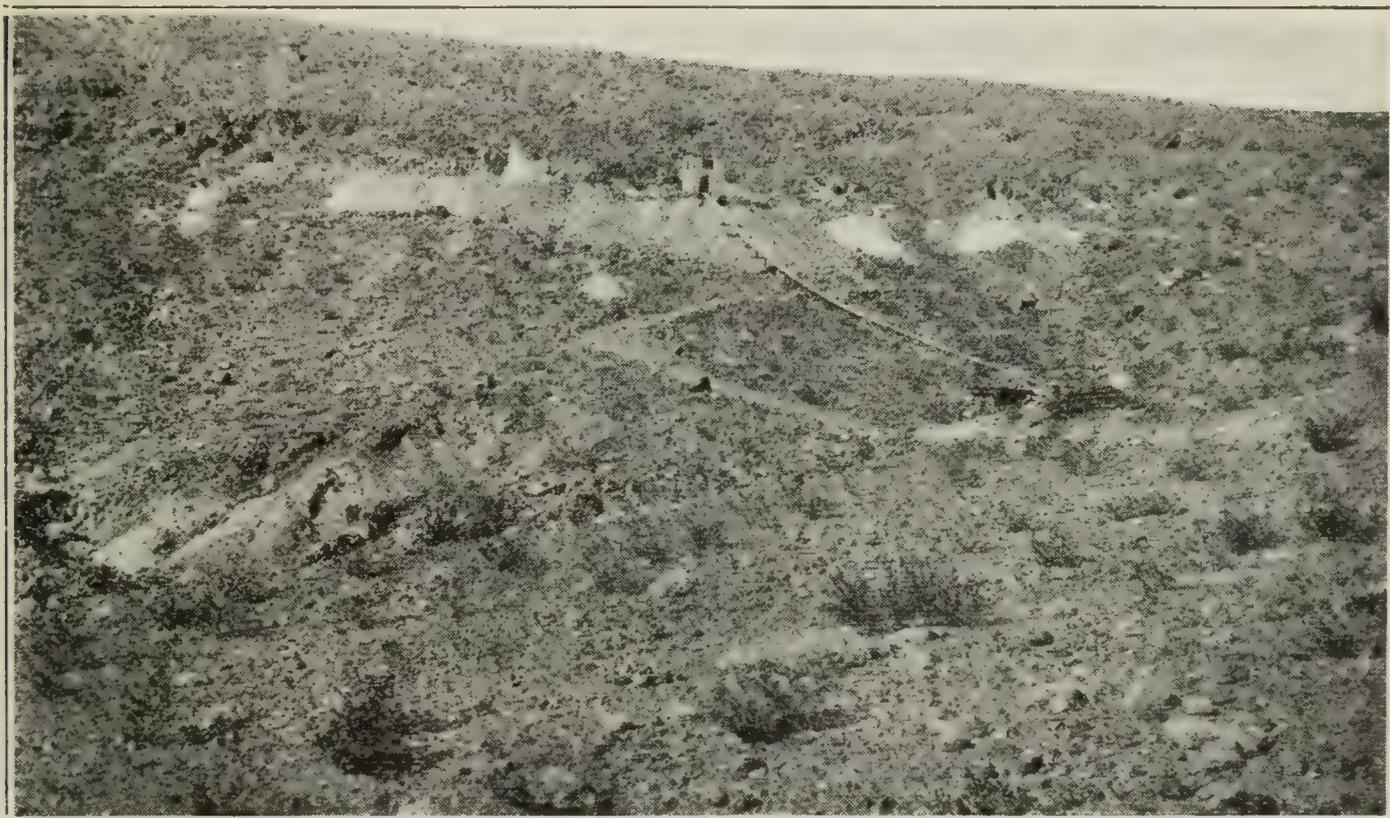
Buena Vista Group (lead, copper, gold). Comprises 4 claims located in the Arrow Mining District, twenty-two miles northwest of Fenner, in the Providence range of mountains. Owner, *Thomas J. Fitzsimmons*, Hollywood, Cal.

A series of parallel quartz veins in granite and schist strike north-south and dip 40° to 60° W. Widths vary from 2 inches to 2 feet. The quartz is iron stained and carries values in copper, gold and lead.

Developments consist of a number of shallow shafts and open cuts. Only yearly assessment work is done on the property. Idle.

Lead Mountain Mine. Located in the Grapevine mining district, five miles northwest of Yermo. Holdings consist of 640 acres, patented, in Sec. 36, T. 10 N., R. 1 W. Owner, *Western Smelters and Supply Company*. Lewis I. Buck, president; S. A. Court, Secretary. Offices, 503 Chamber of Commerce Building, Los Angeles.

The country rock is tufa, limestone, and andesitic porphyry. The



Lead Mountain Mine. Yermo, San Bernardino County.

ore-bearing fissure strikes northwest-southeast and dips 40° N.E. Width of ore zone is about 100 feet, the orebodies occurring irregularly throughout this area, which has been proved for a distance of 1300 feet along the strike of the fissure. The vein material is a coarsely crystallized baryta with quartz containing brown iron oxides, lead carbonate, ochre, manganese oxide, and silver chlorides. The ore is said to assay: Ag, 6 to 30 ozs.; Au, \$0.40 to \$2.00; Pb, 15% to 30%.

Developments: The principal workings which are on the south slope of Lead Mountain, consist of a series of open cuts and tunnels along the strike of the ore zone for a distance of 500 feet. The present work is confined to a tunnel which is driven north 75 feet, crosscutting the ore fissure. On this level drifts have been run northwest about 100 feet in the center of the orebody, with some stoping above the level.

Near the portal of the crosscut tunnel, a shaft has been sunk on an incline of 33° for 210 feet. At this point there is a stope 25 feet wide by 50 feet long and 30 feet high. The ore mined is galena and lead

carbonate. This ore occurred along a N. 20° W. fracture. From the floor of the stope there is a vertical winze 240 feet deep which connects with a crosscut tunnel 1300 feet in length, driven from the north side of Lead Mountain.

Equipment: 15-h.p. hoist, cars, and Packard truck. Six men are employed.



OIL FIELD DEVELOPMENT OPERATIONS.

By R. D. Bush, State Oil and Gas Supervisor.

FEATURES OF PRODUCTION, FIRST HALF OF 1924.

The production of oil in California for the first half of 1924 was 118,113,000 barrels as compared with 146,338,069 barrels for the last half of 1923, a decrease of 28,225,000 barrels. The average daily production at the first of 1924 was 700,300 barrels declining to 619,500 barrels on July 1 and shows a steady but gradual decline from the peak of production which occurred during the fall of 1923.

While the production decline of the State has been gradual the decline of the three prolific fields, Santa Fe Springs, Long Beach and Huntington Beach, which produced a large proportion of the oil, has been rather precipitous, but this was offset by additional development of good wells in the Torrance Field, discovery of the Dominguez Field with its large producers, extension of the eastern edge Buena Vista Hills, Kern County, into highly productive territory, and the resumption of closed in production in the older fields of the state.

Consumption also declined and more rapidly than production with the result that storage increased from about 92,000,000 barrels on January 1, 1924, to about 100,000,000 barrels at the end of June. The unexpected decrease in consumption was due to various causes, among them being decreased demand for fuel oil by the largest consumers, the railroads, decreased demand for gasoline resulting from the hoof and mouth disease in California, decreased demand for gasoline east of the Rocky Mountains due to weather conditions and to the continued over-production of oil in the Mid-Continent fields. The last two factors no doubt account for the fact that the export of California oil to eastern and gulf ports was 6,728,000 barrels less during the first half of 1924 than during the previous six months. This amount accounts for practically all the storage increase in the state during the first half of this year.

The total proved oil land of the state as of March 1, 1924, was 116,868 acres, an increase of 4107 acres over the previous year as determined by the State Oil and Gas Supervisor.

The estimated cost of maintaining the Department of Petroleum and Gas for the fiscal year 1923-1924 was \$135,917.17. Therefore in order to renew the Petroleum and Gas fund to the maximum of \$185,000 allowable by the statute under which the Department functions, oil and gas producers and oil land owners will be subject to a tax, prorated against oil and gas produced during 1923 and proved oil land to bring in a total amount of \$135,917.17.

In prorating the assessment one-tenth of the total amount is assessed against the proved oil land and the remaining nine-tenths is levied against the oil produced and sold, as determined from sworn statements of oil and gas producers. For the purpose of assessment ten thousand cubic feet of gas is equivalent to one barrel of oil.

The total production of net oil in 1923 according to sworn statements was 259,882,565 barrels. The total quantity of gas produced and sold was 115,682,200,000 cubic feet. The rate per barrel of oil and per ten thousand cubic feet of gas is \$.00045063 to yield a total of \$122,325.46.

OIL FIELD DEVELOPMENT OPERATIONS.

From April 12, 1924, to and including July 5, 1924, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
ALAMEDA COUNTY:					
Brady Sure Shot Oil Co.....Lot H	2	1	1	---	Alameda County
CONTRA COSTA COUNTY:					
Leachman & Marshall (Acalanes Ranch near Tunnel Road)-----	--	1	3	1	
FRESNO COUNTY:					
Coalinga Empire Oil Co.....	6	21	15	7	Coalinga
Coalinga Lubricating Oil Co.....	2	21	14	White Creek 6	Coalinga
Netherlands Oil Co.....	26	20	14	6	Coalinga
Pacific Oil Co.....	25	20	14	108	Coalinga
Premier Oil Co.....	24	20	14	25	Coalinga
St. Paul Consolidated Oil Co.....	23	20	14	10	Coalinga
Salvia Oil Co.....	14	20	14	10	Coalinga
Ward Oil Co.....	12	20	14	11	Coalinga
Albert W. Baxter.....	18	22	16	Baxter 1	Fresno County
Thomas M. Crum.....	20	21	17	1	Fresno County
E. J. Miley.....	7	22	16	1	Fresno County
KERN COUNTY:					
Belridge Oil Co.....	34	30	24	15X	Elk Hills
Pacific Oil Co.....	25	30	24	10	Elk Hills
Pacific Oil Co.....	27	30	24	113	Elk Hills
Pacific Oil Co.....	35	30	24	91	Elk Hills
Pacific Oil Co.....	35	30	24	103	Elk Hills
Pan American Petroleum Co.....	2	31	24	Crampton 11-F	Elk Hills
Pan American Petroleum Co.....	6	31	25	Crampton 13-A	Elk Hills
Standard Oil Co.....	31	30	25	Kern Co. 18	Elk Hills
Robert Barry.....	34	27	27	1	Kern County
Marland Oil Co.....	28	25	21	1	Kern County
Geo. A. Parsons.....	10	31	38	1	Kern County
Geo. F. Getty.....	14	28	27	1	Kern River
Gray Heirs.....	3	29	28	46	Kern River
L. M. Howland.....	2	29	28	8	Kern River
Marland Oil Co.....	16	28	27	Cauley 1	Kern River
E. A. Parkford.....	13	29	28	1	Kern River
S. G. Tryon.....	2	29	28	8	Kern River
Associated Oil Co.....	2	31	22	61	Midway
Associated Oil Co.....	22	31	23	81	Midway
Balboa Oil Co.....	24	31	23	30	Midway
Bell-Evans Oil Co., Inc.....	35	32	23	6	Midway
Berry & Ewing.....	31	32	24	6	Midway
Big Ten Oil Co.....	36	32	23	7	Midway
Boston Pacific Oil Co.....	32	31	24	4-C	Midway
Brady Oil Co.....	34	32	24	1	Midway
Brookshire Oil Co.....	24	31	22	12	Midway
Formax Oil Co.....	36	32	23	16	Midway
General Petroleum Corp.....	32	31	24	Buena Vista 9	Midway
Honolulu Consolidated Oil Co.....	4	32	24	71	Midway
Honolulu Consolidated Oil Co.....	6	32	24	78	Midway
Honolulu Consolidated Oil Co.....	8	32	24	12	Midway
Interstate Oil Corp.....	15	32	23	Empire 11	Midway
Kendon Petroleum Co.....	35	32	23	3	Midway
Mascot Oil Co.....	36	32	23	4	Midway
Midland Oilfields Co., Ltd.....	24	31	23	7	Midway
Midland Oilfields Co., Ltd.....	24	31	23	8	Midway
Midland Oilfields Co., Ltd.....	34	31	24	4	Midway
Midway Oil Co.....	36	32	23	Alpine 5	Midway
Midway Oil Co.....	36	32	23	Alpine 7	Midway
E. H. Mitchell Co.....	15	31	22	12	Midway
Naval Reserve Oil Co.....	8	31	23	1	Midway
North American Oil Cons.....	30	31	24	8	Midway

Company	Sec.	Twp.	Range	Well No.	Field
KERN COUNTY—Continued.					
North American Oil Cons.-----	30	31	24	9	Midway
Pacific Oil Co.-----	25	31	23	31	Midway
Pacific Oil Co.-----	25	31	23	66	Midway
Pacific Oil Co.-----	31	31	24	24	Midway
Pacific Oil Co.-----	31	31	24	37	Midway
Pacific Oil Co.-----	31	31	24	68	Midway
Pacific Oil Co.-----	31	31	24	69	Midway
Pacific Oil Co.-----	33	31	24	20	Midway
Pacific Oil Co.-----	33	31	24	22	Midway
Pacific Oil Co.-----	1	32	23	83	Midway
Pacific Oil Co.-----	1	32	23	84	Midway
Pacific Oil Co.-----	3	32	24	2	Midway
Pinal Dome Corp.-----	22	31	22	Weir 1	Midway
Southwestern Petroleum Co.-----	2	31	22	6	Midway
Surprise Oil Co.-----	36	32	23	4	Midway
Tumbador Oil Co.-----	23	31	22	16	Midway
B. B. & O. Oil Co.-----	28	12	24	26	Sunset
B. B. & O. Oil Co.-----	28	12	24	30	Sunset
C. J. Berry-----	34	12	24	Hillside 24	Sunset
C. J. Berry-----	34	12	24	Hillside 28	Sunset
C. J. Berry-----	34	12	24	Hillside 29	Sunset
C. J. Berry-----	34	12	24	Hillside 30	Sunset
C. J. Berry-----	34	12	24	Hillside 31	Sunset
Border Oil Co.-----	2	11	24	10	Sunset
Empire Gas & Fuel Co.-----	4	11	23	1	Sunset
Ethel D. Co.-----	36	12	24	1-A	Sunset
General Petroleum Corp.-----	18	11	23	226-A	Sunset
General Petroleum Corp.-----	19	11	23	106-A	Sunset
General Petroleum Corp.-----	20	11	23	1-A	Sunset
General Petroleum Corp.-----	35	12	24	1-A	Sunset
E. G. Lewis-----	20	11	23	12	Sunset
Martin Judge, Jr.-----	32	12	24	1	Sunset
Midway Oil Co.-----	28	12	24	10	Sunset
Midway Oil Co.-----	34	12	24	161	Sunset
Midway Oil Co.-----	34	12	24	171	Sunset
Midway Oil Co.-----	34	12	24	181	Sunset
Midway Oil Co.-----	34	12	24	191	Sunset
Pliocene Oil Co.-----	18	11	23	2	Sunset
Charles A. Son-----	32	12	23	U. S. 1	Sunset
Standard Oil Co.-----	10	11	23	Rass 1	Sunset
Western Minerals Co.-----	17	11	23	2	Sunset
Earl S. Shaw-----	1	29	20	1	Temblor
Standard Oil Co.-----	28	11	20	Kern Co. Lease No. 2	12 Wheeler Ridge
Standard Oil Co.-----	28	11	20	Kern Co. Lease No. 2	13 Wheeler Ridge
KINGS COUNTY:					
Bolsa Chica Oil Co.-----	30	23	19	Downing 1	Kings County
Marland Oil Co.-----	12	22	17	Elliott 1	Kings County
LAKE COUNTY:					
Lake County Drilling & Dev. Co.---	35	13	7	1	Lake County
LOS ANGELES COUNTY:					
A. Otis Birch-----	32	3	13	1	Dominguez
Marland Oil Co.-----	3	4	13	Dominguez 1	Dominguez
Shell Co.-----	33	3	13	Reyes 6	Dominguez
Shell Co.-----	33	3	13	Reyes 7	Dominguez
Shell Co.-----	34	3	13	Reyes 8	Dominguez
Shell Co.-----	34	3	13	Reyes 9	Dominguez
Shell Co.-----	34	3	13	Reyes 10	Dominguez
Shell Co.-----	34	3	13	Childs 2	Dominguez
Superior Oil Co.-----	34	3	13	Carpenter 1	Dominguez
Union Oil Co.-----	28	3	13	Callender 5	Dominguez
Union Oil Co.-----	33	3	13	Carson 2	Dominguez
Union Oil Co.-----	33	3	13	Hellman 5	Dominguez
Union Oil Co.-----	33	3	13	Hellman 6	Dominguez
Union Oil Co.-----	34	3	13	Hellman 7	Dominguez
The United Oil Co. and Henderson Petroleum Corp.-----	3	4	13	Dominguez 1	Dominguez

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued.					
E. L. Blanton, trustee.....	29	4	12	T-2	Long Beach
Courtney Petroleum Co.....	19	4	12	1	Long Beach
Courtney Petroleum Co.....	30	4	12	2	Long Beach
Dabney Oil Syn., Inc.....	30	4	12	24	Long Beach
Davis & Macmillan Co.....	29	4	12	9	Long Beach
General Petroleum Corp.....	19	4	12	Black & Signal 2	Long Beach
A. T. Jergins Trust.....	19	4	12	13	Long Beach
L. A. Lambert.....	30	4	12	Cowden 1	Long Beach
Petroleum Midway Co., Ltd.....	19	4	12	Davidson 5	Long Beach
Petroleum Midway Co., Ltd.....	19	4	12	Fields 5	Long Beach
Petroleum Midway Co., Ltd.....	19	4	12	Fields 7-A	Long Beach
Petroleum Midway Co., Ltd.....	19	4	12	Fields 8	Long Beach
Shell Co.....	20	4	12	Coseboom 5	Long Beach
Shell Co.....	29	4	12	Bixby 3	Long Beach
Shell Co.....	29	4	12	Jones Comm. 6	Long Beach
Shell Co.....	29	4	12	Nesa 6	Long Beach
Whiston Petroleum Co.....	24	4	13	1	Long Beach
Associated Oil Co.....	17	3	13	Brockley 1	Los Angeles County
Associated Oil Co.....	20	3	13	Higgins 1	Los Angeles County
Bankline Oil Co.....	18	3	13	Gordon 1	Los Angeles County
Bandini Petroleum Co.....	21	2	12	2	Los Angeles County
H. A. Bardeen.....	3	2	10	2	Los Angeles County
Barnsdall Oil Co.....	20	3	13	Rosecrans 1	Los Angeles County
General Petroleum Corp.....	18	3	13	Amestoy 1	Los Angeles County
General Petroleum Corp.....	18	3	13	Vaughan 1	Los Angeles County
Fred W. Heath, trustee.....	36	3	14	1	Los Angeles County
Hermosa Syndicate.....	30	3	14	2	Los Angeles County
Jackson, Pearson & Todd.....	36	5	15	1	Los Angeles County
C. C. Julian.....	17	3	13	Julian 9	Los Angeles County
Julian Petroleum Corp.....	7	3	13	Athens Comm. 1	Los Angeles County
Mathews Petroleum Corp.....	17	3	13	Williams 1	Los Angeles County
Mathews Petroleum Corp.....	20	3	13	Ball 1	Los Angeles County
B. C. Morrison.....	20	3	13	1	Los Angeles County
Ring Petroleum Corp.....	20	3	13	Robertson 1	Los Angeles County
B. Rosenberg.....	35	3	14	2	Los Angeles County
Sandburg Petroleum Co.....	20	3	13	1	Los Angeles County
Sentinel Oil Co.....	12	3	14	Brown 1	Los Angeles County
Standard Oil Co.....	17	2	14	L. A. Inv. 1 2	Los Angeles County
Standard Oil Co.....	17	2	14	L. A. Inv. 2 1	Los Angeles County
Standard Oil Co.....	34	2	14	Potter & Smith 1	Los Angeles County
Standard Oil Co.....	17	3	13	Cowan 1	Los Angeles County
Superior Oil Co.....	12	2	11	Andres 1	Los Angeles County
Superior Oil Co.....	13	2	11	A-1	Los Angeles County
Temple & LaFever.....	24	5	17	1	Los Angeles County
Union Oil Co.....	17	3	13	Chandler 1	Los Angeles County
Union Oil Co.....	17	3	13	Hursey 1	Los Angeles County
Union Oil Co.....	17	3	13	Padelford 1	Los Angeles County
Union Oil Co.....	17	3	13	Zins 1	Los Angeles County
Union Oil Co.....	18	3	13	Athens 2	Los Angeles County
Union Oil Co.....	18	3	13	Trust 1	Los Angeles County
Union Oil Co.....	19	3	13	Rosecrans 2	Los Angeles County
McGinley Oil Co.....	6	2	11	18	Montebello
Standard Oil Co.....	2	2	12	Howard & Smith 2	Montebello
George A. Denison.....	2	3	16	1	Newhall
Crawford Syndicate Oil Co.....	13	3	16	2	Newhall
Associated Oil Co.....	10	3	11	McNally 2	Santa Fe Springs
Standard Oil Co.....	36	2	12	A. O. Houghton 2	Santa Fe Springs
Standard Oil Co.....	36	2	12	W. L. Houghton 3	Santa Fe Springs
Standard Oil Co.....	36	2	12	Jordan 6	Santa Fe Springs
Standard Oil Co.....	36	2	12	Santa Ger- trudes 10	Santa Fe Springs
Union Oil Co.....	6	3	11	Bell 26	Santa Fe Springs
Union Oil Co.....	6	3	11	Bell 27	Santa Fe Springs
Standard Oil Co.....	1	3	12	Orr 4	Santa Fe Springs
Associated Oil Co.....	16	4	14	Cunningham 1	Torrance
Associated Oil Co.....	16	4	14	Cunningham 2	Torrance
Associated Oil Co.....	16	4	14	Cunningham 3	Torrance
Bonded Oil Syn.....	23	4	14	2	Torrance
C. C. M. O. Co.....	2	4	14	Francis 1	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued.					
C. C. M. O. Co.....	14	4	14	Kettler 21	Torrance
C. C. M. O. Co.....	14	4	14	Torrance 52	Torrance
C. C. M. O. Co.....	14	4	14	Torrance 53	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 38-A	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 44	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 45	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 48	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 49	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 57	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 58	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 60	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 61	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 62	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 63	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 64	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 65	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 66	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 68	Torrance
C. C. M. O. Co.....	15	4	14	Torrance 69	Torrance
C. C. M. O. Co.....	16	4	14	Del Amo 15	Torrance
C. C. M. O. Co.....	16	4	14	Del Amo 17	Torrance
C. C. M. O. Co.....	16	4	14	Del Amo 18	Torrance
C. C. M. O. Co.....	16	4	14	Del Amo 19	Torrance
C. C. M. O. Co.....	23	4	14	Kettler 20	Torrance
George B. Clark	30	4	14	1	Torrance
Collins & Dean.....	23	4	14	1	Torrance
Consolidated Mutual Oil Co.....	19	4	13	Oakley 2	Torrance
Consolidated Mutual Oil Co.....	19	4	13	Oakley 3	Torrance
W. C. Currier.....	16	4	14	1	Torrance
Fullerton Oil Co.....	8	4	14	Waddell 3	Torrance
Fullerton Oil Co.....	16	4	14	Barlow 1	Torrance
Fullerton Oil Co.....	16	4	14	Cotton 2	Torrance
Fullerton Oil Co.....	16	4	14	Cotton 4	Torrance
Fullerton Oil Co.....	16	4	14	Cotton 6	Torrance
Fullerton Oil Co.....	16	4	14	Cotton 8	Torrance
B. Gildner.....	23	4	14	2	Torrance
A. T. Krauss & L. E. Bayer.....	23	4	14	1	Torrance
R. S. McKeon.....	23	4	14	4	Torrance
E. J. Miley.....	24	4	14	Torrance 7	Torrance
Pan American Petroleum Co.....	13	4	14	Parmer 1	Torrance
Pan American Petroleum Co.....	24	4	14	Andrews 1	Torrance
Pan American Petroleum Co.....	24	4	14	DeWitt 1	Torrance
Pan American Petroleum Co.....	24	4	14	Hub 2	Torrance
Pan American Petroleum Co.....	24	4	14	Pate 1	Torrance
Pan American Petroleum Co.....	24	4	14	Pate 2	Torrance
Pan American Petroleum Co.....	24	4	14	Rinehart 1	Torrance
Petroleum Midway Co., Ltd.....	8	4	14	Dawson 1	Torrance
Petroleum Midway Co., Ltd.....	13	4	14	Logan 3	Torrance
Petroleum Midway Co., Ltd.....	16	4	14	Gilman 1	Torrance
Petroleum Midway Co., Ltd.....	24	4	14	Logan 2	Torrance
R-K Drilling Co., Inc.....	23	4	14	"McKissick Lease" R-K 2	Torrance
Selby & Root Co.....	14	4	14	8	Torrance
Selby & Root Co.....	14	4	14	9	Torrance
Sentinel Oil Co.....	24	4	14	Joughin 8	Torrance
Sentinel Oil Co.....	24	4	14	Joughin 9	Torrance
Sentinel Oil Co.....	24	4	14	Joughin 10	Torrance
Sentinel Oil Co.....	24	4	14	Joughin 11	Torrance
Shell Co.....	9	4	14	Torrance 2	Torrance
Shell Co.....	13	4	14	Bluemle 7	Torrance
Shell Co.....	13	4	14	March 7	Torrance
Shell Co.....	13	4	14	March 8	Torrance
Shell Co.....	13	4	14	March 9	Torrance
Shell Co.....	24	4	14	Bluemle 3	Torrance
Shell Co.....	24	4	14	Bluemle 4	Torrance
Shell Co.....	24	4	14	Bluemle 5	Torrance
Shell Co.....	24	4	14	Bluemle 6	Torrance
Shell Co.....	24	4	14	Bluemle 8	Torrance
Shell Co.....	24	4	14	Bluemle 9	Torrance
Shell Co.....	24	4	14	Bluemle 10	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Continued.					
Shell Co.-----	24	4	14	Kettler 12	Torrance
Shell Co.-----	24	4	14	Kettler 13	Torrance
Shell Co.-----	24	4	14	Kettler 14	Torrance
Shell Co.-----	24	4	14	March 6	Torrance
Shell Co.-----	24	4	14	Scarborough 1	Torrance
Shell Co.-----	24	4	14	Scarborough 2	Torrance
Shell Co.-----	24	4	14	Scarborough 3	Torrance
Shell Co.-----	24	4	14	Scarborough 4	Torrance
Shell Co.-----	24	4	14	Scarborough 5	Torrance
Shell Co.-----	24	4	14	Scarborough 6	Torrance
Standard Oil Co.-----	19	4	13	Joughin 3	Torrance
Standard Oil Co.-----	19	4	13	Joughin 5	Torrance
Standard Oil Co.-----	19	4	13	Joughin 7	Torrance
Standard Oil Co.-----	13	4	14	Dominguez 4	Torrance
Standard Oil Co.-----	13	4	14	Dominguez 6	Torrance
Standard Oil Co.-----	13	4	14	Dominguez 7	Torrance
Standard Oil Co.-----	13	4	14	Dominguez 8	Torrance
Standard Oil Co.-----	13	4	14	Dominguez 9	Torrance
Standard Oil Co.-----	13	4	14	Dominguez 10	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 8	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 9	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 10	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 11	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 12	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 13	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 15	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 16	Torrance
Standard Oil Co.-----	15	5	14	Marble Fee 17	Torrance
Standard Oil Co.-----	15	5	14	Marble Fee 18	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 7	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 8	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 9	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 10	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 11	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 12	Torrance
Standard Oil Co.-----	23	4	14	Kettler 2	Torrance
Standard Oil Co.-----	23	4	14	Kettler 3	Torrance
Standard Oil Co.-----	24	4	14	Joughin 1	Torrance
Standard Oil Co.-----	24	4	14	Joughin 2	Torrance
Standard Oil Co.-----	24	4	14	Joughin 4	Torrance
Standard Oil Co.-----	24	4	14	Joughin 6	Torrance
Superior Oil Co.-----	19	4	13	Torrance 37	Torrance
Superior Oil Co.-----	19	4	13	Torrance 38	Torrance
Superior Oil Co.-----	19	4	13	Torrance 39	Torrance
Superior Oil Co.-----	19	4	13	Torrance 44	Torrance
Superior Oil Co.-----	24	4	14	Torrance 28	Torrance
Superior Oil Co.-----	24	4	14	Torrance 31	Torrance
Superior Oil Co.-----	24	4	14	Torrance 32	Torrance
Superior Oil Co.-----	24	4	14	Torrance 33	Torrance
Superior Oil Co.-----	24	4	14	Torrance 34	Torrance
Superior Oil Co.-----	24	4	14	Torrance 35	Torrance
Superior Oil Co.-----	24	4	14	Torrance 40	Torrance
Superior Oil Co.-----	24	4	14	Torrance 41	Torrance
Walter A. Wyatt-----	23	4	14	1	Torrance
Woolner Oil Co.-----	23	4	14	Lomita 2	Torrance
Associated Oil Co.-----	17	2	11	Gregg 1	Whittier
Pan American Petroleum Co.-----	17	2	11	Jesuran 1	Whittier
MONTEREY COUNTY:					
John C. Guerrier-----	3	20	7	1	Monterey County
ORANGE COUNTY:					
Brea Canon Oil Co.-----	2	3	10	36	Brea Olinda
Standard Oil Co.-----	18	3	10	M-C 100	Coyote Hills
Standard Oil Co.-----	13	3	11	Emery 39	Coyote Hills
General Petroleum Corp.-----	2	6	11	Dabney 2	Huntington Beach
Pan American Petroleum Co.-----	11	6	11	Johnson 3	Huntington Beach
Petroleum Midway Co., Ltd.-----	11	6	11	Brown 4	Huntington Beach
Standard Oil Co.-----	34	5	11	Bolsa 16	Huntington Beach

Company	Sec.	Twp.	Range	Well No.	Field
ORANGE COUNTY—Continued.					
Standard Oil Co.-----	34	5	11	Bolsa 17	Huntington Beach
Standard Oil Co.-----	2	6	11	Hunt. B. 24	Huntington Beach
Standard Oil Co.-----	3	6	11	Hunt. A. 24	Huntington Beach
Standard Oil Co.-----	3	6	11	Hunt. A. 25	Huntington Beach
Standard Oil Co.-----	3	6	11	Hunt. B. 26	Huntington Beach
Standard Oil Co.-----	12	6	11	Farnsworth 3	Huntington Beach
Standard Oil Co.-----	14	6	11	Mills 3	Huntington Beach
Gross Drilling Co.-----	2	5	11	1	Orange County
Trustees Development Association---	6	5	9	1	Orange County
Monarch Development Co.-----	28	6	10	Monarch 1	Newport
Capitol Oil Co.-----	29	3	8	3	Richfield
Chiksan Oil Co.-----	32	3	9	1	Richfield
S. H. Keoughan, trustee-----	24	3	9	1	Richfield
Union Oil Co.-----	29	3	9	Morse 6	Richfield
SAN BERNARDINO COUNTY:					
Como Oil Co.-----	14	3	6	1	San Bernardino Co.
Mojave Basin Oil Co.-----	2	10	5	1	San Bernardino Co.
Victor Valley Land Owners Oil & Gas Co.-----	22	5	6	Victor 1	San Bernardino Co.
SAN DIEGO COUNTY:					
Pacific Coast Petroleum Corp.-----	23	11	5	1	San Diego County.
SAN LUIS OBISPO COUNTY:					
Little Bear Oil Co.-----	2	32	22	1	San Luis Obispo Co.
Oak Ridge Oil Co.-----	4	25	12	Mahoney 1	San Luis Obispo Co.
J. E. Russell-----	28	31	21	1	San Luis Obispo Co.
SAN MATEO COUNTY:					
H. H. McClintock-----	Sho	ults	Ranch	1	San Mateo Co.
Midstate Oil Co.-----	16	6	5	3	San Mateo County
SANTA BARBARA COUNTY:					
Brooks Oil Co.-----	32	9	32	4	Cat Canyon
Brooks Oil Co.-----	32	9	32	5	Cat Canyon
Channel Oil & Development Co.-----	--	4	27	1	Santa Barbara Co.
La Mesa Oil Co.-----	7 (Tra	ct 5, R	ancho	1	Santa Barbara Co.
	Las	Posit	as)		
TULARE COUNTY:					
Thos. L. Woodruff-----	17	22	27	1	Tulare County
VENTURA COUNTY:					
Dr. J. Von Gal-Scale-----	4	1	20	14	Conejo
Dr. J. Von Gal-Scale-----	4	1	20	15	Conejo
Dr. J. Von Gal-Scale-----	4	1	20	16	Conejo.
Hess-Rue-Henderson Oil Co.-----	33	4	23	2	Ojai
A. H. McFarland-----	33	4	18	2	Piru
Peacock Refining Co.-----	8	4	18	1	Piru
Arthur Apple Petroleum-----	27	4	21	1	Santa Paula
Caltura Oil Co.-----	25	4	22	15	Santa Paula
Lincoln Oil & Gas-----	21	4	21	29	Santa Paula
K. A. P. Oil Co.-----	32	3	20	1	Simi
Oak Ridge Oil Co.-----	18	3	20	Willard 15	South Mountain
Union Oil Co.-----	13	3	21	Snyder 1	South Mountain
Associated Oil Co.-----	27	3	23	Lloyd 9	Ventura
Associated Oil Co.-----	28	3	23	Lloyd 14-A	Ventura
Shell Co.-----	27	3	23	Gosnell 6	Ventura
Shell Co.-----	28	3	23	Gosnell 7	Ventura
Shell Co.-----	28	3	23	Taylor 7	Ventura

SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff and others are published in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

OIL AND GAS RIGHTS.

By A. H. RICKETTS, of the bar of the Supreme Court of the United States, of California and of Nevada.

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PART III.

WITHDRAWALS—PICKETT ACT—FEDERAL WATER POWER ACT—RECLAMATION PROJECTS.

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| § 1. The President's Withdrawal Order. | § 6. Reclamation Projects. |
| § 2. Power of the President. | § 7. Mineral Lands Withdrawn. |
| § 3. The Pickett Act. | § 8. Default in Assessment Work. |
| § 4. Act of August 25, 1914. | § 9. Jurisdiction of Land Department. |
| § 5. Federal Water Power Act. | |

§ 1. The President's Withdrawal Order.

The President's withdrawal order of September 27, 1909, "in aid of proposed legislation" withdrawing oil lands in California and Wyoming from entry or disposal under the mineral laws did not withdraw such lands from the right to enter, locate nor purchase merely. Its manifest object, as the language plainly shows, was to preserve the petroleum in the lands in order to subserve the public interest. Its purpose was to withdraw such lands from the right to explore for oil or to extract and dispose of the same. The lands are valuable only for their mineral contents and the express purpose of the withdrawal order was to preserve such contents until Congress should provide for their disposition and when withdrawn the lands ceased to be public lands within the meaning of the mining law and hence not open for exploration nor discovery under such laws.¹ Such withdrawal order is ineffectual as against a title previously acquired.²

¹ U. S. vs. Midway Northern Oil Co., 232 Fed. 627. This withdrawal was confirmed in executive order of July 2, 1910, creating Petroleum Reserve No. 2, which said reservation was made subject to all the provisions, limitations, exceptions and conditions of the Pickett Act, *infra*, § 3. Interstate Oil Corp. 50 L. D. 262.

A petroleum withdrawal prior to the Leasing Act of unproved lands for the purpose of classification, was not extinguished by the passage of that act, inasmuch as the prospecting for oil and gas thereunder was intended merely as preliminary to leasing, and not as a method of disposal, they being only subject to lease upon discovery of their value for mineral deposits. Utah vs. Lichliter (on reconsideration), 50 L. D. 231.

Lands within the forfeited grant to a railroad company that have been classed as "power site lands" under the authority of the act of June 9, 1916 (39 Stat. 218), and

§ 2. Power of the President.

The power of the President to make withdrawal orders was upheld by the Supreme Court of the United States³ and authorized by the "Pickett Act."⁴

§ 3. The Pickett Act.

The act of June 25, 1910, did not in any way affect the Presidential withdrawal order of September 27, 1909.⁵ It authorized withdrawals "for water power sites, irrigation, classification of lands or other public purposes to be specified in the orders of withdrawal." This act was amended on August 24, 1912,⁶ so as to include nonmetalliferous minerals and provided that it should not be construed as a repudiation, abridg-

included within a power site reserve by Executive order issued pursuant to the Pickett Act, are open to exploration, discovery, and purchase under the mining laws only so far as those laws apply to metalliferous minerals. Dailey Clay Co., 48 L. D. 429.

² Stockley vs. U. S., 260 U. S. 532; N. P. R. Co. vs. Mitchell, 208 Fed. 469; Knudsen vs. Omanson, 10 Utah 124, 37 Pac. 250. As to state selections see Wyoming vs. U. S., 255 U. S. 489. It was not the intention of the President acting for and on behalf of his principal, the United States government, to except from the operation of the withdrawal order all claims or locations that might then be subsisting upon lands included within the order. Special pains were taken to indicate that the intention of the President was that only valid locations or claims were to be excepted from the general operation of the withdrawal order. The effect of the withdrawal order depends upon what is meant by a valid location or claim. Under the mining laws the locator has no vested right as against the government until he makes a discovery of oil upon his claim. The posting or recording of his oil placer claim gives him no rights as against the United States until by discovery of oil it is made apparent that the land in truth and in fact is mineral land and subject to location under the mining law. The initiation of his claim by posting notices protects him as against third persons so long as he remains in possession and with due diligence prosecutes his claim toward a discovery. Although this gives him no vested rights against the government yet he has rights which ought to be by all parties respected. All locators who were thus conducting themselves at the time of the withdrawal order had their rights respected by the exception contained therein. If on the date of the withdrawal order any locator then was on any withdrawn lands and was with "due diligence" prosecuting his work toward a discovery of oil, he was not affected by such order, and had a valid location and could proceed to a discovery and thereby perfect his right to the mineral claim. But a locator not in possession or who was not with "due diligence" prosecuting his work toward discovery, was not protected by the order. A person or locator deeming the withdrawal order entirely invalid can not after its date either begin or resume operations looking to the discovery of oil upon his claim, for the reason that the land by reason of such order was no longer open to entry or claim and as between him and the government any subsequent effort of his could not divest the United States of its title. U. S. vs. McCutchen, 234 Fed. 709; see, also, U. S. vs. McCutchen, 217 Fed. 655. For an instance of failure to support the claim of diligent prosecution of work looking to discovery see U. S. vs. Chanslor-Canfield Co., 266 Fed. 143.

It has been decided that a homestead entryman upon withdrawn lands does not acquire the right to an oil well derrick and other fixtures erected by a mineral claimant prospecting for oil under locations made before the withdrawal and before the homestead entry where the mineral claimant has not abandoned his rights and is seeking to maintain them as against the homestead entryman and the government. That the homestead entryman acquires no title to the minerals in the land either by the entry or by the patent issued in pursuance thereof. These are reserved to the government. Hence under the homestead entry no rights are secured to the oil below the surface, nor to the right to prospect therefor. Son vs. Adamson, 188 Cal. 99; 204 Pac. 392; see, also, Midland Oil Co. vs. Rudneck, 188 Cal. 265; 204 Pac. 174.

³ U. S. vs. Midwest Oil Co., 236 U. S. 459; Stockley vs. U. S., *supra* (2). A withdrawal order promulgated by the Secretary of the Interior is deemed the act of the President. Stockley vs. U. S., 271 Fed. 632.

⁴ 5 U. S. Comp. St. p. 5320, § 4523.

⁵ See § 1, *supra*.

⁶ 5 U. S. Comp. St. p. 5320, § 4523, amended, *Id.* p. 5321, § 4524. See act of January 26, 1921, Fed. Stats. Anno. 1921, p. 268. The Pickett Act is the first legislative recognition by Congress of a statutory right in an occupant of public oil lands prior to discovery. It was manifestly intended to and does expressly give to those coming within its provisions a legal status and a right to continue work of discovery with the attendant consequences. Its purpose was to protect *bona fide* occupants of public oil or gas lands who in good faith were, at the date of the withdrawal, engaged in work leading to discovery, by giving them the right to continue their work to a discovery, and thereafter to extract and market the oil, and to acquire title notwithstanding the withdrawal. U. S. vs. Rock Oil Co., 257 Fed. 333. The term "metalliferous minerals" in the Pickett Act was used to describe those minerals or ores of economic value from which the useful metals can be directly and advantageously extracted. Con. Ores Co., 46 L. D. 468. The right of withdrawal exists in the President without special authorization from congress. Stockley vs. U. S., *supra* (3).

ment, or enlargement of any asserted rights or claims initiated upon any oil- or gas-bearing lands after any withdrawal of such lands prior to the passage of the act. The statute did not indicate an intention to nullify or affect the validity of previous orders withdrawing oil- or gas-bearing lands, but shows an intention on the part of Congress to regulate withdrawals after its passage and to grant relief to those who were in diligent prosecution of work leading to the discovery of oil or gas at the date of the previous withdrawal. There is nothing to indicate the slightest intention to nullify, cancel, or repudiate withdrawals of oil- or gas-bearing lands already made. It is remedial in its nature and should be liberally construed.⁷

§ 4. Act of August 25, 1914.

This law⁸ was amendatory of the act of March 2, 1911,⁹ and provided for working reserved lands prior to the issuance of patents therefor and the disposal of the proceeds thereof.

§ 5. Federal Water Power Act.

The Federal Water Power Act of June 10, 1920,¹⁰ sought to provide for the development of water power and the use of the public lands in relation thereto and granted certain limited authority to the Federal Power Commission, which, under the law, is charged with the adminis-

⁷ U. S. vs. Midway Northern Oil Co., *supra* (1); U. S. vs. Standard Oil Co., 265 Fed. 762; see, also, U. S. vs. Ohio Oil Co., 240 Fed. 1005; U. S. vs. Stockton Midway Oil Co., 240 Fed. 1009. A withdrawal under this act is, in its nature, a continuing withdrawal which, although not attaching to land that at date of withdrawal was within a valid subsisting location, attaches immediately upon default of the claimant thereafter. This because the provision in § 2324, Revised Statutes (5 U. S. Comp. St. p. 5525, § 4620), declaring that a mining claim upon which the required annual assessment work has not been performed shall be subject to relocation in the same manner as if no location of the same had ever been made, impresses the land in a defaulted claim with the status of public land which as long as it remains in that state may be withdrawn by the government. Interstate Oil Corp. *supra* (1) citing and applying cases of Navajo Ind. Reservation, 30 L. D. 515, and Kinney, 44 L. D. 580. In November, 1908, paper locations were posted by one person in the name of sundry persons claiming the several tracts under the placer mining law, they being at the time vacant, unoccupied mineral lands of the United States. After some transfers and consolidation of claims, the associates entered into a contract with an oil company for the development of one particular property and the oil company under the contract was diligently engaged in work leading to discovery on September 27, 1909, when the land was included in the presidential withdrawal order of that date. Work of development continued after the withdrawal and oil was discovered in December, 1909, involving an expense of a large amount of money. The locations were alleged to be fraudulent and void, because they were made for the purpose of enabling one of the associates to acquire more land within a single location than the law permits. But there could be no reason why the persons succeeding to the rights of the original locators should not be deemed to be *bona fide* occupants at the date of the withdrawal within the meaning of the Pickett Act, where they innocently obtained possession in the first instance from some one who was attempting to acquire more land than the law permitted. Their right was not deraigned from, nor did it depend upon a prior location but upon the terms of the said act. They were occupying and holding in their own right and as persons lawfully entitled to acquire the property under the mining laws. Their possession was not tainted with the fraud of the prior attempted locator whom they did not represent and in whose interest and for whose benefit they were not holding. U. S. vs. Rock Oil Co., 257 Fed. 332. See, also, U. S. vs. North American Oil Co., 242 Fed. 723; Con. Mutual Oil Co. vs. U. S., 245 Fed. 521. Compare U. S. vs. McCutchen, *supra* (2), and 238 Fed. 575.

⁸ 5 U. S. Comp. St. p. 5681, § 4637a. See Estate of Ladd (on rehearing), 48 L. D. 313.

⁹ 5 U. S. Comp. St. p. 5681, § 4637. This act provided that patents for oil and gas lands should not be denied because of transfer prior to discovery of oil or gas therein. See Cole vs. Ralph, 252 U. S. 286. The manifest purpose of this law was to provide a temporary method of operating mining claims embraced in applications for patents and conserving the proceeds until it could be decided whether the lands belonged to the claimants or to the government, without resorting to receivership proceedings. Following this act, the Secretary of the Interior entered into agreements with applicants for patents to land outside the naval reserves and not already in suit, which provide for deposits in escrow of one-eighth of the gross production pending the determination of title.

¹⁰ Supp. Fed. Stats. Ann. 1920, p. 367, amended, Supp. Fed. Stats. 1921, p. 333. This act does not cover the whole subject nor provide a complete system of law displacing

tration of said act. Under the provisions of § 24 of this act any lands of the United States included in any proposed project become reserved from entry, location or other disposal under the laws of the United States, from the date of the filing of the application therefor. If the Commission determines that the value of such lands, reserved or classified as power sites, will not be injured nor destroyed for the purpose of power development by location, entry or selection under the public land laws, the Secretary of the Interior shall declare such lands open to location, entry or selection subject to certain conditions.¹¹

§ 6. Reclamation Projects.

The act of June 17, 1902,¹² known as the Reclamation Act, provides for two forms of withdrawal. The first form of withdrawal is of lands required for the construction of irrigation works.¹³ This is an absolute withdrawal from any kind of entry or mineral location.¹⁴ The second form of withdrawal is of lands under said works and subject to irrigation, which may be entered only under the Homestead laws.¹⁵

§ 7. Mineral Lands Withdrawn.

There is no doubt that lands containing mineral deposits may be withdrawn and reserved from disposal or exploration. It has been so held as to National Monuments,¹⁶ military and Indian reserves,¹⁷ but it is also held in that connection that valid mining locations made prior to such withdrawal are not defeated by such reservation so long as the

all others. 33 Op. A. G. 34. It is evident, however, that congress did not intend that the inclusion of lands in a proposed project or any power site withdrawal or reserve should not be subject to the provisions of the Leasing Act. Oil Prospecting Permits in Power Site Reserves, 48 L. D. 459. See Dailey Clay Co., *supra*.⁽¹⁾

The proviso to § 24 which authorizes the approving or patenting, subject to limitations and conditions of the act, or locations, entries, selections, or filings theretofore made for lands reserved as water power sites, has reference only to such locations, entries, selections, or filings as were made prior to the passage of the act. Wilcox, 48 L. D. 184. The act does not contemplate that reserved lands shall be subject to suspended filings or applications while so reserved. Therefore, as to any public lands covered by the application which are so reserved the application is ineffective and will not be entertained. Walker River District, 48 L. D. 197.

¹¹ An oil and gas prospecting permit or a lease thereon, granted pursuant to the Leasing Act does not constitute an "entry," "location" or other "disposal" of the land included therein, within the meaning of those terms as contemplated by § 24 of the Water Power Act of June 10, 1920. The authority conferred upon the Federal Power Commission by subdivision *h* of § 4 of that act to make rules and regulations not inconsistent with the purposes of the act as may be necessary and proper for the purpose of carrying out its provisions, does not clothe that commission with jurisdiction to require the insertion of restrictions in oil and gas permits and leases consequent thereon pursuant to the Leasing Act, for lands in power site withdrawals and reserves for power purposes. Oil Prospecting Permits in Power Site Reserves, 48 L. D. 459, 628.

¹² 5 U. S. Comp. St. p. 5763, § 4702, *et seq.*

¹³ U. S. vs. Hanson, 167 Fed. 881; U. S. vs. Fall, 276 Fed. 623; Crafts, 36 L. D. 138; see Instructions, 33 L. D. 607, 38 L. D. 629; Loney vs. Scott, 57 Or. 466, 112 Pac. 172.

¹⁴ See 1 Fed. St. Anno. 414; U. S. vs. Minidoka Co., 190 Fed. 491; Bisbing, 13 L. D. 45; Gabathuler, 15 L. D. 488; Austin, 18 L. D. 4. Lands withdrawn for a reservoir site or similar reclamation purposes which are essential to the project, and lands acquired by purchase or condemnation for the exclusive use of the project, may be developed for their mineral resources only by temporary leases for periods not inconsistent with the needs of the project. Mell, 50 L. D. 308; see, also, Wolfe, 49 L. D. 625, and Clyde vs. Cummings, 35 Utah 461, 101 Pac. 106.

¹⁵ See *supra*, note 13; Bowen vs. Hickey, 53 Cal. A. 256, 200 Pac. 46.

¹⁶ Cameron vs. U. S., 252 U. S. 450, affirming 250 Fed. 943; see Grand Canyon Co. vs. Cameron, 36 L. D. 66. A national monument may be created within the limits of a forest reserve; but, in so far as they both embrace the same land, the monument reserve becomes the dominant reserve. Cameron vs. U. S., *supra*.

¹⁷ Fort Maginnis, 1 L. D. 552; Kinney, 44 L. D. 580; Interstate Oil Corp., *supra*⁽¹⁾; see, also, Grisar vs. McDowell, 6 Wall. 383. Mineral lands within an abandoned military reservation are subject to the mineral laws. See Randolph, 23 L. D. 517. After an Indian reservation has been withdrawn mining locations may be made within its former boundaries. See Collins vs. Bubb, 73 Fed. 735; see, also, Kendall vs. San Juan Co., 9 Colo. 349, 12 Pac. 198, affirmed in 144 U. S. 658.

mineral claimant continues to comply with the law.¹⁸ In other words, a mining location founded on actual discovery of a valuable mineral deposit within the limits of the claim, and maintained in accordance with the mining law and the local regulations applicable thereto, excepts the land covered thereby from the operation of a withdrawal under said act.¹⁹

§ 8. Default in Assessment Work.

A mining claim as to which the claimant was in default in the performance of the required annual assessment work at the date of a withdrawal for the construction of irrigation works under said act does not except the land from the force and effect of the withdrawal.²⁰

§ 9. Jurisdiction of Land Department.

The Land Department holds that it has jurisdiction to determine whether the mining claimant has failed to do the annual assessment work and to declare by its judgment whether the possessory right to a location has been divested so as to restore the land to the government.²¹

PART IV.

SURFACE ACTS.

- | | |
|--|---|
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| § 2. "The Surface Act." | § 12. Mineral Rights Reserved. |
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| § 5. Use of Surface by Miner. | § 15. Timber and Stone Act. |
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§ 1. Introductory.

The severance of surface from subsurface rights in land, which an individual proprietor, in its disposal may make as he will, has been authorized by several acts of congress relative to the disposal by the United States of its public domain, among which may be mentioned the act of July 17, 1914, which permitted agricultural entry of the surface rights in withdrawn oil, gas, and other specified mineral lands, and the Leasing Act, which provided for disposal by lease of the subsurface rights separately from the surface ownership, in lands containing certain specified minerals.¹

§ 2. The Surface Act.

The act of July 17, 1914,² called "The Surface Act," did not suspend nor work a repeal of the provisions of the mining laws where such laws could otherwise operate. nor did the act itself effect such a repeal, and no such purpose nor intent can properly be gathered from the language

¹⁸ See preceding note; see, also, *Caledonia Co. vs. Noonan*, 3 Dak. 189, 14 N. W. 426, affirmed in 121 U. S. 393.

¹⁹ Instructions, 32 L. D. 387.

²⁰ See note 17, *supra*.

²¹ Wyoming, 38 L. D. 508. Disputes between rival claimants relating to the fulfillment by mining locators, or their successors in interest, of the legal requirements as to performance of annual assessment work are not, generally, matters for departmental determination, but come exclusively within the jurisdiction of the courts. *Corbett*, 50 L. D. 291; see, also, *Cameron vs. U. S.*, *supra*,⁽¹⁶⁾

¹ *Emerald Oil Co.*, 48 L. D. 243.

² 5 U. S. Comp. St. p. 5683, § 4640a.

used. After the passage of this statute, oil, gas or asphaltic minerals (and the other minerals mentioned therein), in the public domain, in areas not covered by Executive withdrawals or reservations, were subject to exploitation and location under the same conditions and with the same facility as theretofore. The specific repeal of the mining laws, as to the mineral deposits mentioned, was accomplished by the Leasing Act. That act, however, expressly provides that valid claims existent at the passage thereof and thereafter maintained in compliance with the laws under which initiated, might be perfected under such laws, even including discovery, under the last-mentioned act.³ These two acts are not in conflict but are the complement of each other.⁴

§ 3. Reservation to United States.

This act provides that the surface lands withdrawn or classified as oil, gas, or asphaltic minerals or which are valuable for those deposits are

³ Pollock, 48 L. D. 5.

⁴ Marathon Oil Co. vs. West, U. S. Intervenor, 48 L. D. 150; Foster vs. Hess, 50 L. D. 276.

In the case of Foster vs. Hess the claim was made that an entryman of lands not withdrawn, classified nor reported as valuable for oil and gas deposits at the time of entry, can only be required to consent to a reservation of such deposits when it is shown, prior to final entry, that the lands contain valuable deposits of oil or gas. In other words, the actual demonstrated existence of minerals is essential; and a reasonable belief that such deposits will be found, based upon geologic indications which would warrant expenditures in prospecting operations, is not sufficient. In the course of the decision it was said: "Analysis of the Acts of July 17, 1914, and February 25, 1920 (the Leasing Act), discloses the fallacy of this claim.

"The act of July 17, 1914 (38 Stat. 509), provided a means whereby surface entries could be made and perfected upon lands 'valuable for' deposits of nitrate, potash, oil, gas or asphaltic minerals; and authorized the issuance of patents to these surface entrymen, which patents should contain a reservation of the particular deposits for which the land was valuable, and reserved to the United States, its lessees or licensees, certain rights in respect to said deposits. It can not be doubted that this act was intended to permit the joint use of mineral lands; and that such rights were reserved from the surface patents as would permit the government, or those in privity with it, to fully exploit and develop the reserved deposits which gave the land value as mineral land.

"Consideration of the rights reserved, therefore, must indicate what the Congress wished to withhold from the surface entrymen and to conserve.

"In each of the three sections of the act of July 17, 1914, the rights reserved are 'to prospect for, mine and remove' the reserved deposits (italics supplied). Lands which, from geologic indications warrant *prospecting* operations to establish the actual existence of deposits of the minerals specified in the act of July 17, 1914, *supra*, are clearly therefore, to be considered as 'valuable for' such deposits within the meaning of said act; and a report as to such prospective value is a proper basis for a requirement that an entryman of lands having such prospective value consent to a reservation of the particular deposits, in accordance with said act. State of Utah vs. Litchliter et al. (50 L. D. 231). * * * A second reason for the lack of merit in the foregoing claim appears when the result of said claim, if allowed, is considered. Under that view, only such lands as have been prospected before final entry could be properly classified as mineral. In all other cases, the entryman, by completing final proof, could force the hand of the government and acquire unrestricted title to lands which, from their situation and from their geologic formation strongly suggested the presence of minerals, but which, for some reason not related to the character of the land (such as economic conditions retarding prospecting generally, or especial conditions of isolation, or similar difficulties), had not been prospected and the minerals discovered. The privilege given entrymen in § 2 of the act of July 17, 1914, of proving, before final entry, that the lands 'are in fact non-mineral in character' clearly indicates a contrary intent of the Congress. Any doubt which may have existed on this point prior to the passage of the Leasing Act of February 25, 1920, *supra*, which act is a complement of the act of July 17, 1914, *supra* (Marathon Oil Co. vs. West, U. S. intervener, 48 L. D. 150), was dispelled by the provisions of the said Leasing Act. Under § 13 of that act, permits to prospect for oil and gas are authorized as to deposits of said minerals owned by the United States; and in § 20 of said act, surface entrymen of said lands so entered before the lands were withdrawn or classified as mineral, who were thereafter required to consent to accept a restricted or surface patent with the minerals reserved to the United States, are given a preference right to a permit to *prospect for* oil or gas. When the actual existence of deposits of these minerals are established the entryman is entitled to a lease. No clearer evidence that lands prospectively valuable for oil and gas were intended to be patented under the nonmineral laws only with a reservation of such deposits can well be desired." See, also, California, Robinson, Transferee, 48 L. D. 387; Pace vs. Carstarphen, 50 L. D. 369.

subject to appropriation, location, selection, entry, or purchase, if otherwise available, under the nonmineral laws whenever made with a view of obtaining or passing title with a reservation to the United States of the deposits on account of which the lands were withdrawn or classified or reported as valuable, together with the right to prospect for, mine and remove the same.⁵ Such deposits to be subject to disposal by the government only as shall be expressly directed by law.⁶

§ 4. Prospecting Reserved Deposits.

Any person qualified to acquire the reserved deposits may enter upon said lands with a view of prospecting for the same upon the approval by the Secretary of the Interior of a bond or undertaking to be filed with him as security for the payment of all damages to the crops and improvements on such lands by reason of such prospecting, the measure of any such damage to be fixed by agreement of parties or by a court of competent jurisdiction.⁷

§ 5. Use of Surface by Miner.

Any person who has acquired from the United States the title or the right to mine and remove the reserved deposits, should the United States dispose of the mineral deposits in lands, may reenter and occupy so much of the surface thereof as may be required for all purposes reasonably incident to the mining and removal of the minerals therefrom, and mine and remove such minerals, upon payment of damages caused thereby to the owner of the land, or upon giving a good and sufficient bond or undertaking therefor in an action instituted in any competent court to ascertain and fix said damages.⁸

§ 6. Prompt Consideration of Applications.

Nothing contained in the act shall be held to deny or abridge the right to present and have prompt consideration of applications to locate, select, enter, or purchase, under the land laws of the United States, lands which have been withdrawn or classified as oil gas, or asphaltic mineral lands, with a view of disproving such classification and securing a patent without reservation.⁹

§ 7. Proving Nonmineral Character.

Persons who have located, selected, entered, or purchased lands subsequently withdrawn, or classified as valuable for said mineral deposits, shall not be debarred from the privilege of showing at any time before final entry, purchase, or approval of selection or location, that the lands entered, selected, or located are in fact nonmineral in character.¹⁰

⁵ 5 U. S. Comp. St. p. 5683, § 4640a. Where land within a homestead entry upon which final proof has been submitted, but suspended to await the fulfillment of some further requirement, is discovered to be within the limits of a producing oil field prior to the completion of the proof, the entryman must consent to a reservation of the oil and gas content as prescribed by the act of July 17, 1914, or assume the burden of showing the nonmineral character of the land. *La Flame*, 49 L. D. 324; see *Washburn vs. Lane*, 258 Fed. 524; *Son vs. Adamson*, *supra*⁽²⁾; *Midland Oil Fields Co. vs. Rudneck*, *supra*.⁽²⁾

⁶ 5 U. S. Comp. St. p. 5683, § 4640b.

⁷ *Id.* See note 60, *infra*.

⁸ *Id.*

⁹ 5 U. S. Comp. St. p. 5683, § 4640b.

¹⁰ 5 U. S. Comp. St. p. 5684, § 4640b.

Before issuance of patent the Secretary of the Interior may institute an inquiry upon his own motion, to ascertain whether there was fraud in the entry, and this authority extends to his subordinate, the Commissioner of the General Land Office. *Orchard vs. Alexander*, 157 U. S. 372; *Love vs. Flahive*, 205 U. S. 195; *Jones vs. Hoover*, 144 Fed. 221.

§ 8. Restricted Patents.

Any person who has, in good faith, located, selected, entered, or purchased, or any person who shall hereafter locate, select, enter or purchase, under the nonmineral laws of the United States, any lands which are subsequently withdrawn, classified or reported as being valuable for oil gas, or asphaltic minerals, may, upon application therefor, and making satisfactory proof of compliance with the laws under which such lands are claimed, receive a patent therefor, which patent shall contain a reservation to the United States of all deposits on account of which the lands were withdrawn, classified, or reported as being valuable, together with the right to prospect for, mine, and remove the same.¹¹

§ 9. Jurisdiction of Courts.

The courts, not the Land Department, have direct jurisdiction to determine questions pertaining to actual physical possession of lands in cases arising from conflicts between claimants under the acts of July 17, 1914, and February 25, 1920, respectively.¹²

§ 10. Jurisdiction of Land Department.

The determination of the character of the public lands is committed exclusively to the Land Department, and in exercising that jurisdiction it may select its own instrumentalities and methods. A recommendation of its Geological Survey that specified public lands be withdrawn from entry (nonmineral or other) and placed in a petroleum reserve, if approved by the Department head and acted upon favorably by the Executive, is one mode of classification of those lands as mineral in character; provisional, it is true, and subject to revocation upon further investigation or upon showing by a nonmineral claimant, but until then, presumptively fixing their mineral character. In *Washburn vs. Lane* (*supra*,⁴) it was held that inclusion in a petroleum reserve was a *prima facie* mineral classification, prevailing against a lieu selection of the land as nonmineral, previously initiated but not completed.¹³

One who purchases of any entryman before the issuance of patent obtains no greater right or estate than is possessed by the entryman, and acquires at the most a right or equitable estate which is subject to examination within the Land Department while the title remains in the government. *Hawley vs. Diller*, 178 U. S. 488; *Thayer vs. Spratt*, 189 U. S. 352.

¹¹ 5 U. S. Comp. St. p. 5684, § 4640c; U. S. vs. *Ridgely*, 262 Fed. 675; *Stockley vs. U. S.*, *supra*.⁽³⁾ Consent to accept a restricted patent in accordance with the act of July 17, 1914, for oil and gas lands, may be filed by a mortgagee, if the homestead entryman, after proper notification, fails to do so. Otherwise the relief to which the former is entitled, would be wholly defeated. *Gordon and Overly Co.*, 50 L. D. 240.

¹² *Marathon Oil Co. vs. West*, U. S. Intervener, *supra*.⁽⁴⁾

¹³ *Mabry* (on rehearing), 48 L. D. 280; see, also, *Lane vs. Cameron*, 45 App. Cas. (D. C.) 409. See, generally, *Cameron vs. U. S.*, 252 U. S. 450; *Burke vs. S. P. R. R. Co.*, 234 U. S. 670; *Vore vs. Ephraim*, 173 Cal. 245, 159 Pac. 719.

The rules of law as administered by courts are binding upon the Land Department only in so far as they are not adverse to but assist its function as an administrative branch of the executive department of the government which, as the proprietor of the public domain, as a party to all proceedings looking to the disposal of any part of that domain, and in its executive administration is entitled to rely upon and adhere to the classification of its lands, once arrived at, even though between others than the parties to a new application to enter. This principle of the paramount nature of the administrative side of the Land Department's work, rather than its function of adjudicating the rights of private claimants, entitles it, in so adjudicating, to respect and follow its own former adjudications as to particular lands, even though not binding in strictness upon a new claimant. Its executive liberty of action in this respect is quite analogous to the executive power, existing through implication of withdrawal of lands from entry notwithstanding congressional legislation had previously made them free and open to occupation and purchase, which is fully discussed in *U. S. vs. Midwest Oil Co.*, *supra*.⁽³⁾ *Day*, 50 L. D. 23. The practice of withdrawing lands contemplates their segregation for purposes of investigation and the Land Department holds that it is clearly its duty to seek such withdrawals

§ 11. Stock-raising Homestead Act.

The act of December 29, 1916,¹⁴ called the "Stock-Raising Homestead Act" provides that the Secretary of the Interior may designate unappropriated, unreserved public lands as "stock-raising lands," where the surface thereof is, in his opinion, chiefly valuable for grazing and raising forage crops, provided they do not contain merchantable timber, are not susceptible of irrigation from any known source of water supply, are of such character that 640 acres are reasonably required for the support of a family, and contain no water holes nor other bodies of water needed or used by the public for watering purposes.

Where lands are thus designated, any person qualified to make entry under the homestead laws may make a homestead entry for not exceeding 640 acres thereof, and the fact that the tract sought may be valuable for coal or other minerals is not material, since all minerals are reserved to the United States.

§ 12. Mineral Rights Reserved.

All coal and other mineral rights are reserved to the United States, together with the right to prospect for, mine, remove and dispose of the same.¹⁵

§ 13. Relative Rights of Miner and Agriculturist.

Under the provisions of this law the homesteader does not obtain a title to the fee. His rights are confined to the surface or so much thereof as may not ultimately be set apart for the conduct of mining operations, which, by its terms, do not seem to be limited to the underlying minerals. The miner, under the restrictions shown in note 15 *supra*, may enter

whenever from evidence before it an inference or belief is warranted that lands in fact are mineral. *Utah vs. Lichliter, supra.*⁽⁴⁾

¹⁴ 39 Stat. 862; amended 40 Stat. 1016; amended 41 Stat. 287. See Instructions, 48 L. D. 485. This act modifies the placer mining laws so as to authorize the issuance of surface patents for lands of the character contemplated by this act and duly entered thereunder, and authorized the patenting of the reserved deposits to mineral applicants under the placer mining laws. *Dean vs. Lusk Royalty Co.*, 50 L. D. 193.

¹⁵ *Id.* Any person qualified to locate and enter the coal or other mineral deposits, or having the right to mine and remove the same under the laws of the United States, shall have the right at all times to enter upon the lands entered or patented, as provided by this act, for the purpose of prospecting for coal or other mineral therein, provided he shall not injure, damage, or destroy the permanent improvements of the entryman or patentee, and shall be liable to and shall compensate the entryman or patentee for all damages to the crops on such lands by reason of such prospecting. Any person who has acquired from the United States the coal or other mineral deposits in any such land, or the right to mine and remove the same, may reenter and occupy so much of the surface thereof as may be required for all purposes reasonably incident to the mining or removal of the coal or other minerals, first, upon securing the written consent or waiver of the homestead entryman or patentee; second, upon payment of the damages to crops or other tangible improvements to the owner thereof; where agreement may be had as to the amount thereof; or third, in lieu of either of the foregoing provisions, upon the execution of a good and sufficient bond or undertaking to the United States for the use and benefit of the entryman or owner of the land, to secure the payment of such damages to the crops or tangible improvements of the entryman or owner, as may be determined and fixed in an action brought upon the bond or undertaking in a court of competent jurisdiction against the principal and sureties thereon, such bond or undertaking to be in form and in accordance with rules and regulations prescribed by the Secretary of the Interior and to be filed with and approved by the register and receiver of the local land office of the district wherein the land is situate, subject to appeal to the Commissioner of the General Land Office: *Provided*, That all patents issued for the coal or other mineral deposits herein reserved shall contain appropriate notations declaring them to be subject to the provisions of this act with reference to the disposition, occupancy, and use of the land as permitted to an entryman under this act. *Id.*

The filing of an application to make entry of lands subject to entry under this act confers upon the applicant a prior right to the surface that is not subject to contest by a mineral claimant who bases his right upon discovery made after the filing of the homestead application. *Rosetti vs. Dougherty*, 50 L. D. 16. See note 60, *infra*.

upon, prospect and mine the land, thus practically conducting the usual mining operations thereon with the same facility as before the enactment of this statute as it does not repeal the mining law.¹⁶

§ 14. Character of Land.

When an issue is raised between rival applicants, either of them is entitled to a hearing for the purpose of showing that his adversary secured the designation necessary to his entry by making a false or fraudulent representation as to the character of the land.¹⁷

§ 15. Timber and Stone Act.

This act¹⁸ allows entries thereunder under the act of July 17, 1914,¹⁹ for lands withdrawn or classified as valuable for (among other minerals) oil gas, or asphaltic minerals, or which are valuable for those deposits, provided the applicant files his consent, to have the entry stand subject to the provisions and limitations of said act.²⁰

§ 16. Determination of Character of Land.

Lands within the known geologic structures of producing oil or gas fields, or embraced in applications for oil and prospecting permits, or in permits or leases granted, are not subject to entry hereunder until and unless the Secretary of the Interior shall determine that the surface of the lands may be disposed of without detriment to the public interest.²¹

§ 17. Oil and Gas Lands.

A complete equitable title becomes vested upon the claimant's full compliance with the law and the final certificate upon a timber and stone entry is *prima facie* evidence of that title. Thereafter such entryman can not be compelled to accept a limited patent pursuant to the act of July 17, 1914, because of a subsequent report that the land is valuable for oil or gas, unless the government makes the charge and shows upon assumption of the burden of proof that the land was of known mineral character at the date of the perfection of the claim.²²

¹⁶ In *Barker vs. Mintz*, 73 Colo. 262, 215 Pac. 534, it is said: "The land is wild, and its present value, except for coal, is only for pasturage; a very little of it for cultivation. The stripping destroys these values, but the fair and equitable way is so to treat the matter that each party shall get the greatest amount of good with the least possible harm, and that is by allowing the defendant to take out his coal and pay the plaintiff for the damages he thereby does to her estate. He then will get the full value of his property and she will get the full value of hers. Is that not equity?"

¹⁷ *Stokes & Eckert*, 48 L. D. 105.

¹⁸ 5 U. S. Comp. St. p. 5726, § 4671. For entry of building stone lands under the provisions of the law in relation to placer mineral claims see 5 U. S. Comp. St. p. 5678, § 4633. One who has made entry for the full area permitted by the Stock-Raising Homestead Act is thereafter debarred from making a timber and stone entry, or any other form of entry under the agricultural land laws. *Feltner*, 49 L. D. 527.

¹⁹ 5 U. S. Comp. St. p. 5683, § 4640a.

²⁰ See Regulations, 49 L. D. 288.

²¹ *Id.*

²² *Chamberlain*, 48 L. D. 411. A report by a field agent, after the issuance of a final certificate upon such an entry, charging that the land contains oil and gas and was so known at the date of final proof, may be used as a basis for government proceedings against the claim, but it is not competent evidence upon which final action adverse to the claimant may be taken, without charges, notice and an opportunity for a hearing. See *Goodwin*, 43 L. D. 484, *Ireland*, 40 L. D. 484.

The difference between a receiver's receipt and a register's final certificate of entry is that the former, as its name imports, acknowledges the receipt of the money paid. The other certifies to the payment and declares that the claimant on presentation of the certificate to the Commissioner of the General Land Office shall be entitled to a patent. *Stockley vs. U. S.*, *supra*.⁽²⁾

§ 18. Indian Lands.

The Leasing Act did not, expressly nor by implication, repeal nor modify those provisions of the act of February 28, 1891,²³ which relate to the leasing by allottees of lands within Indian reservations.²⁴

PART V.

FEDERAL PERMITS AND LEASES.

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²³ 26 Stat. 794. The provisions of this act relating to the leasing by allottees of lands within Indian reservations, were applicable only to such reservations as those created by treaty or congressional action, and prior to the enactment of the Leasing Act no authority existed for the leasing of lands withdrawn from the public domain by Executive order for the use of the Indians. Lands withdrawn from the public domain by Executive order for the use of the Indians are lands "owned by the United States" within the purview of that term as used in the Leasing Act and may be included within an oil and gas prospecting permit under § 13 thereof. Harrison, 49 L. D. 139. For additional requirements to be demanded of permittees and lessees deemed necessary for the protection of the Indians. See Instructions, 50 L. D. 238.

²⁴ Harrison, *supra*.⁽²³⁾

§ 1. Introductory.

Lands chiefly valuable for petroleum or other mineral oils¹ or a deposit of natural gas² could be located as placer mining claims unless within the boundaries of lands reserved by congress for a public purpose, as, for instance, Indian reservations, military reservations, national parks and reservoir sites or until such mineral lands were included within areas temporarily withdrawn by executive order³ previous to or under the terms of the act of June 25, 1910,⁴ and permanently withdrawn from location and entry under the provisions of the act of February 25, 1920.⁵ Under the terms of the act of July 17, 1914, and the Stock-Raising Homestead Act⁶ the miner is given the right to prospect for, mine and remove the minerals in the land and to occupy so much of the surface as may be required for all purposes reasonably incident to such operations after securing the consent or waiver of the owner of the surface or paying all damages to crops or other tangible improvements to the owner thereof or in lieu thereof giving bond to the United States for the use and benefit of the entryman or owner of the land to secure payment of such damages to the crops, etc.

¹ 29 Stat. 526; *Chrisman vs. Miller*, 197 U. S. 313; *Weed vs. Snook*, 144 Cal. 440, 77 Pac. 1023; *McLemore vs. Express Co.*, 158 Cal. 559, 112 Pac. 59; *Bay vs. Oklahoma Co.*, 13 Okla. 425, 73 Pac. 936.

² *New England Co. vs. Congdon*, 152 Cal. 211, 92 Pac. 180; *Whiting vs. Straup*, 17 Wyo. 19, 95 Pac. 849.

³ In *U. S. vs. Midwest Oil Co.*, 236 U. S. 459, the authority of the President to withdraw oil lands from location and patent was upheld. See, also, *Mason vs. U. S.*, 260 U. S. 545; *U. S. vs. Midway Northern Oil Co.*, 232 Fed. 627. For an instance of wrongful entry upon lands embraced within a withdrawal order, see *El Dorado Co. vs. U. S.* 229 Fed. 949; see, also, *U. S. vs. Dominion Oil Co.*, 241 Fed. 426. For cases involving the issuing of an injunction and the appointment of a receiver to prevent the extraction and waste of oil on withdrawn lands, see *U. S. vs. McCutchen*, 234 Fed. 712; *U. S. vs. Honolulu Con. Oil Co.*, 249 Fed. 168. A petroleum withdrawal impresses the land with a *prima facie* mineral character. *Baxter*, 48 L. D. 126.

⁴ 5 U. S. Comp. St. p. 5320, § 4523, amended 5 U. S. Comp. St. p. 5321, § 4524, so as to include all nonmetalliferous deposits. This legislation is known as the Pickett Act. It is a remedial statute. It was intended to protect *bona fide* occupants of public oil or gas lands who in good faith were at the time of the withdrawal engaged in work leading to discovery by giving them the right to continue their work to a discovery and thereafter to extract and market the oil and to acquire title notwithstanding the withdrawal. *U. S. vs. Rock Oil Co.*, 257 Fed. 333; see *Con. Mutual Oil Co. vs. U. S.*, 245 Fed. 521; *U. S. vs. McCutchen*, *supra*.⁽³⁾ For an instance of what are sufficient to constitute an occupation, possession and due diligence within the provisions of the Pickett Act, see *U. S. vs. Grass Creek Co.*, 236 Fed. 485, and see *Oregon Basin Co.*, 50 L. D. 244. Compare *El Dorado Co. vs. U. S.*, *supra*.⁽³⁾; see, also, *U. S. vs. Ohio Oil Co.*, 240 Fed. 1005; *U. S. vs. Stockton Midway Oil Co.*, 240 Fed. 1009. The government by its mining statutes offers to qualified persons the minerals in the public domain through the means of mining locations, and if the offer so made is accepted by compliance and by the location of a valid mining claim in accordance with the statutory provisions before the offer is withdrawn by the government, it can not, after acceptance, withdraw its order, as the offer then becomes binding and an enforceable obligation. But the government may withdraw its offer at any time before acceptance and the situation stands as if no offer had ever been made. In other words, in the absence of a discovery on an oil (or any other mineral) location on the public domain and in the absence on the part of the locator of diligent prosecution of work leading to discovery, even though in actual possession of the claim, as against the government, he is subject at any time to the possibility of a withdrawal of the privileges offered to him and consequently a termination of his rights. *U. S. vs. McCutchen*, *supra*.⁽³⁾

⁵ 2 Supp. U. S. Comp. St. p. 1409, § 4640¹/_{ff} (§ 13). The passage of the Leasing Act of February 25, 1920, was the enactment into law of a broad comprehensive plan of general application by which an entire new system respecting the disposition of lands and the deposits of minerals beneath the surface owned by the United States and valuable for certain specified minerals was adopted. The purpose of this act was to encourage the development of the mineral resources of the country under the principle of permits for exploration and the leasing of the lands owned by the United States. It will be noted that under the terms of said act, all lands owned by the United States were included within its provisions except as to certain lands therein specifically enumerated. *Harrison*, 49 L. D. 139.

⁶ 5 U. S. Comp. St. p. 5683, § 4640^a. Act of December 29, 1916 (39 Stat. 862), amended by the act of October 25, 1918. (40 Stat. 1016) and the act of September 29, 1919 (41 Stat. 287). The former act modified the placer mining laws so as to

§ 2. Lands Subject to Disposition Under the Act.

Under the provision of the act of February 25, 1920⁷ (commonly called "The Leasing Act"), oil, oil shale, gas (and other minerals) on the public domain owned by the United States, including those in national forests, but excluding lands acquired under the act known as the Appalachian Forest Act, approved March 1, 1911⁸, and those in national parks, and in lands withdrawn or reserved for military or naval uses or purposes, except as therein provided, shall be subject to disposition in the manner and form provided by that act to citizens of the United States, or to any association of such persons, or to any corporation organized under the laws of the United States, or of any state or territory thereof, and in the case of oil, oil shale, or gas to municipalities.

§ 3. Helium Reserved.

The United States reserves the right to extract helium from all gas from lands permitted, leased, or otherwise, granted under the provisions of the act, under such rules and regulations as shall be prescribed by the Secretary of the Interior.⁹

authorize the issuance of surface patents for lands of the character contemplated by the Stock-Raising Act and duly entered thereunder, and authorized the patenting of the reserved deposits to mineral claimants under the placer mining laws. This intent clearly appears from the following provision in section 9 of that act: "*Provided*, that all patents issued for the coal or other mineral deposits herein reserved shall contain appropriate notations declaring them to be subject to the provisions of this act with reference to the disposition, occupancy and use of the land as permitted to an entryman under this act." *Dean vs. Lusk Royalty Co.*, 50 L. D. 192. See *Stock-Raising Homesteads*, 48 L. D. 485.

A stock-raising homestead entryman does not have a sufficient interest in the reserved mineral deposits in the lands within his entry to entitle him to protest against the issuance of an oil and gas prospecting permit, except it be in his capacity as a citizen desiring to prevent the perpetration of a fraud upon the government. *Dean vs. Lusk Royalty Co.*, *supra*.

The provisions of the Surface Act of July 17, 1914, and those contained in the Leasing Act are not in conflict, but are the complement of each other. From the homestead entries mineral rights and all incidents essential thereto are reserved, while in the lease and permit that may be issued to the mining claimant the rights pertaining to the estate of the surface claimant must be duly respected and protected. Any question that may arise as to actual possession of any portion of the area, or any possible difficulties between these two claimants, are matters over which the Land Department has no direct jurisdiction. Those matters must be investigated and adjudicated in the local tribunals having jurisdiction over the parties. *Marathon Oil Co. vs. West*, U. S. Intervener, 48 L. D. 150. *Cleveland vs. Johnson* (on rehearing), 48 L. D. 18, involved the construction of said act.

An application for an oil and gas permit embracing lands within a homestead entry, filed by the entryman during the pendency of action by the Land Department upon the question of allowance of his final proof, constitutes an admission that the land has a prospective oil and gas value and amounts to an election to take a restricted patent in accordance with the provisions of the act of July 17, 1914. *Heirs of Corder*, 50 L. D. 185.

A permittee under an oil and gas prospecting permit is not authorized to injure the permanent improvements of a stock-raising homestead entryman, and damage to crops must be compensated for as provided by section 9 of the act of December 26, 1916. *Dean vs. Lusk Royalty Co.*, *supra*. See note 60, *infra*.

⁷ 2 Supp. U. S. Comp. St. p. 1404, § 4640½. This act supersedes the provisions of the mining laws in so far as the minerals named therein are concerned and it makes specific provision for various classes of preference rights. *Amerman vs. Mackenzie*, 48 L. D. 580.

⁸ Stat. 1911, p. 961. Ownership by the government of lands abutting upon a meandered nonnavigable body of water carries with it the same rights with respect to submerged land opposite thereto that private ownership does, and such rights pass by permit or lease of the government-owned uplands as well as by patent to such lands. A prospecting permit or permit application, therefore, covering land abutting a meandered nonnavigable body of water embraces the adjacent submerged area, as well as the upland. Lands beneath the waters of a nonnavigable lake which is surrounded by tracts that have been patented by the government or are embraced within existing claims or pending applications are not subject apart from the abutting uplands to the oil prospecting permit or lease provisions of the Leasing Act. *Phebus*, 48 L. D. 128.

⁹ 2 Supp. U. S. Comp. St. p. 1404, § 4640½.

§ 4. No Substantial Delay.

In the extraction of helium from gas produced from such lands, it shall be so extracted as to cause no substantial delay in the delivery of gas produced from the well to the purchaser thereof.¹⁰

§ 5. Persons Excepted.

Citizens of another country, the laws, customs or regulations of which deny similar or like privileges to citizens or corporations of this country, shall not by stock holding, or stock control, own any interest in any lease acquired under the provisions of this act.¹¹

§ 6. Prospecting Permit for Oil or Gas.

Under the terms of the act and the rules and regulations prescribed by the Secretary of the Interior a qualified applicant may be granted the exclusive right, for a period not exceeding two years to prospect for oil or gas upon not to exceed two thousand five hundred and sixty acres of land wherein such deposits belong to the United States and are not within any known geological structure of a producing oil or gas field upon condition that the permittee shall begin drilling operations within six months from the date of the permit, drill one or more wells for oil or gas to a depth of not less than five hundred feet each, unless valuable deposits of oil or gas shall be sooner discovered, and shall, within two years from date of the permit, drill for oil or gas to an aggregate depth of not less than two thousand feet unless valuable deposits of oil or gas shall be sooner discovered.¹²

¹⁰ Id.

¹¹ Id. While an oil and gas prospecting permit can not be issued under the act to an alien, yet there is nothing in the law nor the practice of the Land Department that forbids the issuance thereof to a citizen who is naturalized after the filing of the application but before the granting of the permit. O'Rourke, 48 L. D. 215; see, also, Manuel vs. Wulff, 152 U. S. 505. The same rule has uniformly been followed by the Land Department in homestead cases. See Lerow vs. Grant, 32 L. D. 403, and cases there cited. Upon the granting of an oil prospecting permit rights thereunder attach as of the date of the application. Brennan, 48 L. D. 108. See, also, Lee, 49 L. D. 175.

¹² 2 Supp. U. S. Comp. St. p. 1409, § 4640 $\frac{1}{4}$ ff (§ 13). It always is possible that when a structure must be defined long before it is completely drilled up, it may include territory that will later prove to be nonproductive and may exclude land that later is proved to be productive, because no accurate prediction can be made as to the distance down the flanks of the fold to which the oil or gas will extend. Hopkins, 50 L. D. 213. Land that is not within a designated oil or gas structure nevertheless is to be treated as valuable for oil and gas when embraced within a prospecting permit. Brennan, *supra*.⁽¹¹⁾ Where qualified persons have filed proper applications for oil or gas permits they can not be deprived of their rights because of a delay in action upon the application so filed due to there intervening a designation by the Land Department of the lands being within the geological structure of a producing oil or gas field occasioned by a discovery of oil or gas subsequent to the filing of the application in the local land office. Oil Prospecting Permit, 48 L. D. 98. Compare Mason (on petition), 48 L. D. 213, in which case the Land Department said: "With respect to the particular lands here in question, the Director of the Geological Survey reports that the said lands formed a part of the known geological structure of the Elk Hills field for some years prior to the passage of the Leasing Act, and, therefore, before any rights could be initiated under that act. It is clear, therefore, that notwithstanding the fact that the land may not have been designated by the Director of the Geological Survey as within the known geological structure of a producing oil and gas field until after the application of Mason was filed, the land was not subject to permit under section 13 of the act for the reason that as a matter of fact it was at the time of the filing of Mason's application known to be within such a geological structure." Once a structure is pronounced as producing, and this definition is acquiesced in by the persons whose applications preceded its definition, but were made after the discovery prompting it, they may not thereafter, by filing applications for reinstatement alleging later developments, revive their former applications, but must, in order to receive permits, file the first proper application after the lands are restored from the defined structure, which was, in effect, a withdrawal from appropriation under section 13. Hopkins, *supra*.

The denial of an application for oil and gas prospecting permit is a proper exercise of the discretionary authority conferred upon the Secretary of the Interior, if the

§ 6a. Extension of Time.

If it appears that the permittee has been unable with the exercise of diligence, to begin drilling operations or to drill wells of the depth and within the time aforesaid, the Secretary of the Interior may extend the time for beginning such drilling or completing it, to the amount specified in the act for such time, not exceeding three years, and upon such conditions as he shall prescribe.¹³

§ 7. Preliminary Demarcation.

Whether the lands sought in any such application and permit are surveyed or unsurveyed the applicant shall, prior to filing his application for permit, locate such lands in a reasonably compact form and according to the legal subdivisions of the public land surveys if the

lands to be prospected were at the time of the filing of the application within a known geological structure, although not designated as such until subsequently thereto. When the limits of a producing oil and gas field are determined by the Geological Survey, and the same is designated by it as such, the designation relates to the time that the production began, and the filing of an application for a prospecting permit for lands then known to be within a producing oil field, although not yet designated, does not confer upon the applicant any vested right or constitute a ground upon which the granting of a permit under the act can be enforced by him. Haupt, 48 L. D. 355. This case cites and follows the cases of Mason, *supra*, and Watson, 48 L. D. 214, and cites and construes the cases of Payne vs. C. P. R. Co., 255 U. S. 228; Payne vs. New Mexico, 255 U. S. 367; Payne vs. U. S., 255 U. S. 438; Wyoming vs. U. S., 255 U. S. 489.

The definition of a structure as within a producing oil and gas field is in effect a withdrawal of the lands from appropriation under § 13 of the Leasing Act, and an application for a permit, even though filed prior to such definition, does not confer any rights upon the applicant that will inure to his benefit upon the exclusion of the lands by reason of the redefinition of the structure. Where an application for a prospecting permit is denied because of the inclusion of the lands within a producing oil and gas field, such application can not be revived by reinstatement upon a subsequent restoration of the lands, but they will be open to prospecting after their restoration as though no application had been filed. Hopkins, *supra*. There is nothing in the Leasing Act nor the regulations thereunder which gives exclusive segregative effect to a mere application for a prospecting permit. Until the Land Department has satisfied itself as to the qualifications of the first applicant and issued a permit to him, applications may be filed by others and if the first application is rejected their claims will be considered in the order initiated until one qualified to receive a permit is found; after which all subsequent applications must be rejected. Eaton vs. Butts, 50 L. D. 341.

¹³ 2 Supp. U. S. Comp. St. p. 1410, § 46401fff. The Land Department has held that in case a permittee is unable to begin drilling operations with the exercise of diligence within six months from date of the permit, action will not be taken looking to the cancellation of the permit but that twelve months and ten days from date thereof authorized, every permittee is required to file a corroborated affidavit specifying the work done upon the land embraced in the permit, together with such other information as may be pertinent to his operations thereon. Tieck vs. McNeill, 48 L. D. 158.

A permittee who has been unable with the exercise of due diligence to comply with the terms of the permit issued under any section of the act, may, if the facts warrant, be granted an extension of time upon filing an application therefor, accompanied by his own affidavit setting forth what effort, if any, he has made to comply with the terms of his permit and the reasons for delay in the full compliance therewith, and such showing to be accompanied by a corroborating affidavit of at least one disinterested person having actual knowledge of the facts.

The affidavit by the applicant must also show the time when he proposes to commence or resume his operations and any arrangements he has made for complying with the terms of the permit.

An extension of time to perform one of the acts required by the permit necessarily extends for the same period the time for the performance of all subsequent requirements, and as the bond is expressly limited by its terms to the period for which the permit was granted, the permittee must furnish a properly executed assent by the surety to the extension of his bond to cover the life of the permit as it will be extended if an extension is granted.

The application may be filed in the General Land Office or in the local land office having jurisdiction over the land involved by the permit. In the latter event proper applications will be promptly forwarded to the first named office by the local officers.

In cases where applications for extensions, filed in the local offices, are not in affidavit form and duly corroborated or are not accompanied by the required assent by the sureties on the bonds the local officers will require the permittee to remedy these defects within fifteen days from receipt of notice and will transmit the applications with evidence of service and a report of action taken at the expiration of the time allowed. Instructions, 49 L. D. 403. An oil and gas prospecting permit is to be considered in force until it has been canceled by the General Land Office and the cancellation noted upon the tract books of the local land office. Instructions, 50 L. D. 364. As to notation of cancellations, see Instructions, 50 L. D. 299.

land be surveyed; and in an approximately square or rectangular tract if the land be an unsurveyed tract, the length of which shall not exceed two and one-half times its width.¹⁴

§ 8. Monument and Notice.

If the applicant shall cause to be erected upon the land for which a permit is sought a monument not less than four feet high, at some conspicuous place thereon, and he shall post a notice in writing on or near said monument, stating that an application for permit will be made within thirty days after posting said notice, the name of the applicant, the date of the notice, and such a general description of the land to be covered by such permit by reference to courses and

¹⁴ 2 Supp. U. S. Comp. St. p. 1409, § 4640 $\frac{1}{2}$ ff (§ 13). See § 11, *infra*. While it is essential to the validity of a mining location that there be a prior marking of the boundaries of the property upon the ground so that the same may be readily traced, it is not believed that Congress intended by the use of the word "locate" in the Leasing Act, to impose any such requirement upon an applicant for a permit to prospect for oil or gas. On the contrary, it would seem that the act contemplates that the right to a permit may be initiated by filing an application therefor in the land office, specifically describing them by legal subdivisions, if surveyed, and if unsurveyed, by metes and bounds. This view is strongly supported in the further provision of the act which reads: "The applicant shall, within ninety days after receiving a permit, mark each of the corners of the tract described in the permit upon the ground with substantial monuments, so that the boundaries can be readily traced on the ground, and shall post in a conspicuous place upon the lands that such permit has been granted and a description of the lands covered thereby." This makes clear that one to whom a permit has been granted must thereafter go upon the lands and establish such monuments and post such notice as will make it easily understood by others inspecting the land to what extent it is claimed by the prior applicant. Manifestly the purpose of the act is primarily requiring of an applicant for a permit that he "locates such lands in a reasonably compact form" was to provide a plan for orderly arrangement and selection and to demand of the applicant that he determine, choose or locate the lands to be prospected, with due regard to form, shape and external lines. The condition imposed relates solely to these matters and was not intended to mean that the area applied for should in the first instance be *located* in the same manner as mining claims are located under the mining laws of the United States. Van Houten & Dowd, 48 L. D. 185.

In prescribing the length and width of unsurveyed tracts which may be embraced in prospecting permits, Congress apparently intended to prevent an applicant from securing an undue advantage by locating a long and narrow tract of land across a geologic structure, and assumed that unsurveyed land was unappropriated and could be taken in the prescribed form. In construing the provisions of section 13 as to compactness of areas that may be included in a prospecting permit the Land Department has held that those provisions of the section were directory, not mandatory. For example, it has been held that incontiguous tracts within a square of six miles may be included in a permit where conditions are such that, because of prior disposals, a reasonable area of contiguous land can not be procured. Mathews, 48 L. D. 239. This case is cited in the case of Spindle Top Oil Ass'n. vs. Downing, 48 L. D. 555, and therein it is said: "The Department has held that the requirement of the statute is directory and not mandatory. (Fred Mathews, 48 L. D. 239). The rule as laid down in the regulations is that incontiguous tracts within a limited radius may be included in a permit when conditions are such that because of prior disposals a reasonable area of contiguous land can not be procured. This is a flexible rule and each case presented must be considered in the light of the particulars existing therein. Where an applicant in good faith presents an application which the Commissioner determines does not conform to the requirements of compactness, it has been the practice to allow him to make an election as to the tracts he will retain, and such right is not defeated by a subsequent section 13 application. The defect is considered to be a curable defect, and in this case it was cured within the time allowed by the Commissioner." See Dripps vs. Allison Mines Co., 45 Cal. A. 95, 187 Pac. 448. There is nothing in the Leasing Act which expressly directs or indeed suggests that the maximum area may at all times be applied for and the issuance of a permit therefor insisted upon by the applicant. On the contrary, the expressed requirement that permits for surveyed lands cover an area in a reasonably compact form suggests a limitation which must prevail as against the provision that prospecting permits shall be issued for "*not to exceed* two thousand five hundred and sixty acres." The fact that but one test well is required to prove the oil-bearing character of all the land covered by a permit, thus making it subject to lease, also presents an added reason for holding that one permit can only be issued for incontiguous tracts which are, as stated in the Regulations of March 11, 1920 (47 L. D. 437), within a "limited radius." The Land Department has held on numerous occasions that a general area equal to a township, that is, an area six miles square, represents the maximum over which prospecting can properly be carried on under one permit, pursuant to the Leasing Act. This construction of what constitutes an area in a "reasonably compact form" within the meaning of this section of the act is one of extreme liberality which the Land Department states it will not be warranted in modifying by way of enlargement except in cases involving special conditions. Curns, 50 L. D. 353.

distances from such monument and such other natural objects and permanent monuments as will reasonably identify the land, stating the amount thereof in acres, he shall during the period of thirty days following such marking and posting, be entitled to a preference right over others to a permit for the land so identified.¹⁵

¹⁵ 2 Supp. U. S. Comp. St. p. 1409, § 4640 $\frac{1}{2}$ ff (§ 13). The monument may be of iron, stone, or durable wood, not less than four inches square or in diameter, and must be firmly embedded in the ground. The notice must be so protected as to prevent its destruction by the elements. The preference right accorded by the act in the award of an oil and gas prospecting permit to one who has properly monumented and posted notice in accordance with the provisions of the act must be denied if the terms of the act with respect thereto are not strictly complied with. For example, should it be made to appear that the monument erected by one who seeks a preference right was less than four feet high, the Land Department would feel obligated to deny the claim of preference right. *Blakesley vs. McCord*, 49 L. D. 419. As between two conflicting applications for an oil and gas prospecting permit, no such preference right is acquired by the second applicant by reason of his previous location of the land and posting of notice thereon as will defeat a proper application filed prior thereto. *Van Houton vs. Dowd*, *supra*.⁽¹⁴⁾

The act does not require the posting of notice on the land preliminary to the filing of an application for an oil and gas prospecting permit, and one who posts notice and applies for a permit under section 13 of the act after filing an application by another under that section does not acquire a preference right to a permit. *Spindle Top Oil Assn. vs. Downing*, *supra*.⁽¹⁴⁾ The general Rules of Practice relating to the serving of notice are applicable to oil prospecting permit cases in which the question of preferred right is involved with respect to unperfected and patented entries containing reservation of the minerals to the United States, and the regulation which requires personal service is to be construed to include actual service by registered mail, when possible, or by publication when proper showing is made that the person to be served can not be found. *Stevens*, 48 L. D. 110. For Rules of Practice see 48 L. D. 246.

In the case of *Rousseau* (47 L. D. 590), it appears that *Rousseau's* application for a permit to prospect for oil and gas upon certain lands was not filed in the local land office until the thirty-first day after the posting of his notice upon the land included therein. The last day of the thirty-day period succeeding the date of posting fell on Sunday and this fact gave rise to the question as to whether, in such a case, the last day should be included in the period, or, on the other hand, excluded therefrom and the succeeding day be included. If such a Sunday is entitled to be excluded, the filing of *Rousseau* was in time; otherwise, it was one day out of time. It is provided in Rule 94 of Practice of the Land Department that—"In computing time for service under the rules of practice, the first day shall be excluded and the last day included: Provided, That where the last day is a Sunday, a legal holiday, or half holiday, such time shall include the next full business day." In the case of *Street vs. U. S.*, (133 U. S. 306), it is declared by the Supreme Court of the United States that Sunday is a *dies non* and that—"A power may be exercised up to and including a given day of the month may generally, when that day happens to be a Sunday, be exercised on the succeeding day." In *Monroe Cattle Co. vs. Becker*, 147 U. S. 56, it is held to be a general rule that—"When an act is to be performed within a certain number of days, and the last day falls on Sunday, the person charged with the performance of the act has the following day to comply with his obligation."

The above quoted provisions of said Rule 94 are thus in full accord with what the Supreme Court of the United States has held to be the general rule in cases where the last day of the period within which an act is to be performed falls on Sunday, and the Land Department is of opinion that the same principle should be followed with respect to all filings required by statute to be made in the Land Department within a limited period, viz, that if the last day of a statutory period within which a filing is required to be made falls on Sunday or a legal holiday, such time shall be held to include the next following business day.

Authority to consider and determine the merits and validity of applications for oil and gas prospecting permits, in the first instance, resides in the Commissioner of the General Land Office, and the fact that the local officers, whose functions in this respect are merely ministerial, received without rejection an application, together with the prescribed bond and fees, does not of itself confer upon the applicant any right to have his application allowed. *Craig*, 50 L. D. 202.

Rights to an oil and gas prospecting permit do not attach prior to the filing of an application in the form and manner prescribed by the act and the Departmental Regulations issued thereunder, and the mere posting of a notice of intention to apply for a permit is not sufficient to defeat the provisions of § 13 of the act, which limits its operation to land that is "not within any known geological structure of a producing oil or gas field." *Lee*, *supra*.⁽¹¹⁾ An application for an oil and gas prospecting permit is in effect a mere request that a license be granted and confers upon the applicant no interest in the lands or the mineral deposits therein. *Enlow vs. Shaw*, 50 L. D. 339.

In the case of *Judge* (49 L. D. 171) the Land Department laid down the general rule that until an outstanding permit is canceled by the Commissioner of the General Land Office, and the notation of the cancellation made in the local office, no other person will be permitted to gain any right to a permit for the same class of deposits on the land included therein by the filing of an application therefor or by the posting of notice of intention to apply for a permit. See, also, *New Mexico vs. Weed*, 49 L. D. 580. In *Purvis vs. Witt* (49 L. D. 260), it was held that a duly corroborated protest or contest against a permit sufficiently alleging failure to comply with the

§ 9. Additional Demarcation.

The applicant shall, within ninety days after receiving a permit, mark each of the corners of the tract described in the permit upon the ground with substantial monuments, so that the boundaries can be readily traced on the ground, and shall post in a conspicuous place upon the lands a notice that such permit has been granted and a description of the lands covered thereby.¹⁶

§ 10. Lease to Permittee.

Upon establishing to the satisfaction of the Secretary of the Interior that valuable deposits of oil or gas have been discovered within the limits of the land embraced in any permit, the permittee shall be entitled to a lease for one-fourth of the land embraced in the prospecting permit: *Provided*, That the permittee shall be granted a lease for

law in matters not shown by the records or known to the Land Department should be entertained and considered by said commissioner with a view to the ordering of a hearing for the ascertainment of the facts. There was nothing in this decision which in any way modified the rule announced in the Judge Case, or suggested that a protestant would gain a preference right to a permit in the event the protest was sustained. Section 2 of the act of May 14, 1880 (21 Stat. 140), as amended by the act of July 26, 1892 (27 Stat. 270), has no application to contests against permits under the Leasing Act, and the act itself gives no such preference right. The fact that a permit application for deposits covered by an existing permit is accompanied by a protest which ultimately results in its cancellation does not give the applicant any special or preferred status, or except from the operation of the general rule. The permit has a segregative effect, the deposits covered by it are not the subject of appropriation until it is canceled and notation thereof made in the local land office, and an application therefor filed prior to that time will not be recognized. *Stahl vs. Stiffler*, 49 L. D. 406.

A protest by an oil placer mining claimant against the allowance of a prospecting permit, containing no allegation which, if substantiated by evidence adduced at a hearing, shows that the protestant is entitled to complete his claim under the placer mining laws or to use the same as a basis for a permit or lease under any of the relief provisions of the act, is not sufficient to defeat a permit application filed under section 13 of the act. *McGee vs. Wooten*, 48 L. D. 147.

The Leasing Act does not presume to take away from the owner of a valid subsisting oil placer mining claim vested rights which he might have accruing through operation under the placer law prior to the Leasing Act. Such owner is not required to make an application to the Department of the Interior for a lease upon the premises, but has the right, if he so desires, at his own option to maintain and prosecute his claim under the placer mining law, through which it had been taken up. He may, however, give up his right to prosecute it under the placer mining law. He may, however, transfer his title in and to the property by deed to the government as a condition precedent to receiving a lease. *Robbins vs. Elk Basin Co.*, 285 Fed. 179.

¹⁶ 2 Supp. U. S. Comp. St. p. 1409, § 4640 $\frac{1}{4}$ ff (§ 13). In *Tieck vs. McNeill*, *supra*,⁽¹³⁾ it is said: "The purpose of posting and marking the corners on the land embraced in a permit is to give notice of the fact that a permit has been granted for that particular tract of land. In this case it appears that the protestant is fully aware that a permit was granted for said land and his only purpose in seeking the cancellation of the permit is to enable him to make application for a permit. To allow contests against permits for such purpose would be to invite endless litigation, which would tend to defeat the very purpose of the oil and gas leasing act, to wit: developing of the oil and gas resources of the country. The only question raised by this protest is whether an oil and gas permit is subject to contest by a third party. The only parties in the case of an oil and gas permit is the permittee and the United States and a contestant could acquire no preference right to a permit though the contest was sustained and the permit canceled. The enforcement of the stipulation in a permit rests with the Department and evidence that the permittee is not complying with the terms of his permit is welcome, but a contest by a third party is not the proper procedure and the application is, therefore, denied and the protest dismissed without right of appeal."

Where an application for a permit is filed in good faith for lands shown by the records of the local land office to be free from conflicting claims, such application constitutes a bar to the amendment of subsisting permit applications, although based upon location notices posted upon the land, if there were no apparent error in those applications when filed. A location notice, posted as prescribed by the act, has a segregative effect for a period of thirty days only, and when an application for a permit is filed the application becomes the notice to all applicants that the land described therein is adversely claimed and can not be amended after the expiration of the thirty-day period to conform to the description posted, in the presence of a *bona fide* intervening claim. Neither the act nor the Departmental regulations issued pursuant thereto make distinction between surveyed and unsurveyed lands as to preference rights initiated under the provisions of the act by the posting of location notices, except that greater particularity is required in the descriptions of lands of the latter class. *Wagner vs. Coffin*, 49 L. D. 655. See *Eaton vs. Butts*, *supra*.⁽¹²⁾

as much as one hundred and sixty acres of said lands, if there be that number of acres within the permit.¹⁷

§ 11. Survey of Land.

The area to be selected by the permittee, shall be in compact form and, if surveyed, to be described by the legal subdivisions of the public land surveys; if unsurveyed, to be surveyed by the government at the expense of the applicant for lease in accordance with the rules and regulations to be prescribed by the Secretary of the Interior and the lands leased shall be conformed to and taken in accordance with the legal subdivisions of such surveys; deposits made to cover expense of surveys shall be deemed appropriated for that purpose, and any excess deposits may be repaid to the person or persons making such deposit or their legal representatives.¹⁸

§ 12. Term of Lease, Royalty and Rent.

Such leases shall be for a term of twenty years upon a royalty of five per centum in amount or value of the production and the annual payment in advance of a rental of one dollar per acre, the rental paid for any one year to be credited against the royalties as they accrue for that year, with the right of renewal as prescribed in section 17 of the act.¹⁹

§ 13. Lease for Remainder of Land.

The permittee shall also be entitled to a preference right to a lease for the remainder of the land in his prospecting permit at a royalty

¹⁷ 2 Supp. U. S. Comp. St. p. 1410, § 4640½g (§ 14).

¹⁸ Id. See note 14, *supra*.

¹⁹ Id. The date of the filing of the application, not the date of the granting of the lease, determines the time from which the annual rental begins to accrue, where an oil and gas lease is granted pursuant to the act, to an applicant who, from and after the filing of the application therefor, has had uninterrupted possession and use of the premises. Big-4 Oil Co., 49 L. D. 482. If a permittee assign to one person his permit rights with respect to a fractional part of the area included in his permit, and intended to represent five per cent land, and assign to another person the remainder of the permitted tract, it will be necessary, upon the discovery of oil or gas upon the permitted tract, for each of the assignees seeking a lease to covenant separately and individually with the government for drilling upon the area included in his assignment, as leases which might be issued to such assignees would represent separate and distinct undertakings. Where the permit rights are assigned to specific tracts covered by a permit to several individuals, each person acquiring a separate tract, it must necessarily follow that upon discovery and the issuance of leases a separate lease will issue to each individual and each individual will be obligated to the government as to that particular tract, hence it follows that each individual in complying with the terms of the lease must proceed to the drilling operations covered by his lease. There are no particular circumstances that can be advanced to justify the waiving of the obligation to proceed to drilling in such instances, but where the enforcement of this rule would appear to be inequitable upon a showing to this effect the government will give each particular case its individual attention, and, if the particular facts justify suspension of the requirement, such action will be taken.

Where the permittee, upon the discovery of oil or gas, takes in his own name one lease for a part of the area under a five per cent royalty and another lease of the remainder of the area on a sliding scale royalty, these leases are designated by the Land Department as A and B, respectively, and so long as they remain in the name of the original permittee they may for certain purposes be regarded as one obligation, but it is obvious that the law does not intend that the lessee may, nor will the Land Department permit him to, confine his drilling to the land upon which he is paying five per cent royalty, and defer drilling upon the remainder of the land with respect to which, under the law and regulations, he is required to pay the higher royalty. In such cases the lessee will also be required to comply with the drilling regulations as to both tracts as provided in paragraph (b), section 2, of the lease, viz: to not only drill wells to offset wells on adjoining privately owned lands, but to also promptly drill wells on the said higher royalty lands to offset wells drilled by him on his five per cent area. The practice of the Land Department, in regarding such leases as a single undertaking for certain purposes is merely for the convenience of the lessee and the Land Department and is not designed to relieve the lessee of the necessity of complying with his obligations as to drilling with respect to either the five per cent or the higher royalty portion of the area. Armstrong, 49 L. D. 445.

of not less than $12\frac{1}{2}$ per centum in amount or value of the production, and under such other conditions as are fixed for oil or gas leases in this act, the royalty to be determined by competitive bidding or fixed by such other method as the Secretary may by regulations prescribe: *Provided*, that the Secretary shall have the right to reject any and all bids.²⁰

§ 14. Payments Prior to Lease.

Until the permittee shall apply for lease to the one-quarter of the permit area provided for in the act he shall pay to the United States twenty per centum of the gross value of all oil or gas secured by him from the lands embraced within his permit and sold or otherwise disposed of or held by him for sale or other disposition.²¹

§ 15. Conditions of Permit or Lease.

All permits and leases containing oil or gas, made or issued under the provisions of the act, shall be subject to the condition that no wells shall be drilled within two hundred feet of any of the outer boundaries of the lands so permitted or leased, unless the adjoining lands have been patented or the title thereto otherwise vested in private owners, and to the further condition that the permittee or lessee will, in conducting his explorations and mining operations, use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by him to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits. Violations of the provisions of this section (16 of the act) shall constitute grounds for the forfeiture of the permit or lease, to be enforced through appropriate proceedings in courts of competent jurisdiction.²²

§ 16. Competitive Bidding.

All unappropriated deposits of oil or gas situated within the known geological structure of a producing oil or gas field and the unentered lands containing the same, not subject to preferential lease, may be leased by the Secretary of the Interior to the highest responsible bidder by competitive bidding under general regulations to qualified applicants in areas not exceeding six hundred and forty acres and in tracts which shall not exceed in length two and one-half times their width, such leases to be conditioned upon the payment by the lessee of such bonus as may be accepted and of such royalty as may be fixed in the lease, which shall not be less than $12\frac{1}{2}$ per centum in amount or value of the production, and the payment in advance of a rental of not less than one dollar per acre per annum thereafter during the continuance of the lease, the rental paid for any one year to be credited against the royalties as they accrue for that year.²³

§ 17. Period of Lease.

Leases shall be for a period of twenty years, with the preferential right in the lessee to renew the same for successive periods of ten

²⁰ 2 Supp. U. S. Comp. St. p. 1410, § 4640 $\frac{1}{4}$ g (§ 14).

²¹ 2 Supp. U. S. Comp. St. p. 1410, § 4640 $\frac{1}{4}$ gg (§ 15).

²² 2 U. S. Comp. St. p. 1411, § 4640 $\frac{1}{4}$ h (§ 16).

²³ 2 U. S. Comp. St. p. 1411, § 4640 $\frac{1}{4}$ hh (§ 17).

years upon such reasonable terms and conditions as may be prescribed by the Secretary of the Interior, unless otherwise provided by law at the time of the expiration of such periods.²⁴

§ 18. Reduction of Royalty.

Whenever the average daily production of any oil well shall not exceed ten barrels per day, the Secretary of the Interior is authorized to reduce the royalty on future production when in his judgment the wells can not be successfully operated upon the royalty fixed in the lease. The provisions of section seventeen of the act shall apply to all oil and gas leases made under the provisions of said act.²⁵

§ 19. Relinquishment of Placer Claims.

Under the provisions of the act claimants of oil or gas locations, under the preexisting placer mining law, and which locations were within certain withdrawn areas, could relinquish their right thereto and obtain a lease thereof. Such a lease was conditioned upon the payment of royalty to the United States of an amount equal to the value of one-eighth of all oil or gas with certain prescribed exceptions, produced from the relinquished area, and the fulfillment of other requirements enumerated within section eighteen of the act.²⁶

§ 20. Inuring Clause.

All leases under the act shall inure to the benefit of the claimant and all persons claiming through or under him by lease, contract, or otherwise, as their interests may appear, subject, however, to the same limitation as to area and acreage as is provided in section 18 of the act. No lease nor leases under said section shall be granted, nor shall any interest therein, inure to any person, association, or corporation for a greater aggregate area or acreage than the maximum in said section provided for.²⁷

²⁴ 2 U. S. Comp. St. p. 1411, § 4640 $\frac{1}{2}$ hh (§ 17).

²⁵ Id.

²⁶ 2 Supp. U. S. Comp. St. p. 1411, § 4640 $\frac{1}{2}$ i (§ 18). For determination of the validity of gas claims under preexisting law to land embraced in the Executive order of withdrawal issued September 27, 1909, (§ 18a), see 2 Supp. U. S. Comp. St. p. 1413, § 4640 $\frac{1}{2}$ ii. This provision was extended to Utah by act of September 15, 1922. 42 Stat. 844. Estate of Ladd (on rehearing), 48 L. D. 313. This section of the act also provides for the settlement of all suits brought by the government affecting such lands and the release of impounded royalties. In the Ladd Case it was said: "This provision indicates unmistakably that the granting of a lease under section 18 was intended by the act to be made a matter wholly independent of any contract that might have been entered into by the lease applicant or his predecessor or predecessors in interest with respect to the land, under the provisions of the act of August 25, 1914. It does, however, contemplate that controversies giving rise to such contracts, shall, as well as suits, be settled in harmony with the provisions of section 18 of the Leasing Act and that moneys impounded pursuant to such contracts shall be paid in accordance with settlements and adjustments so made."

²⁷ 2 Supp. U. S. Comp. St. p. 1413, § 4640 $\frac{1}{2}$ i (§ 18). The issuance of an oil and gas lease by the Department of the Interior to the owner of placer mining claims on the application of such owner and the holders of a lease from him is not an adjudication of the rights of such lessee as against earlier lessees especially in view of the "inuring" clause of the Leasing Act. *Burke vs. Horth*, 296 Fed. 256. See, also, note 92, *infra*.

It clearly appears from this section and from the following section 19 that the "claimant" is the person who located the land under the mining laws or who claims under the locator or locators through a deed or equivalent instrument. That lessees of such person or persons claiming under them through drilling contracts or other arrangements are not regarded as persons eligible to a lease from the United States. The purpose of section 18 of the act obviously is to permit the Land Department to deal with the holder or holders of the record mining title. He or they must surrender and convey that title to the United States. Those who claim through or under him are not recognized as persons entitled to a lease, but their interest is protected by the inuring clause so that if lease issue to him, their interests may be determined by agreement or litigation in the proper form and protected. *Burke vs. Taylor* (on rehearing), 47 L. D. 586.

§ 21. Placer Claims Lacking Discovery.

Any person who on October 1, 1919, was a *bona fide* occupant or claimant of oil or gas lands under a claim initiated while such lands were not withdrawn from oil or gas location and entry, and who had previously performed all acts under then existing laws necessary to valid locations thereof except to make discovery, and upon which discovery had not been made prior to the passage of the act, and who had performed work or expended on or for the benefit of such locations an amount equal in the aggregate of two hundred and fifty dollars for each location if application therefor shall be made within six months from the passage of the act shall be entitled to prospecting permits thereon upon the same terms and conditions, and limitations as to acreage, as other permits provided for in this act.²⁸

²⁸ 2 Supp. U. S. Comp. St. p. 1413, § 4640 $\frac{1}{2}$ j (§ 19). See Cotner vs. Isgrig, 49 L. D. 224. The right conferred by this section is in the nature of a preference right or privilege which may be exercised or waived, at the option of the occupant or claimant, and is of necessity waived if not asserted within the time and in the manner prescribed by the law and the applicable regulations. When so waived, the land becomes subject to disposition to the public generally or to any other claimant recognized by the law as entitled to priority. Murane, 48 L. D. 526. The claim of an applicant for a lease under the relief provisions of this section (19 of the act), who asserts in support thereof an inchoate right under the placer mining laws, but who, during a period of several years prior to October 1, 1919, never made a discovery of oil or gas, stood idly by and without protest permitted others to acquire apparent title, and deal with as their own, and as though he had no right, must be treated as an abandoned claim, not entitled to equitable consideration under said section. Bradley, 49 L. D. 235, citing Galliher vs. Caldwell, 145 U. S. 368; Moran vs. Horsky, 178 U. S. 205; Burke vs. Taylor, 47 L. D. 585. An applicant for an oil and gas prospecting permit under section 19, who is unable to show sufficient fulfillment of the expenditure requirement of that section necessary to entitle him to a permit thereunder, can not be allowed to amend his application and take a permit under section 13 of the act in the presence of an adverse claim existing by reason of the pendency of an application previously filed by another under the latter section. Keenan, 48 L. D. 218.

In the case of Sullivan vs. Tendolle (48 L. D. 337), it is said: "Section 19 of the Leasing Act under which the application was filed provides, among other things, that the claim upon which the application is predicated must have been initiated while the land was not withdrawn from oil and gas location and that the claimant must have previously performed all acts under then existing laws necessary to a valid location except to make discovery. At the time the asserted location of the Tip No. 7 claim is alleged to have been made, the land in question was included in the *prima facie* valid homestead entry of Tendolle; and said entry has ever since remained intact, and down to November 22, 1920, long after the date of the initiation of the claim under the mining laws to the land, and nine months after the passage of the Leasing Act, the entry was unrestricted. The general rule announced by the Supreme Court of the United States is that a *prima facie* valid entry of public land under the laws of the United States segregates the land from the public domain, appropriates it to private use, and withdraws it from subsequent entry or acquisition until such entry has been canceled of record. See Neff vs. U. S. (165 Fed. 273, 281), and cases there cited. While the cases cited involve conflicts between subsisting agricultural entries and junior nonmineral claims, the Supreme Court, in Bunker Hill and Sullivan Mining Company vs. U. S. (226 U. S. 548), declared that the same principle would apply in case of a conflict between an uncanceled homestead entry and an attempted junior mining location. In that case it was urged that certain land covered by the homestead entry of one Messinger, from which timber had been cut by the entryman and sold to the plaintiff in error, was not suited for agricultural purposes and could not be entered under the homestead law; that being mineral land in fact and open to mining location, it was subject to the provisions of the act of June 3, 1878 (20 Stat. 88), which authorizes any citizen of the United States to enter upon public lands open to mineral entry in order to cut timber therefrom; that the homestead entry was void, and that any citizen, the entryman included, could treat the land as public land of the United States and cut the timber thereon. Answering that contention, the court said: 'The statute on which the mining company relies, applies only to public lands, while this was no longer public in the full sense, although the title remained in the government which could have canceled Messinger's entry on proof that it was valuable for mineral purposes. Deffebach vs. Hawke (115 U. S. 302). But until some such action by the United States, Messinger's entry segregated the land from the public domain and made it so far private as to withdraw it from the operation of the law permitting other citizens to locate mines or cut timber on public mineral lands. Hastings & D. R. Co. vs. Whitney (132 U. S. 537); Shiver vs. U. S. (159 U. S. 491, 495). Until his claim was canceled Messinger was entitled to exclude others from the quarter-section. And as they would have been estopped, as against him, from denying that he was lawfully in possession of it as a homestead, so was he estopped from denying that it was a homestead when sued for cutting timber in violation of the law applicable thereto.' To the same effect also is the decision in McLemore vs. Express Oil Co. (158 Cal. 559, 112 Pac. 59). From said decisions it is clear that the land here in question being then covered by the homestead entry was not subject to location at the time the asserted claim relied upon by Sullivan et al. was initiated and neither then nor

§ 22. Effect of Prior Discovery.

Where any such person has heretofore made such discovery, he shall be entitled to a lease thereon under such terms as the Secretary of the Interior may prescribe unless otherwise prescribed for in section 18 of the act: provided, that where such prospecting permit is granted upon land within any known geological structure of a producing oil or gas field, the royalty to be fixed in any lease thereafter granted thereon or any portion thereof shall be not less than 12½ per centum of all the oil or gas produced except oil or gas used for production purposes on the claim, or unavoidably lost.²⁹

§ 23. Lands Reserved for Use of Navy.

The provisions of this section (19 of the act) shall not apply to lands reserved for the use of the Navy.³⁰

§ 24. Fraud.

No claimant of a permit or lease who has been guilty of any fraud or who had knowledge or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section of the act.³¹

§ 25. Legal Representatives.

All permits or leases hereunder shall inure to the benefit of the claimant and all persons claiming through or under him by lease, contract, or otherwise, as their interests may appear.³²

§ 26. Preference Rights to Surface Holder.

In the case of lands *bona fide* entered as agricultural, and not withdrawn or classified as mineral at the time of entry, but not including lands claimed under any railroad grant, the entryman or patentee, or assigns, where assignment was made prior to January 1, 1918, if the entry has been patented with the mineral right reserved, shall be entitled to a preference right to a permit and to a lease as in the act provided, in case of discovery; and within an area not greater than a township, such entryman and patentees, or assigns holding restricted patents may combine their holdings, not to exceed two thousand five hundred and sixty acres for the purpose of making joint application. Leases executed under this section (20 of the act) and embracing only

since has the tract been opened to the inception or completion of location rights pursuant to the mining law. Therefore, such attempted location, as to said tract, affords no basis for a permit under section 19 of the Leasing Act because lacking the element of basic validity in addition to that of discovery, and constitutes no bar to the subsequent permit application of Tendolle." But the location of a mining claim, although coupled with mere possession and occupancy if unaccompanied by diligent prosecution of work leading to the discovery of mineral, are, in the absence of discovery, insufficient grounds for a lawful exclusion from the land of others who seek to make mineral discovery and development thereon. *Clark & Ohio Oil Co.*, 48 L. D. 630. See note 91, *infra*.

²⁹ 2 Supp. U. S. Comp. St. p. 1414, § 4640½j (§ 19). An application for a prospecting permit under section 13 once denied in connection with favorable action upon conflicting applications under section 19 will not be reinstated to the prejudice of the competing applicants, if the defeated applicant did not first seek his remedy under the original application by appeal or otherwise. *Haupt*, 48 L. D. 355.

³⁰ 2 Supp. U. S. Comp. St. p. 1414, § 4640½j.

³¹ *Id.* See *Love vs. Flahive*, 205 U. S. 195; *Jones vs. Hoover*, 144 Fed. 221.

³² 2 Supp. U. S. Comp. St. p. 1414, § 4640½j. See § 20, *supra*. The rights of an oil and gas prospecting permit under section 13 of the act, pass, on the death of the applicant, to the personal representatives in the same manner as does other personal property. *Haynes vs. Smith* (on petition), 50 L. D. 208.

lands so entered shall provide for the payment of a royalty of 12½ per centum as to such areas within the permit as may not be included within the discovery lease to which the permittee is entitled under section 14 of the act.³³

³³ 2 Supp. U. S. Comp. St. p. 1414, § 4640½jj (§ 20). The provisions of this section have no application to entries allowed at any time under the Stock-Raising Homestead Law. Johnson, 48 L. D. 353. An entryman whose entry has been allowed under the Enlarged Homestead Act, upon an application accompanied by the required showing and payment, filed previously to the inclusion by Executive order of the land within a petroleum reserve, is entitled to the exercise of the preference right privilege to an oil and gas prospecting permit accorded by said section 20, notwithstanding that the withdrawal was made prior to the allowance of the entry, and that the entry was allowed subject to the reservations of the act of July 17, 1914 (38 Stat. 509). Johnson, *supra*. See, also, Fletcher, 49 L. D. 204. The privilege of being preferred in the award of an oil and gas prospecting permit accorded by section 20 in favor of an entryman of lands *bona fide* entered as agricultural, and not being withdrawn or classified as mineral at the time of the entry, does not inure to the benefit of one who had only a settlement claim for surveyed public land at the date of the withdrawal. Fletcher (on petition), *supra*. The preference right granted by said section to one who had *bona fide* made an agricultural entry of lands not withdrawn or classified as mineral, to prospect for oil and gas attaches upon the filing of a completed application for a permit, accompanied by the required fees, and such right is not thereafter forfeited by the subsequent relinquishment of the basic entry prior to the actual issuance of the permit. The rule that an application to enter public land subject to entry, when accompanied by the requisite showing and fees, is equivalent to entry, applies with equal force to proper applications filed by qualified persons for permits to prospect for oil and gas on lands subject to exploration under said section. Heryford vs. Brown, 49 L. D. 248, citing and applying Conrad, 39 L. D. 432; Rippy vs. Snowden, 47 L. D. 321; Johnson, *supra*. See, also, Arouni vs. Vance, 48 L. D. 543.

When an entryman had not completed his final proof when the land was classified as valuable for oil, he is not therefore entitled to an unrestricted patent. However, he will be entitled, upon filing his consent to the reservation of the oil and gas to the government, to a preference right to a prospecting permit under section 20 of the act. It is settled law that land covered by an agricultural entry without a reservation of the oil and gas to the government can not be included in a prospecting permit, even to the entryman himself, so long as the entry subsists without such reservation. Since the entryman's consent to a mineral reservation must be given before he can exercise his preference right to a permit his qualifications must be determined as of the date that he files such consent. La Flame, 49 L. D. 324.

A vested equitable right to a patent for both the surface and mineral deposits in public land is not acquired until an entryman has done everything required by law toward earning title. Such a vested equitable title is necessary to deprive the Government of its right to classify entered lands as prospectively mineral. Payment of fees and commissions is a necessary act toward earning title. Martin, 49 L. D. 608; Terrell, 49 L. D. 671.

The preferment in the award of an oil and gas prospecting permit accorded to a homestead entryman by section 20 of the act, over a prior applicant for a permit under section 13 of that act, is not affected by a pending contest against the entry where there is no charge that the entry was made with a view to acquiring the mineral deposits nor in bad faith for any purpose. Miller vs. Little, 50 L. D. 134.

A settlement claim under the homestead laws prior to the inclusion of the land within a petroleum withdrawal, which did not ripen into an entry until after the creation of the withdrawal, affords the entryman no basis for a preference right to an oil and gas prospecting permit under section 20 of the act. Haynes vs. Smith (on petition), *supra*.⁽³²⁾

Where a homestead entry, patented with reservation of the oil and gas by the United States, has been sold or transferred subsequent to January 1, 1918, the transferee does not acquire a preference right under section 20 of the act, to prospect for oil or gas upon the patented land, but having become the sole owner of the land, subject to the reservation contained in the patent, he may, in the absence of other sufficient objection, be granted a prospecting permit under section 13 of the Leasing Act. Watson, 48 L. D. 214.

In Otrin vs. Hawkins (48 L. D. 622), it was said: "The Department is unable to concede the correctness of the contention of Hawkins that the permit application of Otrin was erroneously received because at the date of its presentation the land was covered by the unrestricted homestead application of Andrews, for by section 12 (c) of the regulations of March 11, 1920, reprint as amended to October 29, 1920 (47 L. D. 437, 444, 445), issued under the Leasing Act, the right of a person to file a prospecting permit application for a tract covered by the unrestricted homestead entry of another is expressly recognized, subject, however, to a future amendment of the entry to be obtained in the manner provided for in said section, and to the exercise by the entryman of a preference right, if any, to a permit under the provisions of section 20 of the act. It is clear, therefore, that immediately upon the cancellation, by voluntary relinquishment or otherwise, of such an entry pending a permit application for the land adverse to the entryman, the rights of the permit applicant, all else being regular, would be superior and paramount to those of a junior homestead applicant for the same tract. On the other hand, neither a permit application nor a permit granted thereon, would of necessity preclude the allowance of a homestead entry upon the land, for by section 20 of the Leasing Act it is expressly provided that the Secretary of the Interior, in making a lease (with a view to which a permit application is filed) under said act, may in his discretion reserve to the United States the right to sell or otherwise dispose of the surface of the lands embraced within such lease under existing laws, in so far as the surface

§ 27. Terms and Conditions.

Leases executed under this section (20 of the act) and embracing only lands so entered shall provide for the payment of a royalty of not less than $12\frac{1}{2}$ per centum as to such areas within the permit as may not be included within the discovery lease to which the permittee is entitled to under section 14 of the act.³⁴

§ 28. Oil Shale.

The Secretary of the Interior is authorized to lease to any person or corporation qualified under the act any deposit of shale belonging to the United States and the surface of so much of the public lands containing such deposits, or land adjacent thereto, as may be required for the extraction and reduction of the leased minerals, under such

is not necessary for use of the lessee in extracting and removing deposits thereon. And by departmental instructions of October 6, 1920 (47 L. D. 474), it is directed that application to make nonmineral entry of lands outside of areas which have been designated as within the geological structures of producing oil and gas fields shall be received by local officers, and if in any case nonmineral entry shall be allowed on instructions from the commissioner, the same will be with a reservation of the oil or gas to the United States and subject to the rights of the permittee or lessee, as the case may be, to use so much of the surface of the land as is necessary in extracting and removing the mineral deposits without compensation to the nonmineral entryman for such use. But while the right of a nonmineral claimant to make entry of land covered by the prior prospecting permit application of another is thus clearly recognized both by the provisions of the Leasing Act and the regulations thereunder, such an entry could not affect the unrestricted and unhampered use of the land for prospecting and developing purposes under a permit or lease."

Where a claimant who is asserting rights under the placer mining laws to withdrawn oil- and gas-bearing lands, files concurrently an application for a preferential lease, together with a quitclaim deed, pursuant to the provisions of section 18 (2 Supp. U. S. Comp. St. p. 1411, § 4640*ji*), and a request for a patent, it will be held that the claimant elected to accept the benefits conferred by the Leasing Act. Honolulu Con. Oil Co., 48 L. D. 303. A settlement claim made under the homestead laws prior to the inclusion of the land within a petroleum withdrawal, which did not ripen into an entry until after the creation of the withdrawal, affords the entryman no basis for a preference right to an oil and gas prospecting permit under § 20 of the act. Haynes vs. Smith, *supra*.³⁵ The act does not contemplate that an agricultural entry made after its approval shall constitute the basis of a preference right to a prospecting permit under § 20 thereof. Haupt, (47 L. D. 588). In this case, with a full knowledge of the policy of Congress as disclosed by the act, the claimant is shown to have gone upon the land March 2, 1920, and posted a notice of his intention to apply for a prospecting permit under § 13 of the act, and on March 5 to have made simultaneous filings in the local land office of an application for such permit and an application for homestead entry of the same lands, alleging in the homestead application that the land is essentially nonmineral, but evidently having in mind the assertion of a preference right to a permit under § 20 of the act, if for any reason his claim to a preference right under § 13 should be rejected. The claim for preference right, under § 20, was rejected, the entry not having been made prior to the date of the act. In Miller vs. Little, *supra*, it is said: "There is no express provision in section 20 of the Leasing Act, which requires that an entry be *maintained* according to the law under which it was made as a condition precedent to a preference right, the only requirement being that the entry be *made* in good faith. The entry was uncanceled when the waiver (to reserve the oil and gas deposits to the United States pursuant to the act of July 17, 1914) was filed and the land thereupon became subject to disposal under section 20 of the Leasing Act."

Where an indemnity school selection was made for lands not withdrawn nor classified as mineral when selected, but which were afterwards approved with a reservation of the oil deposits to the United States, a transferee is entitled to preference right under section 20 of the act, if the state had completed the selection and made the transfer prior to January 1, 1918, notwithstanding that the approval was subsequent to that date. Miller and Lux vs. How, 49 L. D. 177. See, also, Wyoming vs. Fry and Doyle, 49 L. D. 564. An applicant for a prospecting permit under § 13 of the Leasing Act is not required to serve notice on the owner of lands patented to a railroad company with reservation of the oil and gas under the act of July 17, 1914, inasmuch as claimants of railroad grant lands are excepted by § 20 of the former act from the preference right to permits thereunder. Staunton & Lee Simonsen, 48 L. D. 175.

One who makes a surface entry under the act of July 17, 1914, for lands embraced at time of entry within a petroleum withdrawal is not entitled to a preference right to an oil and gas prospecting permit under this section.

Where under the laws of the state a mortgage merely is a lien upon the property mortgaged, a mortgagee who purchases at foreclosure sale a homestead covered by his mortgage is not, prior to such purchase, entitled to claim as an assignee within the purview of said section. Schneider vs. Forster, 49 L. D. 610.

³⁴ 2 Supp. U. S. Comp. St. p. 1414, § 4640*jj* (§ 20).

rules and regulations, not inconsistent with the act, as he may prescribe.³⁵

§ 29. Extent of Area.

No lease for oil shale lands shall exceed five thousand one hundred and twenty acres of land, to be described by the legal subdivisions of the public land surveys, or if unsurveyed by the United States, to be surveyed by the United States, at the expense of the applicant, in accordance with regulations to be prescribed by the Secretary of the Interior.³⁶

§ 30. Term of Lease.

Leases for oil shale lands may be for indeterminate periods, upon such conditions as may be imposed by the Secretary of the Interior including covenants relative to the methods of mining, prevention of waste, and productive development.³⁷

§ 31. Royalty.

For the privilege of mining, extracting, and disposing of the oil or other minerals covered by a lease under this section (21 of the act) the lessee shall pay to the United States such royalties as shall be specified in the lease and an annual rental payable at the beginning of each year, at the rate of fifty cents per acre per annum, for the lands included in the lease, the rental paid for any one year to be credited against the royalties accruing for that year: such royalties to be subject to readjustment at the end of each twenty-year period by said Secretary.³⁸

§ 32. Waiver of Royalties and Rental.

For the purpose of encouraging the production of petroleum products from shales the Secretary may, in his discretion, waive the payment of any royalty and rental during the first five years of any lease.³⁹

§ 33. Preference Right in Oil Shale Lands.

Any person having a valid claim to such minerals under existing laws on January 1, 1919, shall, upon the relinquishment of such claim, be entitled to a lease under the provisions of this section (21 of the act) for such area of the land relinquished as shall not exceed the maximum area authorized by said section to be leased to an individual or corporation.⁴⁰

³⁵ 2 Supp. U. S. Comp. St. p. 1414, § 4640½k (§ 21). See § 79, *infra*. Oil shale having been recognized by the Land Department and by Congress as a mineral deposit and a source of petroleum, and having been demonstrated elsewhere to be a material of economic importance, lands valuable on account thereof must be held to have been subject to valid location and appropriation under the placer mining laws, to the same extent and subject to the same provisions and conditions as if valuable on account of oil or gas. Entries and applications for patent for oil shale placer claims will, therefore, be adjudicated within the said department in accordance with the same legal provisions and with reference to the same requirements and limitations as are applicable to oil and gas placers. Instructions, 47 L. D. 548; Utah vs. Watson Oil Co., 50 L. D. 323.

³⁶ Id.

³⁷ Id. See section 35, *infra*.

³⁸ Id.

³⁹ Id.

⁴⁰ Id. See Utah vs. Watson, *supra*.⁽³⁵⁾

§ 34. Fraud.

No claimant for a lease who has been guilty of any fraud or who had knowledge or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith shall be entitled to any of the benefits of said section.⁴¹

§ 35. Limitations.

Not more than one lease shall be granted under said section to any one person, association or corporation.⁴²

§ 36. Limitation on Number of Leases to One Person.

No person, association, or corporation, except as provided in the act, shall take or hold at one time, more than three oil or gas leases, granted thereunder in any one state, and not more than one lease within the geological structure of the same producing oil or gas field.⁴³

§ 37. Corporations.

No corporation shall hold any interest as a stockholder of another corporation in more than such number of leases; and no person or corporation shall take or hold any interest or interests as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease under the provisions of the act, which, together with the area embraced in any direct holding of a lease under this act, or which, together with any other interest or interests, as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease under the provisions of the act, for any kind of mineral leased under the provisions of the act, exceeds in the aggregate an amount equivalent to the maximum number of acres of the respective kinds of mineral allowed to any one lessee under this act.⁴⁴

§ 38. Forfeiture.

Any interests held in violation of the act shall be forfeited to the United States by appropriate proceedings instituted by the attorney general for that purpose in the United States district court for the district within which the property, or some part thereof, is located.⁴⁵

§ 39. Exceptions.

Any ownership or interest forbidden in the act which may be acquired by descent, will, judgment, or decree may be held for two years and not longer after its acquisition.⁴⁶

⁴¹ 2 Supp. U. S. Comp. St. p. 1414, § 4640¹_k (§ 21). See note 31, *supra*.

⁴² *Id.* See § 36, *infra*. The limitation contained in section 21 of the act relating to the deposits of oil shale belonging to the United States prevents a lessee thereunder from taking and holding directly more than one lease, irrespective of whether the leased area is one state or another. The limitations contained in section 27 of said act in respect to any kind of mineral leased under that act, are applicable to an oil shale lease, and consequently no person or corporation can take and hold, either directly or indirectly, any interest or interests in oil shale deposits in an area or areas exceeding in the aggregate the equivalent of five thousand one hundred and twenty acres. Limitations Respecting the Leasing of Oil Shale Deposits. 48 L. D. 635. For regulations concerning oil shale leases, see 47 L. D. 424.

⁴³ 2 Supp. U. S. St. p. 1417, § 4640¹_n (§ 27). See *supra*, § 35.

⁴⁴ *Id.*

⁴⁵ *Id.* See § 46, *infra*.

⁴⁶ *Id.*

§ 40. Lawful Combinations.

Nothing contained in the act shall be construed to limit sections 18,⁴⁷ 18a,⁴⁸ 19,⁴⁹ and 22⁵⁰ of the act or to prevent any number of lessees under the provisions of the act from combining their several interests so far as may be necessary for the purposes of constructing and carrying on the business of a refinery, or of establishing and constructing as a common carrier a pipe line, or lines of railroads to be operated and used by them jointly in the transportation of oil from their several wells, or from the wells of other lessees under the act.⁵¹

§ 41. Approval of Combination.

Any combination for such purpose or purposes shall be subject to the approval of the Secretary of the Interior on application to him for permission to form the same.⁵²

§ 42. Unlawful Combinations.

If any of the lands or deposits leased under the provisions of the act shall be subleased, trustee, possessed, or controlled by any device permanently, temporarily, directly, indirectly, tacitly, or in any manner whatsoever, so that they form a part of, or in any wise controlled by any combination in the form of an unlawful trust, with consent of lessee, or form the subject of any contract or conspiracy in restraint of trade in the mining or selling of oil, oil shale or gas entered into by the lessee, or any agreement or understanding, written, verbal or otherwise to which such lessee shall be a party, of which his or its output is to be or become the subject to control the price or prices thereof or of any holding of such lands by any individual, partnership, association, corporation or control in excess of the amounts of lands provided in the act, the lease shall be forfeited by appropriate court proceedings.⁵³

§ 43. Rights of Way for Pipe Lines.

Rights of way through the public lands, including the forest reserves, of the United States are granted by the act for pipe line purposes for the transportation of oil or natural gas to any applicant possessing the qualifications provided in section 1 of the act⁵⁴ to the extent of the ground occupied by said pipe line and twenty-five feet on each side of the same under such regulations as to survey, location, application, and use as may be prescribed by the Secretary of the Interior and upon the express condition that such pipe lines shall be constructed, operated, and maintained as common carriers.⁵⁵

§ 44. Reservations and Conditions.

The act provides that the government shall in express terms reserve and shall provide in every lease of oil lands under the act that the

⁴⁷ 2 Supp. U. S. Comp. St. p. 1411, § 4640¹*i*.

⁴⁸ 2 Supp. U. S. Comp. St. p. 1413, § 4640¹*ii*.

⁴⁹ *Id.*

⁵⁰ 2 Supp. U. S. Comp. St. p. 1415, § 4640¹*kk*.

⁵¹ 2 Supp. U. S. Comp. St. p. 1417, § 4640¹*n* (§ 27).

⁵² *Id.*

⁵³ *Id.*

⁵⁴ 2 Supp. U. S. Comp. St. p. 1418, § 4640¹*nn* (§ 28).

⁵⁵ *Id.*

lessee, assignee, or beneficiary, if owner, or operator or owner of a controlling interest in any pipe line or of any company operating the same which may be operated accessible to the oil derived from lands under such lease, shall at reasonable rates and without discrimination accept and convey the oil of the government or of any citizen or company not the owner of any pipe line, operating a lease or purchasing gas or oil under the provisions of the act.⁵⁶

§ 45. Limitation of Grant of Right of Way.

No right of way shall hereafter be granted over said lands for the transportation of oil or natural gas except under and subject to the provisions, limitations, and conditions of section 28 of the act.⁵⁷

§ 46. Forfeiture of Pipe Line Rights.

Failure to comply with the provisions of section 28 of the act or the regulations prescribed by the Secretary of the Interior shall be ground for forfeiture of the grant by the United States district court for the district in which the property, or some part thereof, is located in an appropriate proceeding.⁵⁸

§ 47. Reservation of Easements.

Any permit, lease, occupation, or use permitted under the act shall reserve to the Secretary of the Interior the right to permit upon such terms as he may determine to be just, for joint or several use, such easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied or used as may be necessary or appropriate to the working of the same, or of other lands containing the deposits described in the act, and the treatment and shipment of the products thereof by or under authority of the government, its lessees, or permittees, and for other public purposes.⁵⁹

§ 48. Disposal of Surface Land.

The Secretary of the Interior, in his discretion, in making any lease under the act, may reserve to the United States the right to lease, sell, or otherwise dispose of the surface of the lands embraced in such lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for the use of the lessee in extracting and removing the deposits therein.⁶⁰

⁵⁶ 2 Supp. U. S. Comp. St. p. 1418, § 4640¹_{nn} (§ 28).

⁵⁷ Id.

⁵⁸ Id. See § 38, *supra*.

⁵⁹ 2 Supp. U. S. Comp. St. p. 1418, § 4640¹_o (§ 29).

⁶⁰ Id. In the case of Brennan, *supra*,⁽¹⁾ the Land Department held that lands embraced in a prospecting permit must be treated as valuable for oil and gas, although not within a designated oil or gas field; and applications to make homestead entries filed subsequent to the permit application must be made with a reservation of the oil and gas deposits under the act of July 17, 1914 (38 Stat. 509), and subject to the permittee's full right to develop the land without hindrance or liability to the entryman. Such also is the provision made in departmental instructions of October 6, 1920 (47 L. D. 474). This requirement is in the exercise of the discretionary power granted the Secretary of the Interior in the above subdivision of the Leasing Act. The only disposition which may be made of the surface of lands under lease, or under a prospecting permit which gives a right to a lease, is such disposal, under existing nonmineral land laws, as will preserve to the lessee, or permittee, free use of the surface in any manner necessary to the fullest compliance with his lease or permit. Such rights are reserved by the act of July 17, 1914, *supra*, in the expressed reservation of the right to prospect for, mine and remove the reserved deposits. The waiver of compensation required is not an alteration or enlargement of the terms of the said act, as the only provisions requiring reimbursement of an entryman for damage to his crops and improvements appear in section 2 of said act, and clearly relate to

§ 49. Determination of Reservation.

If such reservation is made it shall be so determined before the offering of such lease.⁶¹

§ 50. Issuance of Permits for Easements.

The Secretary of the Interior is authorized to issue such permits for easements provided under the act to be reserved.⁶²

§ 51. Assignment And Subletting.

No lease issued under the authority of the act shall be assigned nor sublet except with the consent of the Secretary of the Interior.⁶³

§ 52. Relinquishment of Rights.

The lessee may, in the discretion of the Secretary of the Interior, be permitted at any time to make written relinquishment of all rights under such a lease, and upon acceptance thereof be thereby relieved of all future obligations under said lease, and may with like consent surrender any legal subdivision of the area included within the lease.⁶⁴

§ 53. Diligence, Skill, and Care.

Each lease shall contain provisions for the purpose of insuring the exercise of reasonable diligence, skill and care in the operation of said property.⁶⁵

§ 54. Safety and Welfare of Miners. Waste.

Each lease shall contain a provision that such rules for the safety and welfare of the miners and for the prevention of undue waste as

entrymen whose claims antedate the initiation of a right to prospect for minerals and to preexisting mineral entries. The practice of requiring an express waiver of claim to compensation for damage to the crops and improvements by a subsequent entryman merely is an administrative means of fully informing such entryman of the extent of his rights under said entry if it is allowed as authorized by the section of the Leasing Act. *Pace vs. Carstarphen*, 50 L. D. 369.

This subdivision of the Land Leasing Act modifies that portion of section 9 of the Stock Raising Act which requires compensation for damages to the crops and improvements of the entryman resultant from the prospecting for the reserved mineral deposits, as to stock raising homestead entries allowed pursuant to such subdivision. *Carlin vs. Cassriel*, 50 L. D. 383. A state selection for lands embraced within an oil and gas prospecting permit can not be allowed prior to the cancellation of the permit and notation of its cancellation upon the records of the local land office, except upon the consent of the selector to take subject to the provisions of the act of July 17, 1914 (38 Stat. 509), and to the right of the permittee to the use of the surface in accordance with the provisions of section 29 of the act of February 25, 1920. *New Mexico vs. Weed*, *supra*.⁽¹⁵⁾

⁶¹ 2 Supp. U. S. Comp. St. p. 1418, § 4640 $\frac{1}{2}$ o (§ 29).

⁶² *Id.*

⁶³ 2 Supp. U. S. Comp. St. p. 1419, § 4640 $\frac{1}{2}$ oo (§ 30). See *Hopkins*, *supra*.⁽¹²⁾

⁶⁴ *Id.* The purchase of a relinquishment, together with the improvements of one who has made an unrestricted homestead entry, does not vest in the purchaser any rights that will interfere with the allowance of an oil and gas prospecting permit under section 13, pursuant to an application that was pending when the relinquishment was executed. A purchaser of a relinquishment executed during the pendency of an oil and gas prospecting permit application by one who made an unrestricted homestead entry only, and then only upon his consenting to the use by the permittee of so much of the surface of the land without compensation to the nonmineral entryman as shall be needed in extracting and removing the mineral deposits.

Relinquishments of entries run only to the United States and any payment by a third party for the relinquishment and the improvements on the land do not vest any rights in the purchaser. *Musolf vs. Cowgill*, 49 L. D. 186.

A relinquishment of an oil and gas prospecting permit does not, of its own force, relieve the lands from the segregative effect created by the permit, and the filing of an application for a permit, predicated upon the relinquishment, prior to the cancellation of the permit by the Commissioner of the General Land Office, and notation thereof upon the records of the local land office, does not confer upon the applicant any right to notice of the disposition of the prior existing claim, nor entitle him to any preference in the allowance of his application when the lands formally are restored. *Craig*, *supra*.⁽¹⁵⁾

⁶⁵ *Id.*

may be prescribed by said Secretary shall be observed, including a restriction of the workday to not exceed eight hours in any one day for underground workers except in case of emergency. Also a provision securing the workmen complete freedom of purchase. Also a provision requiring the payment of wages at least twice a month in lawful money of the United States.⁶⁶

§ 55. Prohibiting the Employment of Minors and Females.

Each lease shall contain provisions prohibiting the employment of any boy under the age of sixteen or the employment of any girl or woman without regard to age in any mine below the surface.⁶⁷

§ 56. Prevention of Monopoly.

Each lease may contain such other provisions as the Secretary of the Interior may deem necessary to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, for the protection of the interests of the United States, for the prevention of monopoly, and for the safeguarding of the public welfare.⁶⁸

§ 57. State Laws.

None of the provisions in such lease shall be in conflict with the laws of the State within which the leased property is situated.⁶⁹

§ 58. Forfeiture or Cancellation of Leases.

Any lease issued under the provisions of the act may be forfeited and cancelled by an appropriate proceeding in the United States district court for the district in which the property, or some part thereof, is located whenever the lessee fails to comply with any of the provisions of the act, of the lease, or of the general regulations promulgated under the act and in force at the date of the lease; and the lease may provide for resort to appropriate methods for the settlement of disputes or for remedies for breach of specified conditions thereof.⁷⁰

§ 59. Rules and Regulations.

The Secretary of the Interior is authorized to prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of the act.⁷¹

⁶⁶ 2 Supp. U. S. Comp. St. p. 1419, § 4640¹₀₀ (§ 30).

⁶⁷ Id.

⁶⁸ Id.

⁶⁹ Id.

⁷⁰ 2 Supp. U. S. Comp. St. p. 1419, § 4640¹_{1p} (§ 31). The provision to the effect that an oil and gas lease may provide for the resort to appropriate methods for the settlement of disputes or for remedies for breach of specific conditions thereof, has particular reference to issues arising between the lessor and the lessee, but disputed questions relating to the disposition of proceeds accruing from drilling operations and remaining after the payment of royalties to the United States, come exclusively within the jurisdiction of the courts. *Heirs of Baker vs. Central Wyoming Co.* (on petition), 49 L. D. 634. The courts, not the Land Department, have jurisdiction to determine questions pertaining to actual physical possession of lands in cases arising from conflicts between claimants under the acts of July 17, 1914 (Stock-Raising Homestead Act) (38 Stat. 509), and February 25, 1920 (Leasing Act) (2 Supp. U. S. Comp. St. p. 1404, § 4640⁴ *et seq.*).

⁷¹ 2 Supp. Comp. St. p. 1420, § 4640⁴_{pp} (§ 32). It is the policy of the Land Department to allow claimants of public land opportunity to be heard, notwithstanding they may have, through mistake, inadvertence, or even laches, clearly forfeited their right to a hearing under the Rules of Practice, unless it appears from the record, with reasonable clearness, that they have no substantial claims to equitable consideration. *Cassidy vs. Hall*, 50 L. D. 363; but see *Bojorques vs. Heihn*, 50 L. D. 165.

§ 60. Boundary Lines.

The Secretary of the Interior is authorized to fix and determine the boundary lines of any structure, or oil or gas field, for the purposes of the act.⁷²

§ 61. State Rights.

Nothing in the act shall be construed or held to effect the rights of the state or other local authority to exercise any rights which they may have, including the right to levy and collect taxes upon improvements, output or mines, or other rights, property, or assets of any lessee of the United States.⁷³

§ 62. Verifications.

All statements, representations, or reports required by the Secretary of the Interior under the act shall be upon oath, unless otherwise specified by him, and in such form and upon such blanks as he may require.⁷⁴

§ 63. Reserved Deposits.

The provisions of the act apply to all deposits of oil, oil shale, or gas in the lands of the United States, which lands have been or may be disposed of under laws reserving to the United States such deposits with the right to prospect for, mine and remove the same, subject to such conditions as are or may hereafter be provided by such laws reserving such deposits.⁷⁵

§ 64. Disposition of Moneys Received.

Ten per centum of all money received from sale, bonuses, royalties, and rentals under the provisions of the act, excepting those from Alaska, shall be paid into the treasury of the United States and credited to miscellaneous receipts; for the past production 70 per centum, and from future production 52½ per centum of the amounts derived from such bonuses, royalties, and rentals shall be paid into, reserved, and appropriated as a part of the reclamation fund created by the act of congress, known as the Reclamation Act, approved June 17, 1902, and for the past production 20 per centum and for future production 37½ per centum of the amounts derived from such bonuses, royalties and rentals shall be paid by the Secretary of the Treasury after the expiration of each fiscal year to the state within the boundaries of which the leased lands or deposits are or were located.⁷⁶

§ 65. Expenditures by State.

Said moneys to be used by such state or subdivision thereof for the construction and maintenance of public roads or for the support of public schools or other public educational institutions, as the legislature of the state may direct.⁷⁷

⁷² 2 Supp. Comp. St. p. 1420, § 4640¼pp (§ 32). See note 43, *infra*.

⁷³ *Id.* For a construction of this provision as to state rights, see *Mid-Northern Oil Co. vs. Walker*, 65 Mont. 414, 211 Pac. 353.

⁷⁴ 2 Supp. U. S. Comp. St. p. 1420, § 4640¼q (§ 33).

⁷⁵ 2 Supp. U. S. Comp. St. p. 1420, § 4640¼qq (§ 34).

⁷⁶ 2 Supp. U. S. Comp. St. p. 1420¼r (§ 35).

⁷⁷ *Id.*

§ 66. Miscellaneous Receipts.

All moneys which may accrue to the United States under the provisions of the act from lands within the naval petroleum reserves shall be deposited in the treasury as "miscellaneous receipts."⁷⁸

§ 67. Royalty Payable in Kind on Demand.

All royalty accruing to the United States under any oil or gas lease, or permit under the act on demand of the Secretary of the Interior shall be paid in oil or gas.⁷⁹

§ 68. Advertising Sales of Royalty Oil and Gas.

Upon granting any oil or gas lease, under the act, and from time to time thereafter, during said lease, the Secretary of the Interior shall, except whenever in his judgment it is desirable to retain the same for the use of the United States, offer for sale for such period as he may determine, upon notice and advertisement on sealed bids or at public auction, all royalty oil and gas accruing or reserved to the United States under such lease.⁸⁰

§ 69. Rejection of Bids.

Such advertisement and sale shall reserve to the Secretary of the Interior the right to reject all bids whenever within his judgment the interest of the United States demands.⁸¹

§ 70. Readvertising. Private Sale.

In cases where no satisfactory bid is received or where the accepted bidder fails to complete the purchase, or where the said secretary shall determine that it is unwise in the public interest to accept the offer of the highest bidder, the said secretary, within his discretion, may readvertise such royalty for sale, or sell at private sale at not less than the market price for such period, or accept the value thereof from the lessee. Pending the making of a permanent contract for the sale of any royalty, oil or gas as herein provided, the said secretary may sell the current product at private sale, at not less than the market price.⁸²

§ 71. Sale to United States Departments or Agencies.

Any royalty, oil or gas may be sold at not less than the market price at private sale to any department or agency of the United States.⁸³

ALASKA OIL PROVISIO.

[§ 72-§ 78, inclusive.]

§ 72. Prospecting Permits.

In the Territory of Alaska prospecting permits not more than five in number may be granted to any qualified applicant for periods not exceeding four years, actual drilling operations shall begin within two years from date of permit, and oil and gas wells shall be drilled

⁷⁸ 2 Supp. U. S. Comp. St. p. 1240¹r (§ 35).

⁷⁹ 2 Supp. U. S. Comp. St. p. 1421, § 4640¹rr (§ 36).

⁸⁰ Id.

⁸¹ Id.

⁸² Id.

⁸³ Id.

to a depth of not less than five hundred feet, unless payable deposits of oil or gas shall be sooner discovered, within three years from date of permit and to an aggregate depth of not less than two thousand feet unless valuable deposits of oil or gas shall be sooner discovered, within four years from date of permit.⁸⁴

§ 73. Preference Right.

In said territory the applicant shall have a preference right over others to a permit for land identified by temporary monuments and notice posted on or near the same for six months following such marking and posting, and upon receiving a permit he shall mark the corners of the tract described in the permit upon the ground with substantial monuments within one year after receiving such permit.⁸⁵

§ 74. Prospecting Permits or Leases on Withdrawn Lands.

Any *bona fide* occupant or claimant of oil or gas-bearing lands within the Territory of Alaska, who, or whose predecessors in interest prior to withdrawal had complied otherwise with the requirements of the mining laws, but had made no discovery of oil or gas in wells and who prior to withdrawal had made no substantial improvements for the discovery of oil or gas on or for each location or had prior to the passage of this act expended not less than two hundred and fifty dollars in improvements on or for each location shall be entitled, upon relinquishment or surrender to the United States within one year from the date of the act, or within six months after final denial or withdrawal of application for patent, to a prospecting permit or permits, lease or leases, under this act covering such lands, not exceeding five permits or leases in number and not exceeding an aggregate of one thousand two hundred and eighty acres in each.⁸⁶

§ 75. Rental and Royalties.

Leases in Alaska under the act whether as a result of prospecting permits or otherwise shall be upon such rental and royalties as shall

⁸⁴ 2 Supp. U. S. Comp. St. p. 1410, § 4640 $\frac{1}{2}$ g (§ 13).

⁸⁵ Id. For regulations relating to the exceptionally liberal provisions with respect to Alaska, see Oil Prospecting Permits in Alaska, 48 L. D. 46. For regulations governing oil and gas permits in Alaska under the act, see 49 L. D. 207, 801. For extension of time for drilling operations, see 2 Supp. U. S. Comp. St. p. 1410, § 4640 $\frac{1}{2}$ fff (act of Jan. 11, 1922, c. 28); Oil and Gas Permits, 49 L. D. 110. For extension to the Territory of Alaska of the principles of the surface homestead acts already in force in the public land states, namely, the acts of March 3, 1909 (35 Stat. 844), June 22, 1910 (36 Stat. 583), and July 17, 1914 (38 Stat. 509), see act of March 8, 1922 (42 Stat. 415), entitled "An act to provide for agricultural entries on coal lands in Alaska." This act provides that, upon the unreserved withdrawn public lands in the Territory of Alaska, homestead claims may be initiated by actual settlers on public lands which are known to contain workable coal, oil, or gas deposits, or which may be, in fact, valuable for the coal, oil or gas contained therein. Thus, by the class last named, provision is made for cases in which land is not at the date of the initiation of the claim thereto actually known to contain workable coal, oil, or gas deposits, but in which it becomes known, during the interval between the initiation of the claim and its completion, that the land is, in fact, valuable for the coal, oil or gas contained therein. It also provides that homestead claims so initiated may be perfected under the appropriate public land laws and that, upon satisfactory proof of full compliance with these laws, the claimant shall be entitled to patent for the lands entered by him, which patent shall contain a reservation to the United States of all the coal, oil or gas in the land patented, together with the right to prospect for, mine, and remove the same.

For instructions relating to the acquisition of title to public lands in the Territory of Alaska, see 50 L. D. 27 and 96. See, also, Identification of Lands in Alaska, 50 L. D. 155.

⁸⁶ 2 Supp. U. S. Comp. St. p. 1415, § 4640 $\frac{1}{2}$ kk (§22).

be fixed by the Secretary of the Interior and specified in the lease, and be subject to readjustment at the end of each twenty-year period of the lease.⁸⁷

§ 76. Waiver of Rental or Royalty.

For the purpose of encouraging the production of petroleum products in Alaska the Secretary may in his discretion, waive the payment of any rental or royalty not exceeding the first five years of any lease.⁸⁸

§ 77. Fraud.

No claimant for a lease who has been guilty of any fraud or who had any knowledge or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section (22 of the act).⁸⁹

§ 78. Disposition of Moneys Received.

The payment of 37½ per centum of the amounts derived from certain bonuses, royalties and rentals by the United States to the state within the boundaries of which leased lands or deposits are or were located does not extend to Alaska.⁹⁰

§ 79 Disposition of Oil, Oil Shale and Gas.

The deposits of oil, oil shale and gas referred to in the act, in lands valuable for such minerals, shall be subject except as to valid claims existent at the date of the passage of this act to disposition only in the form and manner provided for in said act and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery.⁹¹

⁸⁷ 2 Supp. U. S. Comp. St. p. 1415, § 4640½½ (§ 22).

⁸⁸ Id.

⁸⁹ Id. See note 31, *supra*.

⁹⁰ 2 Supp. U. S. Comp. St. p. 1420, § 4640½r (§ 35).

⁹¹ 2 Supp. U. S. Comp. St. p. 1421, § 4640½r (§ 37). The term "valid claims" as used in this section relates to unperfected claims to mineral lands. *Utah vs. Lichtler* (on rehearing), 50 L. D. 231. In view of said provisions, no oil placer mining claims can be passed to patent under the provisions of the placer mining laws unless (a) it shall be shown to have been supported at the date of the Leasing Act by a sufficient discovery; or (b) discovery being at that time absent, it shall be established that work leading to discovery was then being diligently prosecuted by or for the claimants thereof and thereafter diligently continued to discovery. See section 32 of the Land Office Regulations of March 11, 1920, as amended to October 29, 1920 (47 L. D. 462), issued under the Leasing Act. Nor, in the absence of a similar showing, can an unperfected oil placer mining claim not entitled to be made the basis for relief under the sections 18, 18a or 19 of the Leasing Act because of the filing of application for relief, be successfully set up to defeat an application for permit or lease under the act. *McGee vs. Wooten*, *supra*.⁽¹⁵⁾ Valid claims for oil shale which were existent at the date of the Leasing Act and thereafter duly maintained, are excepted from the operation of that statute, and may be perfected under the laws under which the claims were initiated. *Utah vs. Watson Oil Co.*, *supra*.⁽³⁵⁾

In *Hodson vs. Midwest Oil Co.*, 297 Fed. 273, the court said: "The situation presented here also raises the same question which has been before this court in cases recently decided, as to whether or not the Interior Department has the exclusive jurisdiction under the act of February 25, 1920, to determine the matter of granting the leases to owners of placer mining claims upon application under that act. This court held in *Hodson vs. Mt. & Gulf Oil Co.*, 297 Fed. 269, that when the Department of the Interior has recognized the ownership of a Placer Mining Act claim for the purpose of granting a lease to the owner or owners of said claim, such action is final, unless set aside on account of fraud, jurisdictional irregularities, or errors of law upon which the decision was based. Even these cases could not be asserted in an action at law.

"It is asserted in the plaintiff's petition that the Federal Leasing Act is unconstitutional, in that it is in contravention of the 'due process' clause of the constitution. In this manner, by one sweeping averment in his petition, the plaintiff would wipe out the statute upon which rests the right of his opponent. * * * The contention in the petition seems to be that the legislation is retroactive in that it purports to affect property rights already vested, and counsel argues that the act itself in no way pro-

§ 80. Fees and Commissions.

Until otherwise provided, the Secretary of the Interior shall be authorized to prescribe fees and commissions to be paid registers and receivers of United States land offices on account of business transacted under the provisions of the act.⁹²

MISCELLANY.

§ 81. The Act of March 4, 1923—Oklahoma,

Providing for the disposition of oil and gas deposits in lands of the United States south of the medial line of Red River in Oklahoma did not contemplate the recognition of any equities asserted under the Leasing Act, but only those persons who were claiming and possessing lands within that area, in good faith, under color of some legal right, and had made *bona fide* expenditures in development of the lands for oil and gas with reasonable diligence prior to the passage of the Leasing Act, are entitled to equitable consideration.⁹³

§ 82. Trespass.

In *Mason vs. U. S.*⁹⁴ the court holds that the measure of damages for oil trespass is within the controlling scope of state legislation and the court stated: "Here, while the suit is one in equity, the statute and decisions relied upon have nothing to do with the general principles of equity jurisdiction, but simply establish a measure of damages applicable to actions at law and suits in equity. In consonance with that decision the Land Department has directed that in cases of oil trespasses on the public domain if there is no state law governing such trespasses, the measure of damages will be as follows: (1) Innocent trespass. Value of oil taken, less amount of expense

vides methods of giving notice to those parties claiming an interest in lands affected by the legislation.

"Whatever may be the character of right secured by a placer mining claimant, it is not that certain, indefeasible right which comes from a grant of title ownership, but depends at all times upon certain acts to be continuously performed by the claimant, the fee title remaining in the United States, unless the claimant proceed to patent. In the latter proceeding, rights in such a claim may be irrevocably cut off, in which the due process is based upon a published notice. *Golden Reward Co. vs. Buxton Co.*, 79 Fed. 868. While the Leasing Act itself does not provide for notice, it in effect gives the Interior Department the right to prescribe rules and regulations to carry the act into effect. Such rules and regulations were prescribed by the Land Department requiring notice to be given of all applications for leases, which regulations should be given full force and effect of statutes, when not inconsistent with nor repugnant to the law itself. *U. S. vs. Moorehead*, 243 U. S. 607; *Leonard vs. Lennox*, 181 Fed. 760; *Williamson vs. U. S.*, 207 U. S. 425.

"Plaintiff further contends that, being the owner of a claim maintained and perfected in accordance with the requirements of the Placer Mining Act, he and his colocators have the absolute right to proceed under the provisions of that act in the maintenance and operation of the mining claim, as well as proceeding to patent thereunder, without interference through any provisions of the Leasing Act. This contention would undoubtedly be sound, were it not that the Leasing Act, in section 37 (Comp. St. Ann. Supp. 1923, § 4640½s), apparently gives the option to such a claimant to proceed under either act. This seems to be the only practicable construction of section 37, which, if correct, gives the department the undoubted right under due process regulations to call before it any person or persons claiming an interest in an entry upon which a lease is sought. Upon such a hearing the rights of the parties can be fully determined." "Paper locations" of oil and gas lands unaccompanied by discovery therein are not within the excepting clause of this section although the annual assessment work has been performed each year thereon. *Mt. States Co. vs. Taylor*, 50 L. D. 348.

⁹² 2 Supp. U. S. Comp. St. p. 1321, § 4640½ss (§ 38).

⁹³ *Red River Syndicate* (on petition), 49 L. D. 669; see, also, *Oklahoma vs. Texas*, 258 U. S. 574; *Martin*, 48 L. D. 277. For rule establishing boundaries in accordance with the decision of the Supreme Court in the case of *Oklahoma vs. Texas*, see 50 L. D. 216.

⁹⁴ 260 U. S. 545; see *Central Co. vs. Penny*, 173 Fed 340; *Instructions*, 49 L. D. 484.

incurred in taking the same. (2) Wilful trespass. Value of oil taken without credit or deduction for the expense incurred by the wrongdoers in getting it.

§ 83. Recorded Notice Ineffective.

The rules relating to notices of *lis pendens* that are applicable under a state law have no effect in land office proceedings and recordation in the office of the county recorder in which the lands are situate, of proceedings in a local land office, there being no statutory requirement to that effect, neither constitutes constructive notice nor raises a presumption of notice. Persons seeking information should go to the records of the Land Department to obtain it.⁹⁵

§ 84. Annual Assessment Work Within Withdrawn Areas.

A claimant to public land who has done all that is required under the law to perfect his title acquires rights against the government, and his right to a legal title is to be determined as of that time, on the theory that, by virtue of his compliance with the requirements, he has an equitable title to the land, and that the government holds it in trust for him.⁹⁶ But the possession of a mining claim where the statutory requirements have not been complied with is subject to be terminated by the government under some law of congress authorizing the disposal of the public lands.⁹⁷ In other words, if there was, at the time of the withdrawal, a valid claim, said claim is unaffected by the withdrawal so long as it is maintained in accordance with the law under which it was initiated.⁹⁸

It follows that a valid unpatented mining claim located before the passage of the Leasing Act, and containing mineral of the character enumerated in said act, must be kept alive by the performance of the annual assessment work, within the assessment year although, possibly, the commencement of such work on, say, the last day of such year and diligently prosecuting the same to completion within the succeeding year may prevent forfeiture;⁹⁹ or, by application for patent, within which

⁹⁵ Opinion, 50 L. D. 199. Where an application for a permit is filed in good faith for lands shown by the records of the local land office to be free from conflicting claims, such application constitutes a bar to the amendment of subsisting permit applications, although based upon location notices posted upon the land, if there were no apparent error in those applications when filed. A location notice, posted as prescribed by the act, has a segregative effect for a period of thirty days only, and when an application for a permit is filed the application becomes the notice to all applicants that the land described therein is adversely claimed and can not be amended after the expiration of the thirty-day period to conform to the description posted, in the presence of a *bona fide* intervening claim. Neither the act nor the Departmental Regulations issued pursuant thereto make distinction between surveyed and unsurveyed lands as to preference rights initiated under the provisions of the act by the posting of location notices, except that greater particularly is required in the description of lands of the latter class. *Wagner vs. Coffin, supra.*⁽¹⁸⁾

⁹⁶ *Payne vs. New Mexico, supra*⁽¹²⁾; see, also, *Payne vs. C. P. R. Co., supra*⁽¹²⁾; *Interstate Oil Corp., 50 L. D. 262.*

⁹⁷ *McKenzie vs. Moore, 20 Ariz., 176 Pac. 569.* Where a claimant is in default so that his claim could be defeated by another individual adverse claimant, surely the government, desiring to devote the land to an important public use, may likewise take advantage of the default and divest the claim so as to free the land for government use. *Kinney, 44 L. D. 580; Interstate Oil Corp., supra.*⁽⁹⁶⁾

⁹⁸ *Interstate Oil Corp., supra*⁽²⁶⁾; see, also, *Robbins vs. Elk Basin Co. supra.*⁽¹⁵⁾

⁹⁹ *Willits vs. Baker, 133 Fed. 937; see, also, Anderson vs. Robinson, 63 Or. 228, 126 Pac. 988, 127 Pac. 546.* See, also, note 96, *supra.* The mere staking of a mining claim, posting and recording notice, and doing the annual assessment work thereon is not sufficient to confer title upon its claimant. *Union Oil Co. vs. Smith, 249 U. S. 337; Cole vs. Ralph, supra*⁽⁴⁾; *U. S. vs. Midway Northern Oil Co., supra*⁽³⁾; *U. S. vs. Thirty-Two Oil Co., 736.* The annual assessment work upon oil lands may be done upon any one of a group of such claims or locations lying contiguous and owned by the same person or corporations not exceeding five claims in all; provided, that said labor will tend to the development or to determine the oil-bearing character of such contiguous claims. See *Smith vs. Union Oil Co., 166 Cal. 217, 135 Pac. 967; affirmed in Union Oil Co. vs. Smith, supra.*

final entry has been made.¹⁰⁰ Else the land embraced within the location will revert to the government. There can not be either resumption of work or relocation of such a mining claim.¹⁰¹

¹⁰⁰ Annual assessment work is not required to be made after the final entry in the local land office on the theory that the government parts with the property upon such entry, though the title remains in it until the patent in fact, is issued, as the right to the patent immediately arises upon payment of the price of the land and a mere delay in the administration of the Land Department will not defeat nor diminish the right of the purchaser. *Benson Co. vs. Alta Co.*, 145 U. S. 425; *Brown vs. Gurney*, 201 U. S. 184; *Neilson vs. Champagne Co.*, 111 Fed. 657; *Cranes Gulch Co. vs. Scherrer*, 134 Cal. 353, 66 Pac. 487; *Southern Cross Co. vs. Sexton*, 147 Cal. 758, 82 Pac. 483; *Batterton vs. Douglass Co.*, 20 Ida. 760, 120 Pac. 827.

¹⁰¹ See *U. S. vs. McCutchen*, *supra* (3); see, also, note 97, *supra*.



APPENDIX.

**REGULATIONS CONCERNING OIL AND GAS PERMITS AND
LEASES (INCLUDING RELIEF MEASURES) AND RIGHTS
OF WAY FOR OIL AND GAS PIPE LINES.***

* U. S. General Land Office: Circular No. 672, Oct. 29, 1920.

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(Of Circular No. 672.)

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OIL AND GAS REGULATIONS.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,

Washington, D. C., March 11, 1920

REGISTERS AND RECEIVERS,
UNITED STATES LAND OFFICES.

SIRS: Under the authority of the act of congress approved February 25, 1920, entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," the following rules and regulations are prescribed for the administration of the provisions of said act relative to oil and gas:

I. OIL AND GAS PERMITS.

Section 13 of the act authorizes the Secretary of the Interior to grant a qualified applicant the exclusive right to prospect for oil or gas for the period of two years, unless extended, and under authority thereof the following rules and regulations will govern the issuance of such permits:

1. QUALIFICATIONS OF APPLICANTS.—Pursuant to section 1 of the act, permits may be issued to (a) a citizen of the United States; (b) an association of such citizens; (c) a corporation organized under the laws of the United States or of any state or territory thereof; or (d) a municipality.

2. LANDS TO WHICH APPLICABLE.—The permit thus issued may include not more than 2560 acres of land wherein such deposits belong to the United States and are not within any known geological structure of a producing oil or gas field, the lands applied for to be taken in a reasonably compact form, by legal subdivisions if surveyed, and in an approximately square or rectangular tract if unsurveyed, the length of which must not exceed two and one-half times its width. Incontiguous tracts within a limited radius may be included in a permit when conditions are such that, because of prior disposals, a reasonable area of contiguous land can not be procured.

Such permits may not include land or deposits in (a) national parks; (b) forests created under the act of March 1, 1911 (36 Stat., 961), known as the Appalachian Forest Reserve act; (c) lands in military or naval reservations; or (d) Indian reservations. The application of the act to ceded Indian lands depends on the laws controlling their disposition.

See Harrison, 49 L. D. 139; Instructions 49 L. D. 431.

All permits or leases for the exploration for or development of oil or gas deposits under this act within the limits of national forests or other reservations or withdrawals to which this act is applicable shall be subject to and contain such conditions, stipulations, and reservations as the Secretary of the Interior shall deem necessary for the protection of such forests, reservations, or withdrawals, and the uses and purposes for which created.

The boundaries of the geological structures of producing oil or gas fields will be determined by the United States Geological Survey, under the supervision of the Secretary of the Interior, and maps or diagrams showing same will be placed on file in local United States land offices.

It should be understood that under the act, the granting of a prospecting permit for oil and gas is discretionary with the Secretary of the Interior, and any application may be granted or denied, either in part or in its entirety, as the facts may be deemed to warrant.

3. PERMITS OR LEASES FOR OTHER MATERIALS.—The granting of a permit or lease for the development or production of oil or gas will not preclude other permits or leases of the same land for the mining of other minerals, under this act, with suitable stipulations for such joint operation, to the end that the full development of the mineral resources may be secured, nor will it necessarily preclude the allowance of applicable entries, locations, or selections of the lands included therein with a reservation of the mineral deposits to the United States.

4. FORM AND CONTENTS OF APPLICATION.—Applications for permits should be filed in the proper district land office, addressed to the Commissioner of the General Land Office, be suspended for thirty days to enable preference-right claims to be presented before action, and after due notation then forwarded for his consideration, with a full report as to status and conflicts. No specific form of application is required, and no blanks will be furnished, but it should cover, in substance, the following points, and be under oath:

(a) Applicant's name and address.

(b) Proof of citizenship of applicant, by affidavit of such fact, if native born; or if naturalized, by a certified copy of the certificate of naturalization on the form provided for use in public-land matters, unless such a copy is already on file; if a corporation, by certified copy of the articles of incorporation, and a showing as to the residence and citizenship of its stockholders; if a municipality a showing of (1) the law or charter and procedure taken by which it has become a legal body corporate; (2) that the taking of a permit or lease is authorized under such law or charter; and (3) that the action proposed has been duly authorized by the governing body of such municipality.

(c) A statement that the applicant is not the holder of more than two other subsisting permits in the same state, nor of any permit in the same geologic structure, together with a statement of any other applications for permits in the same state, in which the applicant is directly or indirectly interested, fully disclosing the nature and extent of such interests. In this connection attention is directed to the limitations and exceptions of section 27 of the act.

(d) Description of the land for which the permit is desired, by legal subdivisions if surveyed, and by metes and bounds if unsurveyed, in which latter case, if deemed necessary, a survey sufficient more fully to identify the land may be required before the permit is granted. In order to properly identify unsurveyed lands, great care should be taken, and if practicable the metes and bounds descrip-

tion should be connected by course and distance with some corner of the public land surveys.

(e) A statement that to the best of applicant's knowledge and belief the land applied for is not within any known geological structure of a producing oil or gas field.

(f) Three references as to applicant's reputation and business standing.

(g) If the applicant is claiming a preference right as explained in the next succeeding section of these regulations, he should set up fully the facts upon which such preference right is based, together with a true copy of the posted notice.

(h) The applicant must furnish a bond, with qualified corporate surety, in the sum of \$1,000, conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation. The penalty of the bond may be increased by the Secretary of the Interior when conditions warrant, particularly in relief cases. This bond may be filed with the application, which will expedite action thereon, or within ten days after receipt of notice by the applicant that the permit will be granted when the bond is filed.

Additional bonds, or a bond with additional obligations therein, will be required in special cases where a permit embraces reserved deposits in lands theretofore entered or patented with a reservation of the oil and gas to the United States, together with a right to prospect for, mine, and remove the same pursuant to the act of July 17, 1914 (38 Stat., 509), or where the lands constitute a portion of a reclamation project.

See Craig, 50 L. D. 202.

A revenue stamp must be attached to the bond at the rate of 1 cent on each \$1 or fractional part thereof of premium paid.

The following form of bond is prescribed for use in ordinary cases in connection with applications for permit:

BOND.

DEPARTMENT OF THE INTERIOR.

GENERAL LAND OFFICE.

U. S. Land Office_____

Serial Number_____

Bond of oil and gas permittee.

[Act of February 25, 1920 (Public No. 146).]

Know all men by these presents, That we, _____, of the county of _____, in the State of _____, as principal, and _____ of the county of _____, in the State of _____, as surety, are held and firmly bound unto the United States of America in the sum of _____ dollars, lawful money of the United States to be paid to the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators or successors, and assigns, jointly and severally by these presents.

Signed with our hands and sealed with our seals this _____ day of _____ in the year of our Lord one thousand nine hundred and _____.

The condition of the foregoing obligation is such that, whereas the said principal has made application under the act of February 25, 1920 (Public No. 146), for a permit to prospect for oil and gas for two years upon the following described lands _____; and whereas said permit, if granted, will be on condition that all operations shall be conducted in accordance with approved methods; that all proper

precautions shall be exercised to prevent waste of oil or gas developed in the lands, or the entrance of water through wells drilled by, or on behalf of, the principal to the oil sands or oil-bearing strata to the destruction of the oil deposits.

Now therefore, if said principal shall promptly repair any damage that may result to the oil strata or deposits resulting from improper methods of operation, or from failure to comply fully with the aforesaid conditions of said permit, then the above obligation is to be void and of no effect; otherwise to remain in full force and virtue.

Signed, sealed, and delivered in presence of

Name and address of witness:

----- [L. S.]

Principal.

----- [L. S.]

Surety.

In lieu of corporate surety, the applicant may deposit United States bonds of the par value of not less than \$1,000, pursuant to section 1320 of the act of February 24, 1919 (see Treasury Circular No. 154, of June 30, 1919). When United States bonds are submitted as security in lieu of corporate surety same should be accompanied with a bond and power of sale duly executed by the applicant in substantially the following form:

BOND.

DEPARTMENT OF THE INTERIOR.

GENERAL LAND OFFICE.

U. S. Land Office-----

Serial Number-----

Bond of oil and gas permittee where United States bonds are accepted in lieu of surety or sureties, and power of attorney.

[Act of February 25, 1920 (Public No. 146).]

Know all men by these presents, That _____ of _____, State of _____, as obligor, is held and firmly bound unto the United States of America in the sum of \$1,000, lawful money of the United States, to be paid to the United States, for which payment, well and truly to be made, binds himself, his heirs, executors, administrators, and assigns by these presents.

The condition of the foregoing obligation is such that whereas the said obligor has made application under the act of February 25, 1920 (Public No. 146), for a permit to prospect for oil and gas for two years upon the following described land: _____; and

Whereas said permit, if granted, will be on condition that all operations shall be conducted in accordance with approved methods; that all proper precautions shall be exercised to prevent waste of oil or gas developed in the lands, or the entrance of water through wells drilled by or on behalf of the obligor to the oil sands or oil-bearing strata to the destruction of the oil deposits.

Now, therefore, if said obligor shall promptly repair any damage that may result to the oil strata or deposits resulting from improper methods of operation, or through failure to comply fully with the aforesaid conditions of said permit, then the above obligation is to be void and of no effect; otherwise to remain in full force and virtue.

The above-bounden obligor, in order the more fully to secure the United States in the payment of the aforesaid mentioned sum, hereby pledges as security therefor bonds of the United States in the principal sum of \$1,000, which said bonds are numbered serially and are in the denominations and amounts and are otherwise more particularly described as follows:

----- bonds of \$----- bearing ----- per cent interest with ----- coupons attached to each, numbered ----- which said bonds have this day been deposited with the Secretary of the Interior and his receipt taken therefor.

That the said obligor does hereby constitute and appoint the Secretary of the Interior as his attorney, for him and in his name to collect or to sell, assign and transfer the said United States bonds above described and deposited by the obligor as

aforesaid, pursuant to authority conferred by section 1320, of the revenue act of 1918, approved February 24, 1919, as security for the faithful performance of any and all of the conditions or stipulations as hereinbefore set out, and it is agreed that, in case of any default in the performance of the conditions and stipulations of such undertaking the said attorney shall have full power to collect said bonds or any part thereof, or to sell, assign, and transfer said bonds or any part thereof without notice, at public or private sale, free from any equity of redemption or without appraisalment or valuation, notice and right to redeem being waived, and to apply proceeds of such sale or collection in whole or in part to the satisfaction of any damages, or deficiencies arising by reason of such default, as said attorney may deem best. The interest accruing upon said United States bonds deposited as above stated, in the absence of any default in the performance of any of the conditions or stipulations of the bond, shall be paid to said obligor. The said obligor hereby for himself, his heirs, executors, administrators, and assigns ratifies and confirms whatever his said attorney shall do by virtue of these presents.

In witness whereof I have hereunto set my hand and seal this _____ day of _____ 19___.

_____ [L. S.]
Signature.

Before me, the undersigned, a notary public within and for the county of _____, in the State of _____, personally appeared _____ and duly acknowledged the execution of the foregoing bond and power of attorney.

Witness my hand and notarial seal this _____ day of _____, 19___.

[Notarial Seal.]

5. PREFERENCE RIGHT, HOW SECURED.—A preference right over others to a permit may be obtained, under section 13 of the act, by

(a) Erecting upon the land desired, subsequent to the approval of the act, a monument not less than 4 feet high, at some conspicuous place thereon, of such a size as to be visible to anyone who may be interested. The monument may be of iron, stone, or durable wood, not less than 4 inches square or in diameter, and must be firmly embedded in the ground.

(b) Posting on or near said monument a notice stating that an application for permit will be made within 30 days after date of posting said notice, the notice to give the date and hour of posting, to be signed by the applicant, and give such a general description of the land to be covered by the permit, by reference to courses and distances from such monument and other natural objects and permanent monuments, as will reasonably identify the land. The area, approximately, must also be stated, and the notice must be so protected as to prevent its destruction by the elements. The preference right will exist for 30 days after the date of posting such notice, and if no application is filed within that time, the land will be subjected to any other application for permit or to other disposal.

(See Purvis vs. Witt, 49 L. D. 260; Blakesley vs. McCord, 49 L. D. 418.)

(c) In cases of conflict between a preference right application and one filed without any claim of preference, the priority of the initiation of the claim will govern; for example, the filing of a proper application in the land office prior to the posting of notice by another, as aforesaid, will give a prior right.

6. FORM AND REQUIREMENTS OF PERMIT.—A permit will confer upon the recipient the exclusive right to prospect for oil or gas upon the lands embraced therein, provided he complies with the terms thereof, which permit will be, in form and substance, substantially as follows:

PERMIT.

THE UNITED STATES OF AMERICA.

DEPARTMENT OF THE INTERIOR.

General Land Office.

U. S. Land Office_____

Serial Number_____

Know all men by these presents, That the Secretary of the Interior, under and by virtue of the act of Congress entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," approved February 25, 1920, has granted and does hereby grant a permit to _____ granting _____ the exclusive right for _____ years from date hereof to prospect for oil or gas, but for no other purpose, the following described lands: _____, upon the express conditions following:

1. To mark each of the corners of the claim within 90 days from date hereof with substantial monuments so that the boundaries can be readily traced on the ground, and post in a conspicuous place, upon the lands covered hereby, a notice that such a permit has been granted, and a description of the lands covered by this permit.

2. Within six months (two years in Alaska) from date hereof to install upon some portion of the lands a substantial and adequate drilling outfit and to commence actual drilling operations.

3. Within one year (three years in Alaska) from date hereof to drill one or more wells, not less than 6 inches in diameter to a depth of at least 500 feet each, unless valuable deposits of oil or gas shall be sooner discovered.

4. Within two years (four years in Alaska) from date hereof to drill one or more wells to a depth of at least 2000 feet, unless valuable deposits of oil or gas shall be sooner discovered.

5. Not to drill any well within 200 feet of any of the outer boundaries of the lands covered by this permit unless the adjoining lands have been patented or the title thereto otherwise vested in private owners.

6. To carry on all operations hereunder in accordance with approved methods and practice; to use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by permittees to the oil sands or oil-bearing strata to the destruction or injury of the oil deposits, and to carry out, at the expense of the permittee, all reasonable orders of the Secretary of the Interior relative to prevention of waste and preservation of property, and to comply with such regulations as may be issued by the Secretary of the Interior as to methods of operation.

7. To furnish and maintain during the period of this permit a bond with qualified corporate surety in the sum of \$_____, conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation.

8. That as to any lands covered by this permit embraced at the date hereof in any entry or patent with a reservation of the oil and gas deposits to the United States pursuant to the act of July 17, 1914 (38 Stat. 509), or the act of December 29, 1916 (39 Stat. 862), permittee shall reimburse such entrymen or patentee for all damage to crops and improvements caused by drilling or other prospecting operations.

9. That this permit is granted upon the express condition that the right is reserved to the Secretary of the Interior to permit upon such terms as he may determine to be just, for joint or several use, such easements or rights of way, including easements in tunnels upon, through, or in the lands covered thereby, as may be necessary or appropriate to the working of the same, or of other lands containing the deposits described in the act under which this permit is granted.

10. This permit is granted on the express condition that if any of the land covered thereby is embraced in a forest, reclamation, power, or other withdrawal, or is segregated for any particular purpose, operations under this permit shall be so conducted as not to interfere with the administration and use of the land for the purpose for which withdrawn or segregated to a greater extent than may be determined by the Secretary of the Interior to be necessary for the most beneficial use of the land.

11. The granting of this permit shall not preclude the allowance of entry, location, or selection of any of the lands included therein, where such entry, selection, or location is made with a reservation of the mineral deposits to the United States.

12. That until this permittee shall apply for a lease of one-quarter or more of the area included herein, he shall pay to the United States 20 per cent of the gross

value of all oil or gas secured by him from the lands and sold or otherwise disposed of, or held by him for sale or other disposition.

13. The Secretary of the Interior reserves the right and authority to cancel this instrument for failure of the permittee to comply with any of the conditions enumerated herein or to exercise due diligence in the work of development.

14. Valid rights existing at the date of this permit will not be affected thereby.

Dated this _____ day of _____, 19___.

Secretary of the Interior.

7. EXTENSION OF LIFE OF PERMIT.—If for any good reason the permittee is unable, with the exercise of diligence, to test the land within two years, application for extension for not to exceed two years may be filed within the life of the permit, and must be accompanied by a showing under oath, corroborated, as to the causes that make such extension necessary, and as to what efforts have been made to comply with the condition of the permit; ordinarily no extension will be granted in the absence of the minimum amount of drilling required by the permit. This application should be addressed to the Secretary of the Interior, and be filed either in the district land office or in the General Land Office. This privilege is not applicable to Alaska.*

8. REWARD FOR DISCOVERY.—Upon establishing to the satisfaction of the Secretary of the Interior that valuable deposits of oil or gas have been discovered within the limits of the land embraced in the permit, within the period of the permit or extension thereof, the permittee is entitled (a) to a lease of one-fourth of the land included in the permit, on a royalty of 5 per cent, or for at least 160 acres if there be that area in the permit; (b) to a preference right to a lease for the remainder of the land covered by his permit at such royalty as may be fixed by the Secretary of the Interior, not less than $12\frac{1}{2}$ per cent in amount or value of the production, nor more than the royalties fixed for leases under section 18 of the act (sec. 19, par. c, of these regulations), except that on that portion of the average production exceeding 200 barrels per day per well for the calendar month, the royalties shall be $33\frac{1}{3}$ per cent for oil of 30 degrees Baume or over and 25 per cent for oil of less than 30 degrees Baume.*

9. PENALTY FOR DEFAULT.—The permit will be subject to cancellation by the Secretary of the Interior for failure of the permittee to comply with any of the conditions enumerated therein or to exercise due diligence in the work of development.

* Paragraphs 7 and 8 as amended on August 22, 1922, read as follows:

"*Extensions of Time.* The provision in section 13 of the act providing for extensions of the life of permits granted upon lands in the United States has been superseded by an act approved January 11, 1922 (42 Stat. 356), which provides that the Secretary of the Interior may, if he shall find that any oil or gas permittee has been unable, with the exercise of diligence, to begin drilling operations or to drill wells of the depth and within the time prescribed by section 13 of the act of congress approved February 25, 1920 (41 Stat. 427), extend the time for beginning such drilling or completing it to the amount specified in the act for such time, not exceeding three years, and upon such conditions as he shall prescribe. Extensions of time may be granted thereunder in proper cases, both in Alaska and the United States, where applications therefor are filed in accordance with the regulations, Circular No. 801, approved January 16, 1922, as amended March 28, 1922, and May 12, 1922 (49 L. D. 110).

"When an application for a lease of the one-fourth part of the area affected by a prospecting permit is submitted, supported by the requisite evidence of discovery and production of oil or gas, such application must be accompanied by further application by the permittee, or by an assignee of such permittee, for a lease of the remaining portion of the area described in the permit; or, in the alternative, a relinquishment of the permit and waiver of preference right in respect of such remaining area must be submitted." 49 L. D. 207. See 49 L. D. 110, 403.

In the absence of discovery of oil or gas within the period of the permit or extension thereof, the permit will thereupon terminate and the lands or deposits will automatically revert to their original status, but the land will continue segregated pending action by the Land Department on any application for extension that is timely filed.

(See Alger, 50 L. D. 201.)

10. PERMITS IN ALASKA.—The foregoing rules and regulations generally will apply to permits in Alaska, under section 13 of the act, but with some modifications, viz:

(Paragraphs 1 to 9, inclusive, apply to permits in Alaska, under section 13 of the act, with modifications set forth in 49 L. D. 208.)

(a) A person, association, or corporation is authorized to hold five permits at one time in said territory, but only one permit in the geologic structure of any one producing oil field; hence subdivision *c* of section 4 of these regulations should be modified accordingly in making application for permits for lands in Alaska under section 13 of the act.¹

(b) The preference right treated under section 5 of these regulations extends for a period of six months after the erection of monument and posting of notice provided for therein, and the period for marking of the corners is extended to one year after the granting of the permit.

(c) The time for exploratory work in Alaska is four years, instead of two, and there is no provision for extension of such period. The various items necessary in this exploratory work are set forth in the form of permit herein provided, the Alaskan period being included in parentheses, after the period prescribed in the states.

11. PERMITS FOR RESERVED DEPOSITS.—The deposits of oil and gas in all lands for which a patent has issued with a reservation of the oil and gas to the United States, under the act of July 17, 1914 (38 Stat. 509), subject to the preference right, if any, explained in the next succeeding section hereof, may be included in a permit under the provisions of this act, conditioned upon the permittee filing with the Secretary of the Interior a satisfactory bond or undertaking as security for the payment of all damages to crops and improvements on such lands by reason of prospecting, as required by the said act. (See G. L. O. Circular No. 393, 44 L. D., 32.)

12. PREFERENCE RIGHT OF OWNER OF SURFACE.—Under section 20 of the act a preference right to a prospecting permit is given to an entryman or owner of land not claimed under any railroad grant, under the following conditions: (1) The entry must have been made prior to February 25, 1920; (2) the entry must have been bona fide under and pursuant to the act under which made; (3) the entry must have been made without a reservation of the oil and gas, for land unwithdrawn, not classified as oil and gas land, and not known to be valuable for its oil or gas deposits, at date of entry; (4) in case the entry is patented, it must have been with a reservation of the oil and gas to the government; if the entry is not patented, the entryman must waive all right *under the entry* to the oil and gas in the land; (5) if the entry has been assigned or transferred, such assignment or transfer must have been prior to January 1, 1918.

(a) Should an application for permit for entered or patented lands *with a reservation* of the oil and gas content to the United States be filed by a person other than the entryman or owner of the land, the applicant will be required to serve *personal notice* of such application upon the owner or owners of the land so entered or patented, with a warning therein that if said owner desires to exercise his preference right, if any, to a permit, he must file within 30 days his application therefor in the proper local land office. The applicant must furnish evidence of the service of notice on the owner and evidence that the party served is the owner of the land involved, either by his affidavit, duly corroborated, or by certificate of the officer in whose office transfers of real property are to be recorded.

(b) The preference-right applicant must show that he is entitled under the section above outlined, together with his qualifications, to hold a permit as previously set forth in these regulations, and if such an application be filed, the Secretary of the Interior will award the permit to the party entitled thereto.

(c) If the land, either withdrawn or unwithdrawn, is covered by an unpatented nonmineral entry *without a reservation* of the oil and gas content to the government, a prospecting permit may not be granted so long as the entry subsists without such reservation. In cases where applications for prospecting permits are filed by persons other than the entrymen for land in this status such applications will be referred to the United States Geological Survey for classification as to the prospective oil value of the land affected. If the Geological Survey shall conclude and report that the land embraced in such a nonmineral entry is without prospective oil or gas value, the application for permit will be rejected as to such land; but if the Geological Survey shall report that the land has a prospective oil or gas value and offers a favorable opportunity for prospecting operations, then the General Land Office will direct the proper local officers to serve notice on the nonmineral entryman to the effect that said land has been reported as valuable for its oil or gas content, and that the said entryman will be allowed fifteen (15) days within which (1) to file in the local office his consent to a reservation to the government of the oil and gas content of the land embraced in his entry and in which to exercise his preference right, if any, to a prospecting permit for said land by filing a proper application therefor, or (2) to show cause, if any there be, why he should not consent to the mineral reservation, failing in either of which his entry will be canceled without further notice. The local office will thereupon report the action taken to the commissioner, whereupon (1) if the nonmineral entryman shall have failed to take any action, order of cancellation of the nonmineral entry will be made and action taken on the prospecting permit accordingly; (2) if consent to the reservation shall have been filed, a prospecting permit will be granted to the entryman or the former applicant, as the case may be, for the reserved mineral deposits; (3) if the nonmineral entryman shall submit a showing why the entry should not be impressed with a reservation of the mineral to the government, such showing will be referred to the Geological Survey for consideration and report. If upon the receipt of such report the department shall conclude that

the land is without mineral value, the application for prospecting permit will be rejected; but if the department shall conclude that, notwithstanding the showing made by the entryman, the land has a prospective oil and gas value, such action will be taken as the facts may warrant.

From the above it will be seen that it is desirable on the part of any applicant for a prospecting permit for land already embraced in a nonmineral entry without a reservation of the mineral, and likewise desirable on the part of any nonmineral entryman who is contending that the land is nonmineral in character, to submit with their respective applications or showings as complete and accurate geological data as may be procurable, preferably the reports and opinions of qualified experts.

(*d*) In case of conflict between a preference-right claim under section 20 of the act and one claimed by virtue of section 18 or 19, the issue will be determined on the basis of priority.

(*e*) Claimants under this section of the act may combine their holdings for the purpose of making joint application for a permit, provided the aggregate area does not exceed 2560 acres and that all the lands for which application is made are within an area of 6 miles square or within the same township.

(*f*) The right of a permittee under a preference-right permit to a lease after discovery is governed by other provisions of the act, as set forth in section 8 of these regulations.

12½. ASSIGNMENT OF PERMITS.—Permits, after being awarded, may be assigned to qualified persons or corporations upon first obtaining consent of the Secretary of the Interior. Mere rights to receive a permit are not assignable.

II. OIL AND GAS LEASES.

13. DESIGNATION AND OFFER OF LANDS FOR LEASE.—Pursuant to the provisions of section 17 of the act, the unappropriated deposits of oil or gas situated within known geologic structures of producing oil or gas fields, and the lands containing same, will be divided into leasing blocks or tracts in areas not exceeding 640 acres each, and not exceeding in length two and one-half times their width, and offered for lease at a stated royalty by competitive bidding to the highest responsible bidder having the qualifications prescribed by section 15, paragraph (*a*) hereof.

14. NOTICE OF LEASE OFFER.—Notice of the offer of lands for lease will be given by publication in a newspaper of general circulation in the county in which the lands or deposits are situated for a period of 30 days; such notice will state the day and hour on which the offering will be made at public auction at the United States land office of the district in which the lands are situated, to the qualified bidder offering the highest bonus for the lease at the stated rental and royalty. Copy of the notice will be posted in said local office during the period of publication. This notice will be published at the expense of the government. All bidders at any such auction are warned against violation of the provisions of section 59 of the United

States Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders.

15. AUCTION OF LEASE.—At the time fixed in the notice, the register or receiver will, by public auction, offer the land for lease on the terms and conditions as to payments of royalties and rents fixed in the notice, to the qualified bidder of the highest amount offered as a bonus for the privilege of leasing the land. The successful bidder must deposit with the receiver on the date of the sale, certified check on a solvent bank, or cash, for one-fifth of the amount bid by him, which payment the receiver will credit to "Trust funds—Unearned moneys." At the time of such payment the successful bidder will also file the requisite showing of his qualifications to receive a lease, which shall include the following:

(a) Proof of citizenship of applicant; by affidavit of such fact, if native born, or if naturalized, by certified copy of the certificate of naturalization, on the form provided for use in public land matters, unless such copy is already on file; if a corporation, by certified copy of the articles of incorporation and a showing as to the residence and citizenship of its stockholders.

(b) The affidavit of the bidder or the affidavit of one of the officers of a corporate bidder that the bidder does not hold another lease in the geologic structure of the same producing oil or gas field, nor more than two leases, or a lease and a permit, in the state, except under sections 18, 18*a*, 19, and 22 of the act; and also that the acceptance of the lease by such successful bidder will not be in violation of the provisions of section 27 of the act relative to excess holdings by individuals or corporations.

The register and receiver will thereupon transmit such showing, together with a report of the proceedings had at the auction, by special letter to the Commissioner of the General Land Office.

16. AWARD OF LEASE.—On receipt of the report of the auction from the register and receiver, the Secretary of the Interior will take action thereon, and either award the lease to the successful bidder or reject same, notice of which will be forthwith transmitted to the bidder through the local office. If the lease shall be awarded, the notice will be accompanied by copies of leases for execution by the lessee, who shall, within 30 days from receipt of such notice, execute said lease in triplicate, and pay to the receiver the balance of the bonus bid by him, together with the first year's rental, and also cause to be filed in the land office the bond required by section 2(*a*) of the lease; in lieu of such bond, Liberty bonds will be taken at par in the amount of the bond, as provided in the act of February 24, 1919 (40 Stat. 1148). If the bid be rejected, the receiver will return by his official check the deposit made at the auction. In case of the award of a lease and failure on the part of the bidder to execute same, and otherwise comply with the applicable regulations, the deposit made will be considered forfeited and disposed of as other receipts under this act.

17. FORM OF LEASE.—The lease referred to in the preceding sections will be in form and substance substantially as follows:

LEASE.

U. S. Land Office-----
Serial Number-----

DEPARTMENT OF THE INTERIOR.

Lease of oil and gas lands under the act of February 25, 1920.

Date—Parties.—This indenture of lease entered into, in triplicate, this ----- day of ----- A. D., 19___, by and between the United States of America, acting in this behalf by the Secretary of the Interior, party of the first part, hereinafter called the lessor, and ----- of -----, party of the second part, hereinafter called the lessee, under, pursuant, and subject to the terms and provisions of the act of congress approved February 25, 1920, Public No. 146, entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," hereinafter referred to as the act, which is made a part hereof, witnesseth:

SECTION 1. Purposes.—That the lessor in consideration of rents and royalties to be paid, and the covenants to be observed as herein set forth, does hereby grant and lease to the lessee the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following described tracts of land situated in the county of -----, State of -----, and more particularly described as follows: ----- containing ----- acres, more or less, together with the right to construct and maintain thereupon all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipe lines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment hereof, for a period of 20 years, with the preferential right in the lessee to renew this lease for successive periods of 10 years, upon such reasonable terms and conditions as may be prescribed by the lessor, unless otherwise provided by law at the time of the expiration of such periods.

SEC. 2. In consideration of the foregoing, the lessee hereby agrees:

(a) *Bond.*—To furnish a bond with approved corporate surety in the penal sum of \$5,000, conditioned upon compliance with the terms of the lease.

(b) *Commence drilling.*—The lessee agrees, within three months from delivery of executed lease, to proceed with reasonable diligence to install on the leased ground a standard or other efficient drilling outfit and equipment, and to commence drilling at least one well, and to continue such drilling with reasonable diligence to production, or to a point where the well is demonstrated unsuccessful, and thereafter to continue drilling with reasonable diligence at least one well at a time until the lessee shall have drilled wells equal in number to the number of 40-acre tracts embraced in the leased premises, unless the lessor shall, for any reason deemed sufficient, consent in writing to the drilling of a less number of wells; the lessee further agrees to drill all necessary wells fairly to offset the wells of others on adjoining land or deposits not the property of the United States.

(c) *Royalty and rents.*—To pay the lessor in advance, beginning with the date of the execution of this lease, a rental of \$1 per acre per annum during the continuance hereof, the rental so paid for any one year to be credited on the royalty for that year, and, in addition to such rental, a royalty of ----- per cent of the value of oil or gas produced from the land leased herein (except oil or gas used for production purposes on said lands or unavoidably lost), or, on demand of the lessor, ----- per cent of the oil or gas produced (except oil or gas used for production purposes on said lands, or unavoidably lost), in which case credit for rent shall be on the basis of the current field price of oil, the royalty, when paid in value, to be due and payable monthly on the fifteenth of each month following the month in which produced, to the receiver of public moneys of the proper land district; and when paid in kind, to be delivered in the field where produced at such times, and in such manner as may be required by the lessor; such royalties, whether in value or kind, shall be subject to reduction whenever the average daily production of any oil well shall not exceed 10 barrels per day, if in the judgment of the lessor the wells can not be successfully operated upon the royalties fixed herein.

(d) *Sales contract.*—To file with the Secretary of the Interior copies of all sales contracts for the disposition of oil and gas produced hereunder, except for production purposes on the land leased, and, in the event the United States shall elect to take its royalties in money instead of in oil or gas, not to sell or otherwise dispose of the products of the land leased, except in accordance with a sales contract or other method first approved by the Secretary of the Interior.

(e) *Monthly statement.*—To furnish monthly statements in detail in such form as may be prescribed by the lessor, showing the amount, quality, and value of all oil and gas produced and saved during the preceding calendar month as the basis for computing the royalty due the lessor. The leased premises, and all wells, improvements, machinery, and fixtures thereon or connected therewith, and all books and accounts of the lessee shall be open at all times for the inspection of any duly authorized officer of the department.

(f) *Plats and reports.*—To furnish annually and at such times as the Secretary shall require, in the manner and form prescribed by the Secretary of the Interior, a plat showing all development work and improvements on the leased lands, and other related information, with a report as to all buildings, structures, or other works placed in or upon said leased lands, accompanied by a report in detail as to the stockholders, investment, depreciation, and cost of operation, together with a statement as to the amount and grade of oil and gas produced and sold, and the amount received therefor, by operations hereunder.

(g) *Log of wells.*—To keep a log in the form prescribed by the Secretary of all the wells drilled by the lessee, showing the strata and character of the ground passed through by the drill, which log, or copy thereof, shall be furnished to said lessor on demand.

(h) *Diligence—Prevention of waste—Health and safety of workmen.*—To exercise reasonable diligence in drilling and operating wells for the oil and gas on the lands covered hereby while such products can be secured in paying quantities, unless consent to suspend operations temporarily is granted by the Secretary of the Interior; to carry on all operations hereunder in a good and workmanlike manner, in accordance with approved methods and practice, having due regard for the prevention of waste of oil or gas developed on the land, or the entrance of water through wells drilled by the lessee to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits, the preservation and conservation of the property for future productive operations, and to the health and safety of workmen and employees; to plug securely any well before abandoning the same so as to effectually shut off all water from the oil- or gas-bearing strata; not to drill any well within 200 feet of any of the outer boundaries of the lands covered hereby unless the adjoining lands have been patented or the title thereto otherwise vested in private owners; to conduct all mining, drilling, and related productive operations subject to the inspection of the lessor; to carry out at expense of the lessee all reasonable orders and requirements of lessor relative to prevention of waste and preservation of the property and the health and safety of workmen, and on failure so to do the lessor shall have the right to enter on the property to repair damage or prevent waste at lessee's cost; to abide by and conform to regulations in force at the time the lease is granted covering the matters referred to in this paragraph: *Provided*, That lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(i) *Taxes and wages—Freedom of purchase.*—To pay when due all taxes lawfully assessed and levied under the laws of the state upon improvements, oil, and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(j) *Reserved deposits.*—To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(k) *Excess holdings.*—To observe faithfully the provisions of section 27 of the act defining the interest or interests that may be taken, held, or exercised under leases authorized by said act.

(l) *Assignment of lease.*—Not to assign this lease or any interest therein, nor sublet any portion of the leased premises, except with the consent in writing of the Secretary of the Interior first had and obtained.

(m) *Deliver premises in case of forfeiture.*—To deliver up the premises leased, with all permanent improvements thereon, in good order and condition in case of forfeiture of this lease.

SEC. 3. The lessor expressly reserves:

(a) *Rights reserved—Easements and rights of way.*—The right to permit for joint or several use such easements or rights of way, including easements in tunnels

upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in said act, and the treatment and shipment of products thereof by or under authority of the government, its lessees, or permittees, and for other public purposes.

(b) *Disposition of surface.*—The right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereinafter enacted in so far as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein.

(c) *Pipe lines to convey at reasonable rates.*—The right to require the lessee, his assignee, or beneficiary, if owner, or operator of, or owner of a controlling interest in any pipe line, or any company operating the same which may be operated accessible to the oil derived from lands under such lease, to accept and convey at reasonable rates and without discriminating the oil of the government or of any citizen or company, not the owner of any pipe line, operating a lease or purchasing oil or gas under the provisions of this act.

(d) *Monopoly and fair prices.*—Full power and authority to carry out and enforce all the provisions of section 30 of the act, to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices to prevent monopoly and to safeguard the public welfare.

(e) *Helium.*—Pursuant to section 1 of the act, the lessor reserves the right to take all helium from any gas produced under this lease, but the lessee shall not be required to extract and save the helium for the lessor; in case the lessor elects to take the helium, the lessee shall deliver all gas containing same, or portion thereof desired, to the lessor in the manner required by the lessor, for the extraction of the helium in such plant or reduction works for that purpose as the lessor may provide, whereupon the residue shall be returned to the lessee with no substantial delay in the delivery of gas produced from the well to the purchaser thereof; provided, that the lessee shall not, as a result of the operation in this section provided for, suffer a diminution in value of the gas from which the helium has been extracted, or loss otherwise, for which the lessee is not reasonably compensated, save for the value of the helium extracted; the lessor further reserves the right to erect, maintain, and operate any and all reduction works and other equipment necessary for the extraction of helium on the premises leased.

SEC. 4. *Surrender and termination of lease.*—The lessee may, on consent of the Secretary of the Interior first had and obtained in writing, surrender and terminate this lease upon the payment of all rents, royalties, and other obligations due and payable to the lessor, and upon payment of all wages and moneys due and payable to the workmen employed by the lessee, and upon a satisfactory showing to the Secretary that the public interest will not be impaired; but in no case shall such termination be effective until the lessee shall have made full provision for conservation and protection of the property; upon like consent had and obtained the lessee may surrender any legal subdivisions of the area included herein.

SEC. 5. *Purchase of materials, etc., on termination of lease.*—Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessor or another lessee may, if the lessor shall so elect within six months from the termination of the lease, purchase all materials, tools, machinery, appliances, structures, and equipment placed in or upon the land by the lessee, and in use thereon as a necessary or useful part of an operating or producing plant, on the payment to the lessee of such sum as may be fixed as a reasonable price therefor by a board of three appraisers, one of whom shall be chosen by the lessor, one by the lessee, and the other by the two so chosen; pending such election all equipment shall remain in normal position. If the lessor, or another lessee, shall not, within six months, elect to purchase all or any part of such materials, tools, machinery, appliances, structures, and equipment, the lessee shall have the right at any time, within 90 days, to remove from the premises all the materials, tools, machinery, appliances, structures, and equipment which the lessor shall not have elected to purchase, save and except casing in wells and other equipment or apparatus necessary for the preservation of the well or wells.

SEC. 6. *Judicial proceedings in case of default.*—If the lessee shall fail to comply with the provisions of the act or make default in the performance or observance of any of the terms, covenants, and stipulations hereof, or of the general regulations

promulgated and in force at the date hereof, and such default shall continue after service of written notice thereof by the lessor, then the lessor may institute appropriate judicial proceedings for the forfeiture and cancellation of this lease in accordance with the provisions of section 31 of said act; but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. A waiver of any particular cause of forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of forfeiture, or for the same cause occurring at any other time.

SEC. 7. *Heirs and successors in interest.*—It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon and every benefit hereof shall inure to the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

SEC. 8. *Unlawful interest.*—It is also further agreed that no member of or delegate to congress or resident commissioner, after his election or appointment, or either before or after he has qualified, and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom, and the provisions of section 3741 of the Revised Statutes of the United States, and sections 114, 115, and 116 of the Codification of the Penal Laws of the United States approved March 4, 1909 (35 Stat. 1109), relating to contracts enter into and form a part of this lease so far as the same may be applicable.

In witness whereof

THE UNITED STATES OF AMERICA,

By ----- [L. s.]

Witness:

----- [L. s.]
----- [L. s.]
----- [L. s.]

Bond required under paragraph 2a of the lease should be in substantially the following form:

BOND.

DEPARTMENT OF THE INTERIOR.

GENERAL LAND OFFICE.

U. S. Land Office-----
Serial Number-----

Bond of oil and gas lessee.

[Act of February 25, 1920 (Public No. 146).]

Know all men by these presents, That we, -----, of the county of -----, in the State of -----, as principal, and ----- of the county of -----, in the State of -----, as surety, are held and firmly bound unto the United States of America in the sum of ----- dollars, lawful money of the United States, for the use and benefit of the United States and of any entryman or patentee of any portion of the land covered by the hereinafter described lease heretofore entered or patented with a reservation of the oil and gas deposits to the United States, to be paid to the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators, successors, and assigns, jointly and severally by these presents.

Signed with our hands and sealed with our seals this ----- day of -----, in the year of our Lord one thousand nine hundred and -----.

The condition of the foregoing obligation is such that

Whereas the said principal, by instrument dated -----, has been granted the exclusive right to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following described lands -----, under and pursuant to the provisions of the act approved February 25, 1920 (Public No. 146); and

Whereas the said principal has by such instrument entered into certain covenants and agreements set forth therein, under which operations are to be conducted:

Now, therefore, if said principal shall faithfully comply with all the provisions of the above described lease, then the above obligation is to be void and of no effect, otherwise to remain in full force and virtue.

Signed, sealed, and delivered in presence of

Name and address of witness :

----- [L. s.]
Principal.

----- [L. s.]
Surety.

Where government bonds are deposited as security in lieu of a surety bond, in compliance with paragraph 2*a* of the lease form, same should be accompanied with a combined bond and power of attorney to sell, duly executed by the lessee, along the same general lines as the form set out in paragraph 4*h* of these regulations with suitable changes made in the condition of the bond to correspond with the condition in the lease bond, form for which is above set out.

III. RELIEF MEASURES.

Sections 18, 19, and 22 of the act provide for the "relief," so called, of certain defined claimants of oil and gas lands, who at date of the act had not perfected their claims under the preexisting mining laws, and are prevented from doing so by withdrawal of the land or by this act.

18. CONDITIONS FOR RELIEF UNDER SECTION 18:

(*a*) That the land claimed must have been included in the executive order of withdrawal of September 27, 1909, and must have remained so withdrawn.

(*b*) That the claim must have been initiated under the placer mining laws prior to July 3, 1910, and claimed and possessed continuously from that time.

(*c*) That no claimant who has acquired any interest in the land since September 1, 1919, from another claimant who, on that date or since that time, was, or is claiming or holding, more than the maximum allowed a claimant under section 18 of the act, may secure a lease under section 18, or any interest therein. This limitation does not, however, apply to an exchange of an interest in such lands made prior to January 1, 1920, which did not increase or reduce the area or acreage held or claimed, in excess of the maximum by either party to the exchange.

(*d*) That claimant or predecessors must have drilled an oil or gas well on the land to discovery.

(*e*) That all conflicting claims asserted prior to July 1, 1919, must have been disposed of, as provided in section 28 hereof or otherwise.

(*f*) That no claimant who has been guilty of any fraud or who had knowledge or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

(*g*) That claimant must, on or before August 25, 1920, file a relinquishment to the United States of all right, title, and interest in and to the land, together with an application for a lease. This relinquishment may be in the form of an unconditional quitclaim

deed, duly executed and acknowledged, but not recorded, and when filed will be held for such action as the facts and the law in the case warrant and require.

(h) That claimant must pay for one-eighth of the value at the time of production of all oil and gas produced prior to date of filing relinquishment and application for relief, exclusive of oil and gas used on the land for production purposes, or unavoidably lost.

19. RELIEF THAT MAY BE GRANTED UNDER SECTION 18:

(a) *Lands not in naval petroleum reserves.*—A qualified claimant, upon complying with the provisions of the act and these regulations, will be entitled to a 20-year lease from the United States, commencing and effective as of the date of filing relinquishment and application for relief, substantially in the form prescribed in section 17 hereof, at a royalty to be fixed by the Secretary of the Interior, but not less than $12\frac{1}{2}$ per cent of all oil and gas produced exclusive of that used for production purposes on the claim, or unavoidably lost. There is, however, a limitation placed by the act upon the acreage that may be included in such lease. If the geologic oil or gas structure of the producing field in which the claim is situated does not exceed 640 acres in area the lease may include the entire area if covered by the claim; but if the area of such structure exceeds 640 acres the act provides that not more than one-half of the area, same to be selected by the claimant but in no case to exceed 3200 acres, may be leased to any one claimant.

(b) *Lands in naval petroleum reserves.*—If the land claimed is within a naval petroleum reserve the claimant will be entitled to lease only the producing wells on the claim, together with an area of land sufficient for the operation of such wells, upon a royalty to be fixed by the Secretary of the Interior, but not less than $12\frac{1}{2}$ per cent of the production, except that used for production purposes on the claim or unavoidably lost. The act forbids the drilling of any wells in lands subject to this provision within 660 feet of the leased wells without the consent of the lessee. It further provides that the President may, in his discretion, lease the remainder or any part of the claim on which such wells have been drilled, and in the event of such leasing the claimant shall have a preference to such lease. The President may also permit the lessee of any well to drill additional wells within the limited area of 660 feet upon such terms and conditions as he may prescribe. These terms and conditions can not be prescribed here, but will be determined on the merits in each separate case.

(c) *Royalties.*—The royalties payable under leases granted pursuant to section 18 of the act are cumulative, and are hereby determined and prescribed as follows:

For all oil produced of 30° Baume or over upon each claim on which the wells average not exceeding 20 barrels per day per well for the calendar month, $12\frac{1}{2}$ per cent; upon each claim on which the wells average more than 20 barrels and not more than 50 barrels per day per well for the calendar month, $16\frac{2}{3}$ per cent; upon each claim on which the wells average more than 50 barrels and not more than 100 barrels per day per well for the calendar month, 20 per cent;

upon each claim on which the wells average more than 100 barrels per day per well for the calendar month, 25 per cent.

For all oil produced of less than 30° Baume upon each claim on which the wells average not exceeding 20 barrels per day per well for the calendar month, 12½ per cent; upon each claim on which the wells average more than 20 barrels and not more than 50 barrels per day per well for the calendar month, 14⅔ per cent; upon each claim on which the wells average more than 50 barrels and not more than 100 barrels per day per well for the calendar month, 16⅔ per cent; upon each claim on which the wells average more than 100 barrels per day per well for the calendar month, 20 per cent.

Only wells which have a commercial production during at least a part of the month shall be considered in ascertaining the average production herein, and the Secretary of the Interior shall determine what are commercially productive wells under this provision.

The royalties on gas produced, if any, will be fixed and determined in each lease.

20. CONDITIONS FOR RELIEF UNDER SECTION 19:

A. *For permit.*—(a) That the land must not be in a naval petroleum reserve.

(b) The applicant or his predecessor in interest must have been an occupant or claimant of the land on or before October 1, 1919, under a claim initiated under the placer mining laws, when the land was not withdrawn, provided that a transferee of such a claim subsequent to October 1, 1919, will not be permitted to hold permits under section 19 of the act to exceed 2560 acres in the same geologic structure, nor for more than three times that area in the same state.

(c) That claimant, by himself or predecessor in interest, must have performed all acts under the preexisting laws necessary to valid locations, except to make discovery.

(d) That prior to February 25, 1920, claimant must have performed work or expended on or for the benefit of such locations an amount equal in the aggregate to \$250 for each location.

(e) That no claimant who has been guilty of any fraud or who had knowledge, or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

(f) That claimant must, on or before August 25, 1920, file a relinquishment to the United States of all right, title, and interest in and to the land, together with an application for a permit. This relinquishment may be in the form of an unconditional quit-claim deed, duly executed and acknowledged, but not recorded, and when filed will be held for such action as the facts and the law in the case warrant and require.

B. *For lease.*—The conditions necessary to obtaining a lease under section 19 of the act are identical with those outlined in paragraphs (a), (b), (c), and (f), for permits, together with the following additional conditions:

(a) That claimant must have made a discovery of oil or gas on or before February 25, 1920.

(b) That claimant must not be entitled to relief on the land in question under section 18 of the act.

(c) That claimant must pay for one-eighth of the past production up to date of filing application for relief, exclusive of that used on the land for production purposes or unavoidably lost.

21. RELIEF THAT MAY BE GRANTED UNDER SECTION 19:

(a) A claimant qualified under the above conditions relating to permits, upon complying with the provisions of the act and these regulations, will be entitled to a prospecting permit upon the same terms, conditions, and limitations as to acreage, as other permits provided for in the act, substantially in form prescribed in section 6 hereof.

(b) A claimant qualified under the above conditions relating to leases is entitled to a 20-year lease from the United States, effective from date of filing application for relief, substantially in the form prescribed in section 17 hereof, the royalty to be fixed by the Secretary of the Interior, but such royalty may not be less than $12\frac{1}{2}$ per cent of all oil and gas produced exclusive of that used for production purposes on the land or unavoidably lost. In the event the land is in the geologic structure of proven territory at the time of granting the permit under this section, the royalty required under the lease based thereon shall not be less than $12\frac{1}{2}$ per cent, but if at the time the permit is granted the land is not in proven territory the amount of royalty will be governed by the general terms of the act as set out in section 14 thereof.

22. ALASKA CLAIMS—CONDITIONS FOR RELIEF UNDER SECTION 22:

A. *For permit.*—(a) That claimant must have been an occupant or claimant of the land on February 25, 1920, under a claim initiated under the placer mining laws by claimant or predecessors prior to November 3, 1910, the date of the executive order withdrawing all public lands in Alaska containing petroleum deposits, including those in national forests.

(b) That claimant must have performed all acts prior to November 3, 1910, under the then existing laws necessary to valid locations except to make discovery.

(c) That claimant, (1) prior to November 3, 1910, must have made substantial improvements for the discovery of oil or gas on or for each location, or (2) prior to February 25, 1920, expended not less than \$250 in improvements on or for the benefit of each location.

(d) That claimant must on or before February 25, 1921, or within six months after final denial or withdrawal of application for patent, file a relinquishment to the United States of all right, title, and interest in and to the land. This relinquishment must be in the form of an unconditional quit-claim deed, duly executed and acknowledged, but not recorded, and when filed will be held for such action as the facts and the law in the case warrant and require.

In addition to the above, the conditions outlined in paragraph (e) of section 20 hereof are applicable to relief in Alaska.

B. *For lease.*—The conditions necessary to obtaining a lease under section 22 of the act are identical with those outlined in the para-

graphs relating to permits in Alaska together with the following additional conditions:

(a) That claimant or predecessors must have drilled an oil or gas well on the land to discovery.

(b) That claimant must pay for one-eighth of the past production exclusive of that used on the land for production purposes or unavoidably lost.

23. ALASKA CLAIMS—RELIEF THAT MAY BE GRANTED UNDER SECTION 22:

(a) A claimant qualified under the above conditions relating to permits, upon complying with the conditions of the act and these regulations will be entitled to prospecting permits under the same terms and conditions as other permits in Alaska provided for in section 13 of the act, substantially in the form prescribed in section 6 hereof.

(b) A claimant qualified under the above conditions relating to leases is entitled to a lease substantially in the form prescribed in section 17 hereof, the rental and royalty to be fixed by the Secretary of the Interior and specified in the lease, subject to readjustment at the end of each 20-year period of the lease.

(c) Only five permits or leases in the aggregate may be held at any one time by any claimant, and not more than 1280 acres may be included in one permit under section 22 of the act.

23½. ROYALTIES AND RENTALS ON OIL AND GAS LEASES IN ALASKA.—The royalties and rentals payable under oil and gas leases granted in Alaska pursuant to sections 14 and 22 of the act of February 25, 1920 (Public No. 146), are hereby determined and prescribed as follows:

(a) For leases granted under section 22 of the act, the royalty shall be: (1) For the first five years from and after the date of the lease, no royalty, except in the case of leases whereon the producing wells yield an average of 100 barrels or more per well per day for the calendar month, in which event the royalty shall be 5 per cent of all oil produced; (2) for the second period of five years from and after the date of each lease under section 22 of the act the royalty upon all leases shall be 5 per cent; (3) for the succeeding 10 years the royalty upon all leases under section 22 of the act shall be 10 per cent of all oil produced.

(b) Upon leases granted in Alaska under section 14 of the act, the permittee who discovers oil will be entitled to a lease for one-fourth of the area of the permit without payment of royalty for the first five years succeeding the date of the lease and thereafter shall pay a royalty of 5 per cent upon all oil produced. On the remaining lands included within the area of the permit, the permittee will be given a preference right to a lease without payment of royalty for the first five years succeeding the date of the lease, except in the case of leases whereon the producing wells yield an average of 100 barrels or more per well per day for the calendar month, in which event the royalty shall be 5 per cent; for the second five years, the lessee will be required to pay a royalty of 5 per cent upon all oil

produced, and for the succeeding 10 years, a royalty of 10 per cent upon all oil produced.

(c) No royalty will be charged in any case upon leases wherein the wells upon the lands average less than 10 barrels per well per day for the calendar month.

(d) No rental upon any oil or gas lease in Alaska will be charged during the first five years succeeding the date of the lease. After the expiration of the first five years succeeding the date of the lease, a rental of 10 cents per acre per annum will be charged on all leases, payable in advance; *provided*, that the rentals so paid for any one year shall be credited upon the royalties accruing for that year.

(e) The royalties on gas produced, if any, will be fixed and determined in each lease.

24. BENEFICIARIES UNDER LEASES OR PERMITS.—All leases or permits under sections 18, 19, and 22 shall inure to the benefit of the claimant and all persons claiming through or under him by lease, contract, or otherwise, as their interests may appear, subject to the same limitations as to area and acreage as is provided for claimant, but such persons will not necessarily be made parties to government leases, and may assert their rights in the courts. Disputes of this character are not to be confused with adverse claims based upon independent title, hereinafter referred to. (See Sec. 28 hereof.)

24½. WHO MAY APPLY.—All proper parties to a claim for relief under section 18, 19, or 22 of the act should join in the application, but, if for any sufficient reason that is impracticable, any person claiming a fractional or undivided interest in such claim may make application for a lease or permit, stating the nature and extent of his interest, and the reasons for nonjoinder of his coowner or coowners. In cases where two or more applications are made for the same claim or part of a claim, leases or permits will be granted to one or more of the claimants, as the law and facts shall warrant and as shall be deemed just.

25. FORM AND CONTENTS OF APPLICATION.—No set forms of application for a lease under section 18, 19, or 22, or a permit under section 19 or 22 of the act can be prescribed because the facts and circumstances pertaining to claims for relief are so varied. Applications for such leases or permits must be made under oath and the supporting documents and papers certified or under oath so far as practicable. The application, with all the accompanying papers, should be filed in the United States land office of the district in which the land is situated. Applications and supporting papers need not be executed in duplicate, but one complete copy of each application and supporting papers (except abstract of title) should be filed with the application, which copy will be transmitted by the register and receiver to the Chief of Field Division and notation to that effect made on the original. The application should contain full information as to the facts upon which the applicant relies for relief, covering the following points and such additional matters as may, from the peculiar facts in the case, be material in the establishment of his claim under the law:

(a) Date of application for lease or permit.

(b) Applicant's name, post-office address and citizenship.

(c) *Description of land.*—The land for which the application is made must be described by legal subdivisions of section, township, and range, if surveyed; if not surveyed, then by metes and bounds and courses and distances from some permanent monument. If the application is for a lease of unsurveyed land, the applicant, after he has been awarded the right to a lease, but before issuance thereof, will be required to deposit with the United States surveyor general of the state in which the land is situated the estimated cost of making a survey of the land, the balance, if any, after the survey is completed to be returned.

(d) *Origin and basis of applicant's claim for relief.*—The applicant must bring his claim clearly within all the requirements of the act as specifically pointed out in sections 18, 20, and 22 of these regulations. Every application must be supported by a duly certified abstract of title to the land brought up to the date of filing the application. In the event an abstract of title is already on file in the land department, a supplemental abstract extending over the period or periods not covered by the former may be furnished, and if furnished will be considered in connection with the abstract already on file. If any fraud has been committed in connection therewith, then a full affirmative showing must be made by the applicant to the effect that he has not been a party to such fraud, and that he has not been guilty of any fraud or had knowledge of fraud or reasonable grounds to know of any fraud in connection with his claim. If an application for patent has been filed, a brief résumé of the actions taken thereon should be stated. If the land is or has been involved in litigation in the courts to which the United States is a party, the status or result of such litigation should be furnished.

(e) *Particulars as to conflicting claims or interests.*—All conflicting or disputed claims, if any, to the land or production therefrom, specifying the character and extent of such interests, must be shown.

(f) *Discovery.*—Before a lease may be awarded under the relief sections of the act it must be satisfactorily shown that the applicant or his predecessors have drilled a well to a substantial and certain discovery of oil or gas in a producing stratum on the land covered by the location under which the applicant is asserting his claim.

(g) *Wells, improvements, and production.*—With each application for a lease under section 18, 19, or 22 of the act there must be filed a complete and detailed statement showing the number, depth, condition, and present daily production of all wells drilled on the land by the applicant and his predecessors in interest, and the nature and extent of all other improvements placed thereon by them.

With each application for a permit under section 19 or 22 of the act, a description of the work performed and improvements made upon or for the benefit of the location by the applicant and his predecessors must be filed, together with an itemized statement of the cost thereof. If the application is made under section 22, the date the work was performed or the improvements made must also be shown.

In either case applicant must show the position of all wells and improvements by courses and distances from the nearest corner of the public land survey, if the land is surveyed; if not surveyed, then from a corner of the claim. This may be shown by means of a diagram.

(*h*) *Amount and value of past production.*—Claimant must furnish a complete detailed statement, by months, of all past production from the land, up to the date of filing the application and relinquishment, showing (1) the grade and total quantity of oil and gas produced; (2) the amount sold or otherwise disposed of, to whom sold, and the selling price or other consideration received therefor; (3) a statement of the grade and amount of any and all such production held in storage, when produced, and the value at time of production; and (4) the amount consumed for production purposes on the land, or unavoidably lost.

Copies of any and all contracts under which oil or gas produced from the land has been or is being sold or otherwise disposed of must be furnished.

(*i*) *Inspection of records.*—The agreement on the part of the applicant to permit the inspection of any and all books, records, and accounts having any bearing on the data or information required by the application and to furnish copies or abstracts of such books, records, or accounts, on demand.

(*j*) *Interest in other leases and permits.*—The applicant will also furnish a complete statement of all lands for which he has filed application for lease or permit under sections 18, 19, and 22 of the act, and of such lands as are included in other applications in which he has any direct or indirect interest, together with a full disclosure of such interest by stock ownership or otherwise. If the applicant is a corporation, a certified copy of its articles of incorporation must be furnished, and a full disclosure made of the ownership of its stock, whether such stock is owned, held, or controlled directly or indirectly by any other person or corporation, who or which is an applicant for or a holder of a lease under said sections, and, in the event of such ownership, a description of the legal subdivisions of all the lands affected thereby is required. Lists of stockholders need not necessarily be filed in the local land offices, but may be filed directly with the Commissioner of the General Land Office, where they will be kept confidential except for government purposes. In the event the lands so affected are not surveyed they may be described by the usual method of courses and distances and acreage.

(*k*) *Limitation of area.*—Applications for lease under section 18 of the act should disclose all other applications in which the applicant is directly or indirectly interested, for lease under said section for lands (describing same) in the same geologic structure; and applications under section 22 of the act should show all other applications for leases or permits under said section. The boundaries of the geologic structures of the various producing fields will be determined and announced by the United States Geological Survey under supervision of the Secretary of the Interior, and such information will be placed on file in all United States land offices.

(*l*) *Interests of beneficiaries.*—In applications for lease the nature and extent of the interests of all beneficiaries thereof by virtue of operating contracts or otherwise, not covered by paragraph 25 (*j*), must be disclosed, together with a full showing of all their interests in other leases or applications for leases under this act. If the beneficiary is a corporation or joint-stock company, a full disclosure must be made of the ownership of its stock and the residence and citizenship of its stockholders.

26. PAYMENT OF ROYALTY ON PAST PRODUCTION.—The application must be accompanied by a certified check in the amount of one-eighth of the gross value of all oil and gas produced and sold or held in storage, as per the statement required in paragraph 25 (*h*). All such sums will be held by the receiver in his account of "Trust funds—Unearned moneys" to await instructions as to their disposition. In lieu of the certified check herein required, the applicant may be permitted to deposit a bond by approved surety company in an amount not less than one-eighth of the estimated gross value of all oil and gas produced and sold or held in storage, securing the payment to the United States within 30 days from the award of the lease of the cash value of the past production due the United States under this act. In cases where the proceeds, or part thereof, of such past production have been deposited in escrow, pursuant to operating agreements under the act of August 25, 1914 (38 Stat. 708), or where in suits brought by the government affecting such lands the proceeds of production, or part thereof, have been impounded in the custody of receivers, a formal tender may be made of the funds so held in escrow or impounded to the extent available or in the amount necessary, as the case may be, in lieu of such cash payment. In such cases the interest accumulating on such escrowed or impounded moneys after the tender is made will go to the government.

Liberty bonds will be accepted at original cost in payment of royalty on past production in such proportion as the escrowed or impounded moneys have been invested therein.

Operating contracts made under the provisions of the act of August 25, 1914, *supra*, and in operation at the time of such tender, will not be terminated until the entire transaction of granting a lease and payment of royalty on past production shall have been consummated; nor will the Department of Justice be requested to dismiss any suits involving the land affected until the application for a lease has been adjudicated and approved; whereupon, after the suit has been dismissed and the impounded money tendered paid over to the government, the lease will be executed and delivered.

27. PUBLICATION OF NOTICE.—Immediately upon the filing of an application for a lease or permit under section 18, 19, or 22 of the act, the register and receiver will cause to be published, at the expense of the applicant, in a newspaper designated by the register, published in the vicinity of the land and most likely to give notice to the general public, a notice of the said application in substantially the following form:

PUBLISHED NOTICE.

DEPARTMENT OF THE INTERIOR.

UNITED STATES LAND OFFICE.

-----,
-----, 19--.

Notice is hereby given that -----, of -----, has applied for an oil and gas ----- under section ----- of the act of February 25, 1920 (Public No. 146), for ----- section -----, township ----- of range -----, ----- meridian, ----- county, State of -----. Any and all persons having adverse or conflicting claims to said land are hereby notified that a full statement, under oath, of such claim should be filed in this office showing a superior right to a permit or lease under said act or a valid existing adverse or conflicting claim to the land or the minerals therein under the public land laws, on or before -----; otherwise such claim may be disregarded in granting the permit or lease applied for.

-----,
Register.

The register and receiver will fix a date in the notice on or before which adverse or conflicting claims may be asserted, which date should be not less than 30 nor more than 40 days after the date of first publication of the notice.

Such notice will be published in the regular issue and not in any supplement of the newspaper, once each week for a period of five consecutive weeks if in a weekly paper, or if in a daily paper for a period of 30 days. The register and receiver will post a copy of said notice in a conspicuous place in their office during the period of publication.

Upon the applicant's furnishing satisfactory proof of such publication, but not earlier than the day following that set in the published notice on or before which adverse or conflicting claims were to be filed, the register and receiver will transmit by special letter all papers in the case, including any adverse or conflicting claims that may have been filed, together with proof of posting said notice in their office, to the Commissioner of the General Land Office.

28. ADVERSE OR CONFLICTING CLAIMS—PROCEDURE.—In case of adverse or conflicting claims for leases under section 18, 19, or 22, or permits under section 19 or 22, the Secretary of the Interior is clothed with authority to grant leases or permits, as the case may be, to one or more of them, as shall be deemed just.

(a) To have their claims considered in connection with the awarding of leases or permits it will be necessary for adverse claimants to make full showing (1) of a superior right to a lease or permit under this act, or (2) a superior right under some other public land law. If the former, the conflicting claimant must make out a complete case in his own behalf as required by these regulations on or before August 25, 1920.

(b) Upon receipt of the application and showing of an adverse claimant the Commissioner of the General Land Office will consider same. If, in his judgment, the adverse claimant has failed to make a prima facie case showing that he is entitled to a lease or permit, as the case may be, for at least part of the land, his application will

be rejected, subject to appeal to the Secretary of the Interior. But if the adverse claimant makes out a prima facie case the commissioner will take such course as may be advisable under the circumstances of each particular case to settle and adjust the rights of the respective parties, and may, if deemed necessary, order a formal hearing to settle disputed questions of fact. In the absence of appeal to the Secretary of the Interior from the final order or decision of the commissioner same shall be conclusive.

29. COMPROMISES UNDER SECTION 18*a*.—No special procedure will be outlined under this section. Any request for a compromise or settlement under this section which may be filed in the Land Department will be transmitted to the President with such report as may be deemed advisable under the circumstances of the particular case. In case the land is in a naval petroleum reserve the Navy Department will be consulted before making such report.

IV. RIGHTS OF WAY FOR PIPE LINES.

30. Section 28 of the act grants to any applicant having the qualifications outlined in section 1 of these regulations rights of way through public lands of the United States, including national forests, for pipe-line purposes for the transportation of oil or natural gas, on condition that the pipe lines for which rights of way are granted shall be operated and maintained as common carriers. The grant carries with it the right to the use of the ground actually occupied by the pipe line, and 25 feet on each side thereof for the purpose of construction, maintenance, and operation of the pipe line. Applicants for rights of way under this act will be governed by the regulations set forth in circular of June 6, 1908 (36 L. D. 567), in so far as applicable, appropriate changes being made in the forms therein prescribed to make them applicable to right of way cases arising under the act of February 25, 1920 (public No. 146), for pipe lines to be constructed, maintained, and operated as common carriers. Failure on the part of grantee to fulfill the conditions imposed by the act shall be ground for forfeiture of the grant by the United States district court for the district in which the property, or some part thereof, is situated.

V. FEES AND COMMISSIONS.

31. Under the authority of section 38 of the act, the following fees and commissions are prescribed for transactions under the act:

(*a*) For receiving and acting on each application for a permit, lease, or other right filed in the district land office in accordance with these regulations, there shall be paid a fee of \$2 for each 160 acres, or fraction thereof, in such application, but such fee in no case to be less than \$10, the same to be paid by the applicant and considered as earned when paid, and to be credited in equal parts on the compensation of the register and receiver within the limitations provided by law.

(*b*) A commission of 1 per cent on all moneys received in each receiver's office, to be equally divided between the register and receiver; such commission will not be collected from the applicant,

lessee, or permittee in addition to the moneys otherwise provided to be paid.

It should be understood that the commission here provided for will not affect the disposition of the proceeds arising from operations under the act as provided in section 35 thereof; also that such commission will be credited on compensation of registers and receivers only to the extent of the limitation provided by law for maximum compensation of such officers.

(See Hotkin, 49 L. D. 344.)

VI. REPEALING AND SAVING CLAUSES.

32. Section 37 of the act provides that hereafter the deposits of coal, phosphate, sodium, oil, oil shale and gas, referred to and described therein, may be disposed of only in the manner provided in the act "except as to valid claims existent at date of passage of this act, and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery.

Stated negatively under this section of the act the following classes of oil or gas placer locations, so called, notwithstanding absence of fraud and full compliance with law in other respects, may not proceed to patent, viz:

(a) Any location made after withdrawal of the land.

(b) Any location made before withdrawal of the land, but not perfected by discovery at date of withdrawal, which does not come within the protective proviso of section 2 of the act of June 25, 1910 (36 Stat. 847); that is to say, any claimant who, at date of withdrawal, was not a *bona fide* occupant or claimant in diligent prosecution of work leading to discovery of oil or gas, and who has not continued in such diligent prosecution to discovery.

(c) Any location on lands not withdrawn, on which, at the date of the act, the claimant had not made discovery or was not in diligent prosecution of work leading to discovery, and does not continue such work with diligence to discovery.

Very respectfully,

CLAY TALLMAN,
Commissioner.

Approved:

JOHN BARTON PAYNE,
Secretary.

APPENDIX.

(To 'Oil and Gas Regulations.')

DIGEST OF DECISIONS AND OPINIONS IN CONNECTION WITH THE
ADMINISTRATION OF THE ACT OF FEBRUARY 25, 1920,
AS APPLIED TO OIL AND GAS.

Permits for Lands in Government Reclamation Projects.

In the case of permits issued for lands within reclamation withdrawals the following additional conditions will be included in the permit:

7. (b) To reimburse damage sustained by any reclamation homestead entryman pursuant to the requirements of paragraph 8 hereof: (c) To pay any damage caused to any reclamation project or the water supply thereof by failure to comply fully with the requirements of paragraph 9 hereof.

8. That as to any lands covered by this permit which are also embraced in any reclamation homestead entry with a reservation of the oil and gas to the United States, permittee shall reimburse the entryman for all damage to crops or improvements caused by such drilling or other operations, such damage to include reimbursement of the entryman by the permittee of all reclamation charges for construction, operation, and maintenance for the portion of the land used and occupied by the permittee during the period of such use and occupation.

9. That as to any lands covered by this permit within the area of any government reclamation project or in proximity thereto the permittee shall erect such dikes and embankments or take such other precautions as may be necessary, as required by the project manager, effectively to impound any flow of refuse oil, salt water, or oil from wells drilled, to prevent any injury to lands susceptible of irrigation under such project or injury to the water supply thereof.

In such case the following form of bond will be required:

BOND.

DEPARTMENT OF THE INTERIOR.

GENERAL LAND OFFICE.

U. S. Land Office.....
Serial Number.....

Bond of oil and gas permittee.

[Act of February 25, 1920 (Public No. 146).]

Know all men by these presents, That _____ of _____ State of _____ as principal, and _____ of _____ State of _____, as surety, are held and firmly bound unto the United States of America, for the use and benefit of the United States and of any reclamation homestead entryman on any of the hereinafter described lands embraced in that certain prospecting permit hereinafter referred to, in the sum of \$5,000, lawful money of the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators, successors, and assigns jointly and severally by these presents.

Signed with our hands and sealed with our seals this _____ day of _____, 19____.

The condition of the foregoing obligation is such that, whereas the said principal has been granted under the act of February 25, 1920, Public No. 146, a permit (Serial No. _____) to prospect for oil and gas for two years, upon the following described lands: _____ on condition that the permittee shall (a) repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation; (b) reimburse any homestead entryman of land covered by said permit for all damage to crops and improvements caused by drilling or other operation by the permittee, such damage to include reimbursement of the entryman by the permittee of all reclamation charges for construction, operation and maintenance for the portion of the land used and occupied by the permittee during

the period of such use and occupation by the permittee; and (c) erect such dikes and embankments or take such other precautions as may be necessary, as required by the project manager, effectively to impound any flow of refuse oil, salt water, or oil from wells drilled, to prevent any injury to lands susceptible of irrigation under any government irrigation project or injury to the water supply thereof.

Now, therefore, if said principal shall promptly and in all respects comply with said conditions, then the above obligation shall be void and of no effect; otherwise and in default of full and complete compliance therewith the said obligations shall remain in full force and effect.

Signed, sealed and delivered in the presence of:

Name and address of witness:

----- [L. S]
Principal.

----- [L. S]
Surety.

Permits for Deposits Reserved Under Act of July 17, 1914 (38 Stat. 509).

In the case of permits issued for deposits of oil or gas reserved to the United States under the provisions of the act of July 17, 1914 (38 Stat. 509), the following additional condition will be included in paragraph 7 thereof:

(b) To reimburse any entryman or owner of any portion of said lands heretofore entered with a reservation of the oil and gas deposits to the United States made pursuant to the act of July 17, 1914 (38 Stat. 509), for any damage to the crops and improvements of such entryman or owner resulting from drilling or other prospecting operations.

In such case the following form of bond will be required:

BOND

DEPARTMENT OF THE INTERIOR.

GENERAL LAND OFFICE.

U. S. Land Office-----
Serial Number-----

Bond of oil and gas permittee.

[Act of February 25, 1920 (Public No. 146).]

Know all men by these presents, That -----, of -----, State of ----- as principal, and -----, of -----, State of -----, as surety, are held and firmly bound unto the United States of America, for the use and benefit of the United States, and of any entryman or owner of any of the hereinafter described lands embraced in that certain prospecting permit hereinafter referred to, in the sum of \$1,000 lawful money of the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators, successors, and assigns, jointly and severally by these presents.

Signed with our hands and sealed with our seals this ----- day of -----, 19---

The condition of the foregoing obligation is such that, whereas the said principal has been granted under the act of February 25, 1920, Public No. 146, a permit (Serial number -----) to prospect for oil and gas for two years upon the following lands: ----- on condition that the permittee shall (a) repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation; (b) reimburse any entryman or owner of any portion of said lands heretofore entered with a reservation of the oil and gas deposits to the United States made pursuant to the act of July 17, 1914 (38 Stat. 509), for any damage to the crops and improvements of such entryman or owner resulting from drilling or other prospecting operations.

Now, therefore, if said principal shall promptly and in all respects comply with said conditions, then the above obligation shall be void and of no effect; otherwise

and in default of full and complete compliance therewith the said obligations shall remain in full force and effect.

Signed, sealed, and delivered in the presence of:

Name and address of witness:

----- [L. S]
Principal.

----- [L. S]
Surety.

Attorneys in Fact.

In making applications for lease or permit corporations may act by attorneys in fact. Individuals and associations of individuals should execute their own papers.

Limitation of Holdings.

A corporation (except under the relief sections) may not have an interest in more than three leases, either directly as a lessee, or indirectly as a stockholder in a corporate lessee. An individual may hold stock in any number of corporations holding leases provided his stock interests do not represent a greater acreage than 2560 in the same producing structure, or 7680 acres in the same state.

Alien Ownership.

Aliens may not have any direct holding of lease under the oil leasing act, but may be stockholders in American corporations holding leases, provided the laws of their country do not deny like privilege to American citizens. American corporations, some of whose stock is owned by aliens, may make application for lease with a full disclosure of the residence and citizenship of its stockholders, and the department will then determine whether a lease may be granted.

Conflicting Preference Rights Under Sections 19 and 20.

The preference right attaches to the claim first initiated and legally maintained. A locator of a mining claim who has complied with all the provisions of section 19 of the act will be entitled to a preference right over a homestead entryman whose entry was made after the location, the homesteader, however, being entitled to hold the surface right. If the homestead entry was made prior to the date of the placer location, the homestead claimant will have the superior right, except in the case of a stock-raising homestead, wherein all minerals are reserved to the United States.

Permit for Unwithdrawn Land Covered by Agricultural Entry.

No permit will be granted until entryman has elected to take patent with reservation of oil and gas to the United States. If such a waiver is filed, entryman may then exercise his preference right, if any, to permit for lands covered by such entry.

Preference Rights Under Section 20.

Preference rights under section 20 exist in cases where entry was made prior to February 25, 1920, for unwithdrawn or unclassified lands, without any reservation of the minerals by the United

States, and thereafter the claimant files a waiver of his right under the entry to the oil or gas. No preference right exists where land is covered by stock-raising entry, nor where entry is made subject to the act of July 17, 1914, with oil and gas reservations.

Assignability of Permits.

Assignment of a mere right to a permit will not be recognized, but after permit is granted it may be assigned upon consent of the Secretary of the Interior first had and obtained.

Incontiguous Tracts.

Incontiguous tracts within a limited radius may be included in a permit where conditions are such that, because of prior disposals, a reasonable area of contiguous land can not be procured.

Pending Application for Permit, Land Designated as Oil Structure.

Where after application under section 13 for a permit and before permit is granted the land is designated as within the structure of a producing oil or gas field, permit can not be allowed.

Preference Right Under Section 20.

A permit to prospect will be granted an applicant entitled thereto under section 20 of the act, notwithstanding the land is part of a producing oil structure, but only one permit may be granted in the same structure to the same applicant.

Carey Act Segregation as Affected by Leasing Law.

The lands in a Carey Act segregation come under the provisions of section 2 of the oil and gas regulations, and permits and leases may be granted for such lands, subject to such stipulations and requirements as the government may impose for the protection of the reclamation project, to the end that the best development of the lands, both for mineral and agricultural purposes, may be accomplished.

Neither the state nor its contractor would be entitled to any preference right under section 20 of the act, and whether a Carey Act entryman would have such a right would depend upon the conditions affecting his entry being such as to bring him within the provisions of section 20.

Office Practice—Conflicting Applications.

The issuance of a permit should be deferred, where all is regular and the applicant appears entitled to the permit, until the conflicting applicants have been notified that their applications have been rejected, because subsequent in time, subject to the right to show cause or to appeal within 15 days from receipt of notice.

Posting Notice by Agent.

Under the law, the action of an agent in posting notice is the action of his principal, but the application for permit may not be executed by agent, unless applicant is a corporation.

Permits of Corporations as Affected by Stockholders' Permits.

The maximum number of permits to a corporation under section 13 of the act is not limited by permits of individual stockholders, but a corporation may not have an interest in more than three permits in same state, nor in more than one in the same geologic structure, directly or indirectly. An individual may hold a direct interest in not more than three permits and his total interest as permittee and stockholder may not exceed an aggregate of 7680 acres in the same state, or 2560 acres in the same geologic structure.

Preference Right Permits to Qualified Assignees.

Section 19 of the act of February 25, 1920, is construed to permit qualified assignees since October 1, 1919, to secure preference right permits, but no such transferee will be permitted to hold permits exceeding 2560 acres for such lands in the same geologic structure, nor more than three times that area in the same state.

Permits in Alaska.

The same rule applies in Alaska as in the states; that is, not more than one permit in same structure.

Rights Under "Paper Locations."

Arguments have been presented in favor of a construction of section 37 of the leasing act, that would have the result of validating so-called "paper locations" of placer mining claims, and assuring the ultimate right to absolute patent to such claims in case of discovery. Such locations consist merely of setting stakes to indicate the boundaries, posting a notice, and perhaps filing that notice in a proper recording office. It is understood that practically all the public domain having known possible prospective value for oil, is covered by such locations. It is not believed that congress had any such intention or that the language of the act justifies any such conclusion.

Under the express requirements of the mining laws and the decisions of the courts covering a long period of years, *discovery of mineral* has been the sole basis for the location of a mining claim. Without such discovery, the mere posting of notices and marking the boundaries creates no right whatever.

The mining law gives the right to any citizen to explore the public domain for the purpose of finding mineral; hence, the courts have protected a citizen in actual, physical possession of a prospective claim on the public domain, while he is engaged in diligent prosecution of work leading to the discovery of mineral, but this is as far as the courts have gone. As applied to oil lands, this rule was well stated by the Supreme Court of California, in the case of *McLemore vs. Express Oil Company* (158 Cal. 559), in the following language:

But where the location is incomplete no question of assessment work is involved. What the attempting locator has is the right to continue in possession, undisturbed by any form of hostile or clandestine entry, while he is diligently prosecuting his work to a discovery. This diligent prosecution of the work of discovery does not mean the doing of assessment work. It does not mean any attempted holding, by cabin, lumber pile, or unused derrick. It means the diligent, continuous prosecution

of the work, with the expenditure of whatever money may be necessary to the end in view.

These propositions of law were reiterated by the United States Supreme Court as recently as March 15, 1920, in the case of *Cole vs. Ralph*.

From the foregoing it will be seen that no rights whatever could be obtained by mere staking and posting unless such act was followed up with diligent and continuous work leading to discovery. Section 37 of the new leasing act excepts from the operation of that act "valid claims existent at date of passage of this act and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery." Obviously a *valid* claim under the former law is one that the courts and the land department will protect and respect as against the claims of others. The mere staking and posting of notices do not constitute such a claim, and the regulations so hold.

Any other view as to the construction of section 37 is inconsistent with the provisions of other sections of the leasing law. Section 19 provides for relief, so-called, for those persons who initiated claims on the public domain at a time when the lands were not withdrawn or classified, and who, at the date of the act, had not perfected such claims by discovery, and it further provides that where such a claimant had expended an amount equal in the aggregate to \$250 toward the development of his claim, such claimant, if in good faith and the claim was initiated prior to October 1, 1919, would be entitled to a prospector's permit for the area embraced in his claim.

The provisions of the relief section (18, 18*a*, 19, and 22), were the subject of extended consideration by the committees of congress, and it is clear that the provisions of section 19 are just as far as congress intended to go in the protection of claims and locations of the class here under discussion. To construe the act as validating mere "paper locations" would be placing congress and this department in the position of saying that one who had expended \$250 on his claim would be entitled only to a prospecting permit, while one who had only a stake and notice would be left with the privilege for an indefinite time of ultimately getting absolute title. It is further argued that under the act claimant has the option of taking a relief permit under section 19 or standing on his "paper location" under section 37. One might as logically argue that claims for relief under section 18, over which there has been so much controversy, may now go to absolute patent by virtue of section 37. Congress never contemplated any such anomalous situation.

If the view urged in these arguments were adopted there would be little use for a leasing act for oil lands outside the withdrawn areas, and perhaps for lands within such areas. The purpose and policy sought to be accomplished by this important legislation would be largely negatived, and the states and the Reclamation Service would be deprived of funds they are counting on for development purposes. Moreover, there is no practical necessity for the construction urged to protect any legitimate interest. The new law is liberal in the extreme in giving all good-faith claimants, who have made any material expenditures on the ground, fair and reasonable

opportunity to transmute such claims into permits and leases under the new law under far more practical working conditions than existed under the former laws.

Oil Land Leases—Stock-raising Homesteads.

The question has arisen as to whether or not the provisions of section 20 of the leasing act are applicable to lands covered by stock-raising homestead entries.

Section 20 is one of the so-called relief sections of the law, all of which sections are based upon alleged equities of the persons to whom a preference right to a permit or lease is accorded. It was designed to recognize the equities of persons who had gone upon the public domain and made homestead entries under the 160- or 320-acre homestead law, neither of which contains any reservation of minerals, upon the theory and under the belief that they were obtaining an unrestricted title to the land. Because of a *subsequent* withdrawal or classification of the land as mineral after the allowance of their entries, and after they had spent their time and money upon the land, they were under the necessity of either losing the land entirely or accepting a patent under the provisions of the act of July 17, 1914, reserving the oil and gas deposits in the land to the United States. No such equity or reason exists in the case of entries under the 160- or 320-acre homestead law made upon lands *therefore* withdrawn or classified as mineral, because the entryman knew at the time he made the entry that the mineral was known and reserved to the United States, and the most he could obtain was a patent expressly excluding the oil and gas deposits. This is true of all stock-raising homestead entries; for by the terms of the act itself all minerals within the land are expressly reserved to the United States, together with the right to enter upon the lands, mine and remove the same.

Lands within stock-raising homestead entries need not be withdrawn or classified for the purpose of preventing disposition of minerals under the agricultural land laws, because the minerals are reserved in the law itself. It is, therefore, clear that congress, when it used in section 20 of the leasing act, the words "lands bona fide entered as agricultural and not withdrawn or classified as mineral at the time of entry," had in mind only the entries under the 160- or 320- acre homestead law, which contains no reservation or classification of mineral, and where *subsequently*, by reason of a withdrawal or classification, the entryman was, as stated above, under the necessity of accepting a restricted patent. Any other construction of the statute would involve the disregarding of the language "and not withdrawn or classified as mineral at the time of entry."

The regulations specifically state that the preference right under section 20 of the act exists only where the land was entered prior to withdrawal or classification, and *subsequent* to entry was withdrawn or classified as oil or gas bearing in character. This clearly could have no application to entries under the stock-raising homestead law, where all minerals are reserved and where no withdrawal or classification is necessary.

Preferential Rights of Agricultural Claimants.

Whatever preferential rights homesteaders or other agricultural entrymen as such may have to oil permits or leases must be found in section 20 of the act. While this section is not as clear and specific in some respects as might be desired, it is apparent that the class of entrymen or patentees on which congress intended by this section to confer a preference right is those who made their entries when the land was *not withdrawn or classified* as mineral, and who were therefore permitted to make their entries without any reservation of the mineral to the government, but were or will be compelled to take a patent with the reservation because of a withdrawal or classification of the land, or because in the meantime the land has become of known mineral character, before submission of final proof. It is also apparent that this section is in the nature of a relief provision, designed to take care of those who found themselves in the situation above described at the time the act was passed, and not intended to provide generally for the disposition of mineral rights under the homestead law in the future.

With these general propositions in mind, the following specific statements may be made:

1. If the land was withdrawn or classified *at the time of entry* so that the entry was made with a reservation of the mineral, there is no preference right. Conversely, to entitle the homesteader to a preference right the entry must have been properly made *without a reservation* of the mineral.

2. There can be no preference right on an entry allowed after February 25, 1920. See section 12 of the regulations.

3. There can be no preference right on a stock-raising entry under the act of December 29, 1916, for under that act all entries are made with a reservation of the mineral.

4. If the homestead entry was made without reservation of the mineral, but after the lands were of known mineral character, and for the purpose of acquiring mineral rights, there is no preference right to a permit because (a) such an entry should have been made with a reservation of the mineral and the requisite nonmineral affidavit on which the entry was procured was fraudulent, and (b) the entry is not "of lands bona fide entered as agricultural."

5. But where one has an original entry under the 160- or 320-acre law and an additional entry under the stock-raising (640-acre) law, the entryman will have the same rights under the original as he would have had had he not made the additional.

6. Where one has an entry without a reservation of the mineral, nobody (not even the entryman himself) may acquire a permit or lease for the mineral so long as the entry stands in that shape.

7. But if the entryman in the case last above mentioned files a waiver of the mineral rights in the land, then he may exercise his preference right, if he has any, and if not, others may file application for a mineral permit or lease.

8. The "reservation" of the mineral above referred to is pursuant to section 2 of the act of July 17, 1914 (38 Stat. 509), which provides that the mineral occupant shall pay any damage caused to the agricultural claimant.

9. Where a patented entry, or one on which final certificate has issued, has been sold or transferred, the transferee would have the same rights as the entryman, provided he acquired the land before January 1, 1918, but if he acquired it after that date, there would be no preference right in anybody.

10. A patentee, or entryman with final certificate, with a reservation of the mineral to the government, who has a preference right can not withhold the land from development indefinitely. Section 12 of the regulations provides that if anybody else applies for a permit on the land, the preference-right man shall be given notice and allowed 30 days within which to exercise his preference and apply for a permit himself; otherwise he will be out.

11. The preference-right claimant must be qualified to take a permit under the law the same as anybody else; for instance, an alien transferee of patented land

could not get a permit or lease; one who has already received the limit of permits allowed could not get a permit.

12. The matter of whether the agricultural entry on which a preference right to a permit is predicated is within or without a known producing structure cuts no figure in connection with the preference rights here under consideration, provided that only one permit may be granted to the same structure.

13. In case of conflict between a preference-right claimant under sections 18 and 19 and one under section 20 the one would prevail whose rights were prior in their lawful inception.

Conflicts Between Nonmineral Claims and Oil Placers.

When an otherwise valid oil placer location is perfected by discovery the land is not subject to other appropriation so long as the mining claim is maintained, and should it be entered or applied for under some other law prior to the filing of an application for patent by the mining claimant the burden of protecting his claim by contest will rest upon him. This is necessarily so, as the land is not segregated from record entry by a mere mining location of which the land department has no record.

An oil placer location, perfected by discovery, laid over land embraced in a prior, valid, subsisting homestead entry, is ineffective so long as the homestead stands. (Prior to the act of July 17, 1914, the mineral claimant could contest the homestead and cause its cancellation; under that act the homesteader may retain surface rights and the mineral is automatically withdrawn; and under the leasing act the homesteader might have a preference right to a permit for the mineral.) A stock-raising homestead is an exception to this rule, for all minerals are reserved therefrom, and the oil deposits could have been located under the placer law up to February 25, 1920.

A mere "paper" oil placer location (that is, one without a discovery) will not prevent a homestead entry for the land, but where the claimant of a "paper location" is on the ground in diligent prosecution of work leading to discovery at the time the land is homesteaded, he may by contest defeat the homestead entry.

The allowance (after Feb. 25, 1920) of a homestead entry on land covered by valid rights to relief permits or leases under sections 18 or 19, is entirely within the discretion of the Secretary of the Interior.

Reservation of Mineral—When Required.

Where a homestead entry (not under the grazing act) is made without a reservation of the oil to the government and the land is withdrawn or classified as oil land before completed final proof is submitted, the entryman must take patent with a reservation of the oil, unless he can procure a reclassification of the land by the department or a removal of the withdrawal, or unless he can show at a hearing (the burden of proof being on him) that the land was not of a known mineral character at date of final proof.

But where, in the case last stated, the withdrawal or classification as mineral was not made until after final proof was submitted, the entryman will be entitled to a patent without a reservation, unless the government can show (the burden of proof being on the government), at a hearing if necessary, that the land was of known mineral character at the date of final proof. If the government can show

this, the result will be the same regardless of whether there has been a withdrawal or classification.

Interests Under Drilling Contracts.

A drilling contract carrying with it a right in the proceeds, or in the land itself, will be considered an interest in the lease, and when it comes time to grant a lease such drilling contractor will have to show himself qualified to take a lease. In all cases where the drilling is performed under contract the nature and terms of the contract must be disclosed before lease is granted.

As to permits, the situation is different. If a contractor desires to be recognized by the department in connection with a permit, it will be necessary for him to file his contract for approval; but if he so desires he may explore the land under contract with the permittee and bring his contract to the attention of the department only when and if he wishes to be recognized as being interested in such lease as may be applied for.

Discovery on Adjoining Claims.

In case of two claims that adjoin, it is necessary to have discovery on each claim to secure lease for both under section 18. If the discovery is only on one claim, the lease must be confined to the limits of the claim containing the discovery.

Right of Assignees to a Lease Under Section 18.

Good faith locators or their grantees, whose right to a lease is governed by the provisions of section 18 of the act, may transfer their interests to contractors, assignees, or lessees who were in undisputed possession prior to July 1, 1919; and such owners may then jointly apply for a lease for their aggregate holdings or they may make a division of the area and each seek a separate lease for his individual holdings.

Discovery Applicable to All Parts of Location.

A discovery on any part of a placer claim used as a basis for relief under section 18, 19, or 22 of the act will be deemed applicable to every part thereof for leasing purposes.

Only Citizens May Obtain Permits or Leases.

The oil and gas leasing bill provides for the issuance of prospecting permits and leases to citizens of the United States, associations of such citizens, corporations organized under the laws of the United States or of any state or territory thereof, or municipalities. It follows from this that no one but a citizen can obtain a lease or permit, but aliens may be stockholders in some cases.

Citizenship of Agent Immaterial.

A notice of a prospecting permit may be posted by an agent or attorney in fact in the name of his principal. The citizenship of such agent is immaterial.

Oil Claims Antedating Leasing Act.

Oil placer claims for unwithdrawn and unclassified lands upon which discovery was made prior to the enactment of the mineral leasing law are not, in the absence of fraud, affected thereby so long as the claimant complies with the law. If discovery was not made, the claimant in order to protect his right to a patent, must have been engaged in diligent work leading to a discovery at the date of the act and must be able to show that he has continued such work to discovery.

Preference Right of State Grantee.

To entitle the grantee of a state to a preference right under section 20 of the mineral leasing law, the selection must have been approved and transferred by the state prior to January 1, 1918.

(Amended July 14, 1922, by substituting the word "completed" for "approved." 49 L. D. 180.)

When the Mineral Leasing Act Took Effect.

Under the general rule of law applicable to such cases, the act of February 25, 1920, was in force and operation during that entire day, subject, however, to the privilege of any person having a substantial right which would be affected by the application of the general rule to prove, if he can, the exact time of approval.

The act of February 25, 1920, *supra*, section 13, authorizes the Secretary of the Interior, under such rules as he may prescribe, to grant to qualified persons a prospecting permit "upon not to exceed 2560 acres of land," and allows would-be applicants to initiate a preference right, good for 30 days, by posting notice upon the ground. This statute and the rules and regulations promulgated thereunder do not, however, confer upon such locators a right to obtain a prospecting permit for the entire acreage described in any notice of location. The statute simply fixes the maximum amount which may be embraced in a single permit, 2560 acres.

Paragraph 2 of the regulations approved March 11, 1920, states that the granting of such a permit "is discretionary with the Secretary of the Interior, and any application may be granted or denied, either in part or its entirety, as the facts may be deemed to warrant."

Subject to the foregoing, the following rule is announced for the guidance of the officers of the Interior Department and of parties in interest in the disposition of conflicts and controversies arising out of locations and applications made or filed during the day of February 25, 1920:

All locations made or applications filed, pursuant to section 13 of the act of February 25, 1920, at any time during the day of February 25, 1920, will be held, treated, and regarded as simultaneous, and in case of conflict of location and application, in whole or in part, between two or more qualified applicants, all such applicants will be allowed 30 days from notice within which to compromise their differences by division of lands or otherwise, in default of which this department will make such division or disposition as the facts may warrant.

Limitations Under Section 27.

It will be noted that section 27 seems to apply to two classes of interests, namely, those held directly from the government and those held indirectly through ownership of stock in corporations. As to leases held directly, there does not seem to be much doubt that the same person or corporation may not at the same time have more than three leases in any one state, or more than one lease within the geologic structure of the same producing oil or gas field.

The section further provides that "no corporation shall hold any interest as a stockholder of another corporation in more than such number of leases." This language, taken in conjunction with the language preceding it, seems to hold that a *corporation* may not have an interest in more than three leases, either directly as a lessee, or indirectly as a stockholder in a corporate lessee. True, the next clause provides that "no person *or corporation* shall take or hold any interest or interests as a member of an association or associations, or as a stockholder of a corporation or corporations," in which the aggregate leasehold interests exceed an amount equivalent to the maximum number of acres allowed to one lessee. It is clear that as to a corporation the clause last quoted is inconsistent with the clause first quoted, and as the clause first quoted is more restrictive as to a corporation than the following clause, it is considered that the former controls. But this leaves an individual with the right to hold three leases directly, and, at the same time, to have a stock interest in corporations having leases, provided his direct and indirect holdings do not exceed the maximum for one person, namely, not exceeding 2560 acres in the same structure or 7680 in the same state. It follows also that a person may hold stock in any number of corporations holding leases provided his stock interests do not represent a greater acreage than that above stated.

While under the regulations substantially the same restrictions apply to permits as apply to leases, the number of leases one has will not necessarily limit the number of permits he may have, but when a permit ripens into a lease, then the restrictions as to leases apply to both.

Bond With Preference Right Application.

In the case of a preference right application under section 19, the bond may be filed therewith, or deferred until permit is authorized.

Articles of Incorporation.

Under section 25 of the regulations, a certified copy of the articles of incorporation should be filed with the original application, but an uncertified copy is sufficient to accompany the duplicate.

Rights of Association in Geologic Structure.

An association may hold only one permit in the same geologic structure, and the interest of a member of different associations may aggregate 2560 acres in the same structure.

Ceded Ute Indian Lands Subject to Leasing Act.

By departmental decision of August 9, 1920, it was held that the oil and gas deposits contained in that portion of the Ute Indian Reservation in the State of Colorado formerly occupied by the Uncompahgre and White River Utes, ceded to the United States by the confederated bands of Ute Indians by the treaty of March 2, 1868, as amended, accepted, and ratified by the act of June 15, 1880 (21 Stat. 199), and opened to disposal under the provisions of the act of July 28, 1882 (22 Stat. 178), are subject to disposal under the mineral leasing act.

Uintah Ceded Indian Lands Subject to Leasing Act.

The Uintah Indian lands opened to sale and entry by act of May 27, 1902 (32 Stat. 263), are subject to the operation of the leasing act of February 25, 1920.

Procedure in Relation to Agricultural Claims in Conflict With Permits or Leases, or Subject to Preferential Rights.

DEPARTMENT OF THE INTERIOR,

GENERAL LAND OFFICE,

Washington, October 6, 1920.

*Registers and Receivers,**United States Land Offices.*

GENTLEMEN: Instructions have been requested from several local offices as to the proper procedure to take in connection with non-mineral applications or selections filed for lands embraced in applications for prospecting permits or leases, or which may be subject to preference rights, under the leasing act of February 25, 1920.

A prospecting permit is granted in contemplation of a future lease for a part or all of the same land in case of discovery; hence as to subsequent nonmineral entries, with a reservation of the oil or gas to the United States, the lands embraced in a prospecting permit should be treated the same as if embraced in an oil or gas lease, with a reservation to the United States of the right "to lease, sell, or otherwise dispose of the surface of the lands embraced within such lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for the use of the lessee in extracting or removing the deposits therein," pursuant to section 29 of the leasing act. As the placing of such a reservation in a lease is made discretionary with the Secretary, it necessarily follows that any disposition of the surface of lands embraced in permits or leases is by the act left entirely discretionary with the land department, to be determined on the facts of each particular case.

The so-called relief sections of the act (18, 18a, 19, and 22) recognize equitable rights in the owners and occupants of claims initiated under the general mining laws and accord to them a preference right which may be exercised by applying within the time and in the manner prescribed by said sections for oil or gas leases or permits. These

prior rights or claims, if asserted within the time accorded the claimants by the statute, are superior, both in time and right, to nonmineral applications or selections having their inception subsequent to the leasing act. It is apparent also that the allowance of nonmineral appropriation of the surface of vacant lands in producing structures will interfere with the leasing of such lands by competitive bidding under section 17 of the leasing act.

You are therefore directed:

LANDS OUTSIDE PRODUCING STRUCTURES.

(1) In all cases of applications to make nonmineral entries or selections of lands *outside* of areas which have been designated by the department as within the geologic structures of producing oil or gas fields, and which lands are also embraced in applications for prospecting permits or in permits granted, such nonmineral applications should be received, noted on your records, suspended, and transmitted to the Commissioner of the General Land Office for instructions. If in any case such nonmineral entry or selection shall be allowed by you on instructions from the Commissioner, the same will be with a reservation of the oil or gas to the United States, and subject to the rights of the permittee or lessee, as the case may be, to use so much of the surface of such land as is necessary in extracting and removing the mineral deposits, without compensation to the nonmineral entryman for such use, in accordance with section 29 of the leasing act.

LANDS IN PRODUCING STRUCTURES.

(2) You will reject all applications to enter, file upon, or select under the nonmineral land laws, lands which have been or shall be designated by the department as being *within* the known geologic structures of producing oil or gas fields, pending consideration by the department of the agricultural character and value of such lands and a determination as to whether the surface of the land is of agricultural character and value and may be disposed of without detriment to the public interest.

CONFLICTS WITH PREFERENCE RIGHTS.

(3) All homestead entries or other nonmineral filings or selections *allowed* prior to receipt of these instructions and subsequent to February 24, 1920, which are found to be in conflict with preference rights timely asserted under the remedial provisions of the act of February 25, 1920, shall be suspended pending the consideration of the application for the permit or lease, and the parties in interest so advised. If the permit or lease be allowed or granted, such homestead entry or other allowed nonmineral application or selection will be canceled if the lands are within designated geologic structures of producing oil or gas fields. If outside of such designations, the agricultural entries, applications, or selections will be allowed to stand or will be canceled in the discretion of the department, as provided in section 1 hereof.

LIABILITY FOR DAMAGES.

(4) Your attention is drawn to the distinction which exists under the law with respect to the rights of permittees and lessees of mineral deposits in cases where the nonmineral entry or selection is allowed subsequent to the application for permit or lease or subsequent to February 25, 1920, in conflict with rights recognized by sections 18, 18a, 19 and 22 of the leasing act, and those cases where the nonmineral entry, filing, or selection with a reservation of the mineral (either at time of entry or later) under the acts of July 17, 1914 (36 Stat. 509), or December 29, 1916 (39 Stat. 862), precedes the permit, lease, or mineral right, for in the latter case the nonmineral claimant is entitled to be reimbursed for all damages to crops and improvements by reason of the operations of the permittee or lessee, as provided in those acts, while in the former the respective rights of the mineral and surface claimants are governed by section 29 of the leasing act.

Very respectfully,

CLAY TALLMAN,
Commissioner.

Approved October 6, 1920.

JOHN BARTON PAYNE,
Secretary.

NOTE.—For regulations governing oil and gas permits and leases in Alaska, see 49 L. D. 196, 207.

**Regulations Governing Payment of Annual Rental Under Oil and Gas Leases
Required by Section 14 of the Act of February 25, 1920.**

[Circular No. 795.]

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,

Washington, D. C., December 8, 1921.

Registers and Receivers,

United States Land Offices.

Section 14 of the act of February 25, 1920 (41 Stat. 437), relative to oil and gas leases, provides for the payment in advance of an annual rental of \$1 per acre in cash on the acreage covered by the lease, the rental paid for any one year to be credited against the royalties as they accrue for that year.

For the purpose of establishing a uniform practice of handling this rental problem the following rules are prescribed:

1. On the first day of each year of the lease, reckoned from the date stated in the first paragraph thereof, the annual rental becomes due and payable in cash. This must be paid directly to the receiver of public moneys of the land district in which the land is situated. (See Big-4 Oil Co. 49 L. D. 482.)

2. In the event the royalty is to be paid in cash, the lessee shall deduct from royalty payments to the local receiver the amount of the rental paid for that year from the first royalty due, until the accrued royalty equals the annual rental paid.

3. If the royalty is to be paid partly in crude oil and partly in cash, the entire deduction necessary to offset the rental paid shall be taken from the first accrued cash royalty only.

4. If the royalty is to be paid in kind only, the lessee shall deduct from the first accrued royalty product such quantity thereof as will, at the approved selling price on the date of deduction, equal in value the cash rental paid for that year.

Amended February 24, 1923, to read as follows:

“4. If the royalty is to be paid in kind only, the lessee shall deduct from the first accrued royalty product such quantity thereof as will, at the approved selling price on the date of deduction, equal in value the cash rental paid for that year: *Provided, however,* that by consent of the lessee the amount of annual rental paid in any one year may, in lieu of being refunded in oil, continue to be held by the government as a deposit through succeeding years subject to correction if the acreage of the lease shall change or to refund of any amount due when the lease shall terminate. 49 L. D. 459.”

5. The date, amount and character of deduction made to offset rental payments must be shown in the itemized monthly statement required in the lease covering the month when the deduction is made.

WM. SPRY,
Commissioner.

Approved:

F. M. GOODWIN,
Assistant Secretary.

Applications for Leases by Oil and Gas Prospecting Permittees Under Section 14, Act of February 25, 1920.

Instructions.

[Circular No. 823.]

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,

Washington, D. C., May 5, 1922.

Registers and Receivers,
United States Land Offices.

In order to expedite and coordinate the work of the General Land Office and of the Bureau of Mines in acting upon applications for leases filed under section 14 of the act of February 25, 1920 (41 Stat. 437), by the holders of oil and gas prospecting permits, you are instructed as follows:

LEASES FOLLOWING PERMITS.—An application for lease as a reward for discovery by permittees shall be filed in duplicate in the United States land office of the district in which the land is situated. The register and receiver will immediately transmit the original to the Commissioner of the General Land Office, by special letter, and the duplicate to the deputy supervisor of the Bureau of Mines having jurisdiction in the district.

Such applications should set out the following items:

- (1) Serial number of permit.
- (2) Name and address of permittee.
- (3) Name and address of operator.
- (4) Subdivisions on which discoveries have been made. Character of discoveries. Exact date of discovery.
- (5) Number and definite location of each well brought in.
- (6) Complete itemized production statement by calendar months from first discovery to date of application.

(7) The applicant must give description of the land for which he desires a lease at the minimum royalty accorded discoverers under permits. He must also at the same time apply for lease of the remaining lands covered by the permit, or waive claim to his preference right to lease same or such part thereof as he does not desire to lease. A permittee under section 13, and a permittee under section 19 of the act (for lands not within the known geologic structure of a producing oil and gas field at the date the permit application was filed) is entitled to lease one-fourth of the land in the permit, or at least 160 acres, if the permit includes that area, at a flat royalty of 5 per cent. If a permit under section 19 includes areas which were at the date the permit application was filed partly inside and partly outside the known geologic structure of a producing oil and gas field, the permittee is entitled to select one-fourth of the area for lease wholly outside, or wholly inside, or partly inside and partly outside the known structure, *provided, however*, that the royalty on lands within the known structure shall in no event be less than $12\frac{1}{2}$ per cent, and *provided, further*, that the permittee is entitled to a lease at 5 per cent flat royalty upon so much of the outside area as does not exceed one-fourth of the total area covered by the permit.

A permittee under section 20 of the act is entitled to lease one-fourth of the area of land embraced in his permit or at least 160 acres of said lands, if there be that number of acres within the permit, at a flat royalty of 5 per cent, whether the land covered by the permit, or any part thereof, was within or without the known structure of a producing oil and gas field at the date the permit application was filed.

(8) A statement of what interests are to be held under the lease, together with (a) the necessary contracts, assignments, etc., for the approval of the Secretary of the Interior; (b) proof of citizenship of any assignee or interested party by affidavit of such fact if native born, or, if naturalized, by certified copy of the certificate of naturalization on the form provided for use in public land matters unless such copy is already on file, or, if a corporation, by certified copy of the articles of incorporation, and a showing as to the residence and citizenship of its stockholders; (c) a statement as to interests held by the assignee or interested party in leases and permits in the geologic structure of the same producing oil or gas field. If the showings required under (a) and (b) have already been made, a reference thereto may be made giving the land office district and serial number of the case in which the showings were made.

The permittee must exercise his preferential right to the remaining part of the permit at the time of application for lease of the one-fourth part of the area affected.

RELINQUISHMENTS AND BONDS.—Relinquishments of permits will not be accepted and bonds released until all requirements under the permits and the regulations have been fulfilled. When any drilling has been done on the property, the relinquishment should be approved by a representative of the Bureau of Mines or other person so designated by the Secretary of the Interior.

ABANDONMENT OF WELLS.—Upon plugging or abandoning a well drilled under a permit or lease, the casing shall not be drawn from the well until authority has been obtained in writing from the deputy supervisor of the Bureau of Mines or other authorized agent of the Department of the Interior.

SALES CONTRACTS.—Sales contracts submitted for the approval of the Secretary of the Interior under paragraph 2 (d) of the lease must be filed in duplicate with the deputy supervisor of the Bureau of Mines having jurisdiction in the district in which the leased land is situated. The deputy supervisor will retain the duplicate in his files and forward the original, together with a copy of his report, to the Commissioner of the General Land Office. The original report of the deputy supervisor will be transmitted to the Director of the Bureau of Mines.

If a sales contract is submitted to any official of the Interior Department other than the deputy supervisor without its having been approved by the deputy or other authorized official, the contract should be returned to the person submitting it with instructions to file it in duplicate at the office of the local deputy supervisor, who will handle it in the regular manner.

WILLIAM SPRY,
Commissioner.

Approved:

E. C. FINNEY,
First Assistant Secretary.

APPENDIX—FORMS.

Form No. 1.

APPLICATION FOR PROSPECTING PERMIT.

(Act of Feb. 25, 1920.)

Department of the Interior

Land Office at -----

State of ----- }
 County of ----- } ss.

The Honorable -----

The Commissioner of the General Land Office:

And now comes ----- of -----,
 and hereby applies for a prospecting permit for the exclusive right for
 a period of two years to prospect for oil or gas upon the following
 described lands, situated in the State of -----, or
 so much of it as may be public lands, or may be presumed to contain
 deposits of oil or gas, belonging to the United States, to wit:

DESCRIPTION.

In support of this application ----- sets forth
 the following facts:

(a) The applicant's name is -----, and
 his business address is -----.

(b) That ----- is a ----- citizen of the United
 States and he files herewith an affidavit substantiating such fact.

(c) That the applicant is not the holder of and has no direct or
 indirect interest in any other subsisting permit within the State of
 -----, but holds one permit to prospect for
 oil or gas in the State of -----.

(d) That the land for which the permit is desired is that heretofore
 described by legal subdivision.

(e) That the applicant believes that the land described in this appli-
 cation can be reasonably presumed to contain deposits of oil and gas.

That the prospecting permit applied for does not include to exceed
 2,560 acres of land, and that said land is not within any known geo-
 logical structure of a producing oil or gas field.

(f) That it is the intention of the applicant to explore the said tract
 by drilling of wells on such spot or spots as may be judged the most
 advantageous, and he will show due diligence in the said work of
 exploration, and that he has at his command the necessary capital for
 the intended drillings and explorations; that he is ready to satisfy the
 Secretary of the Interior as to his financial responsibility in such manner
 as the said Secretary of the Interior may desire.

(g) That the applicant is an ----- and oil operator, has a
 recognized business standing and refers to the following: -----

(h) That this application is accompanied by a bond of ----- with

qualified surety in the sum of One Thousand Dollars (\$1,000.00), conditioned against a failure of the permittee to repair promptly so far as possible any damage to the oil strata or deposits resulting from improper methods of operation.

This application is made in accordance with the terms of the "Act to promote the mining of coal, phosphate, oil, oil shale, gas and sodium on the public domain," approved February 25, 1920.

IN TESTIMONY WHEREOF, the said applicant_____ has caused his name to be signed as of the day and year first above written. Subscribed and sworn to before me this_____ day of _____

Notary Public

My commission expires_____

NOTE.—For documents to be filed together with 'Application' see Oil and Gas Regulations, par. 4, *supra*.

Form No. 2.

NOTICE OF LOCATION AND NOTICE OF INTENTION TO APPLY FOR PROSPECTING PERMIT UNDER ACT OF CONGRESS APPROVED FEBRUARY 25, 1920.

NOTICE IS HERBY GIVEN that I, _____, a resident of _____, and a citizen of the United States of America, over 21 years of age, have located and do hereby locate under the provisions of an act of the 66th congress of the United States, approved February 25, 1920, the following land situate in the _____, County of _____, State of _____, particularly described as follows, to-wit:

(DESCRIPTION.)

That said land is located for the purpose of prospecting thereon for oil and gas under the provisions of said act of congress and

NOTICE ALSO IS HEREBY GIVEN that I, _____, the locator above named, will within thirty (30) days after the date of posting this notice on said property above described, to-wit, within thirty (30) days after the_____ day of _____, make an application to the Secretary of the Interior of the United States, under and pursuant to the provisions of said act of congress, a permit to prospect for oil and gas upon said land.

WITNESS MY HAND AND SEAL this _____ day of _____ (Seal)

WE HEREBY CERTIFY that the above and foregoing notice of location and notice of intention to apply for prospecting permit was posted on the above described land on a monument over four feet high, near the _____ corner of the _____ of Section _____, Township _____, Range _____, _____ Base and Meridian, County of _____, State of _____, on the _____ day of _____, 19____.

Witness.

Witness.

Form No. 3.

PROTEST AGAINST APPLICATION FOR PERMIT.

IN THE UNITED STATES LAND OFFICE AT _____
 IN THE STATE OF _____
 IN THE MATTER OF APPLICATION OF _____
 Serial No. _____ FOR PERMIT TO PROSPECT AND FOR OIL
 LEASE UPON THE _____
 BASE AND MERIDIAN,

and

IN THE MATTER OF APPLICATION OF _____
 Serial No. _____ FOR PERMIT TO PROSPECT AND FOR OIL
 LEASE UPON THE _____ BASE
 AND MERIDIAN.

PROTEST OF _____

Comes now _____ of the County of _____
 State of _____, whose post-office address is _____
 in said _____ County of _____, and hereby protests
 and objects to the allowance of the application of the _____
 (Serial No. _____, Series) and of the applica-
 tion of _____ (Serial No. _____, Series),
 each of said applications being for permit to prospect and for lease of
 the _____ Base and Meridian,
 under the act of congress approved February 25, 1920, and objects to
 and protests against the allowance of any part or portion of said applica-
 tions or either of them, or of any other application of any person, except
 this protestant, relating to said land or any part thereof upon the
 following grounds, to wit:

1. That this protestant was on _____, at the time of the
 passage of said act of congress above mentioned, and for a long time
 prior thereto, had been and ever since has been and now is the owner of
 and possessed of a right to a patent to the said land above described and
 the whole thereof, under the placer mining laws of the United States.

2. That this protestant was at the time of the passage and approval of
 said act of congress, ever since has been and now is the owner of and
 possessed of a superior right to a lease under the provisions of said act
 of congress, to the said land described and the whole thereof.

The facts concerning this protestant's claims and interests in said
 land above described and his right to a patent and lease thereto as afore-
 said, are in substance as follows, to wit:

1. This protestant is a _____ citizen of the United States, over
 the age of twenty-one years and now is and was at all times herein
 mentioned a resident of the State of _____. That he now does
 and did at all said times reside in _____.

2. This protestant now is and during all the times since a date long
 prior to July 3, 1910, has been, through himself and his predecessors in
 interest, continuously, a *bona fide* claimant of, and in the possession,
 undisputed by any other claimant prior to July 1, 1919, or since said
 last named date, of the following described parcel of land, and of the
 oil and gas wells located thereon, under claims initiated prior to July 3,
 1910, by his predecessors in interest of the said placer mining claim
 hereinafter described, respectively upon the date hereinafter set forth,
 under the preexisting placer mining laws of the United States; and said

parcel of land, including all of the oil and gas wells located thereon have been claimed and possessed by protestant and his predecessors in interest continuously since prior to said 3d day of July, 1910, and for a long time prior thereto.

Said parcel of land so claimed and possessed as aforesaid is situated in the County of _____ of _____, and is more particularly described as follows, to wit:

_____ PLACER MINING CLAIM.

Being the _____ Base and Meridian.

3. The above described parcel of land was embraced in the Executive Order of Withdrawal of September 27, 1909, and ever since has remained so withdrawn. The said parcel of land is situated within Petroleum Reserve No. _____ and is not within any Naval Reserve.

4. That the origin and basis of protestant's rights and interests in and to said parcel of land and of his claim for relief under said act of congress are as follows:

That on the 16th day of February, 1909, the said parcel of land above described was public land of the United States open to location and appropriation under the laws of the United States relating to lands commonly known as "Placers" and lands chiefly valuable for petroleum, and on said date _____ and _____, each then being a citizen of the United States, duly located said parcel of land under said laws as the _____ PLACER MINING CLAIM and entered upon and took possession of said parcel of land, and did duly post thereon a notice of location, and did duly file for record, and there was recorded, on the _____, in the office of the County Recorder of _____, in Book _____, of the records of such county, said notice of location; that said notice of location was posted and filed and recorded by the above named locators in good faith and for the purpose of acquiring said land and the minerals contained therein for themselves and not for the benefit of any other person or persons.

That thereafter and during the month of _____, the said locators commenced the work of developing said land for oil and diligently continued in the possession of said land and in said development work at all times up to and including and after the _____, on which last mentioned date oil was discovered on said placer mining claim in paying quantities.

That thereafter by deed dated _____, and recorded _____, in the office of said County Recorder in Book _____ of Deeds, at page _____, Records of _____, this protestant became the owner of and acquired all of the right, title and interest of all of said _____ locators above named except _____, and now is the owner thereof. That the said _____ died on or about the _____ day of _____, and the whole of the estate of said _____ was by decree of distribution duly given, made and entered by the _____ Court of the _____, State of _____, County of _____, in the matter of the estate of _____, deceased, and in and by the decree of distribution in said estate, distributed to and vested in _____ Said decree of distribution was given, made and entered by said _____ Court on the _____, and was recorded in

the office of the said County Recorder _____, on _____ in Book _____ of _____ records of said County.

That thereafter by deed duly executed and delivered by said _____ to this protestant, this protestant acquired and became the owner of all the right, title and interest of said locator, _____, and of said _____, and ever since has been and now is the owner thereof. Said deed is dated _____, and recorded _____, in Book _____ of Deeds, _____, _____ records of said County.

All of which will more fully appear from the abstract of title covering said parcel of land filed herewith.

5. Commencing in the month of _____, the following work was performed and improvements made, purchased, constructed and installed on said parcel of land, to wit:

(Insert details.)

That on _____, protestant and his predecessors in interest were and for several months prior thereto, had continuously been *bona fide* occupants and claimants of said placer mining location and were on said last mentioned date and for several months prior thereto had continuously been in the diligent prosecution of work leading to the discovery of oil or gas, or both, on said placer mining claim and diligently and continuously continued said work until subsequently oil was discovered in paying quantities on said placer mining claim as is hereinafter more particularly set forth.

6. That actual drilling was commenced on said land on the _____ day of _____, and was thereafter diligently continued until _____, when at a depth of _____ feet a discovery of oil and gas was made. The drilling of said well was continued diligently until _____, when at a depth of _____ feet a further discovery of oil and gas in paying quantities and in a producing stratum on the land covered by said location was made. Oil was produced from said well to the extent of _____ barrels. Said well was then cased off, drilling was resumed thereon and continued diligently to a depth of _____ feet.

7. That said well has been drilled, constructed and now exists upon said parcel of land, said well having been constructed, drilled and developed by this protestant and his said predecessors in interest. No other well or wells have been constructed or drilled or now exist upon said parcel of land or any part thereof. The said well is of the depth of _____ feet. Said well is not now actually producing oil or gas. After discovery of oil as hereinbefore set forth, and after said well has been drilled to said depth of _____ feet it was left in a condition so that the oil and gas therein would remain undisturbed and undamaged and said well was then capped so as to retain the oil and gas therein. Said well is in such a condition that oil may be produced therefrom and it is the intention of this protestant upon the allowance of the said application for lease, to commence the production of oil therefrom.

That the total amount of oil actually produced and taken from said well is _____. No technical test of the grade of said oil was made but protestant is informed and believes and therefore states that said oil was of from _____ degrees to _____ degrees baumé. No other oil or gas has been taken from said well and all said oil was either consumed for production purposes on the land or unavoidably lost.

That filed herewith and made a part hereof is a diagram marked Exhibit "A," showing the position of said well by course and distance from the nearest corner to the -----Base and Meridian.

8. That there has been expended in improvements, labor and equipment for the said development of and operations upon said parcel of land including the actual cost of the well thereon, hereinbefore described, a sum in excess of \$-----. That a detailed statement showing the actual cost of the said well and of the improvements, labor and equipment for the development of and operations upon said land, is fully set forth in the application of this protestant for relief under said act of congress, which said application is Serial No. -----, and reference to which is hereby made.

9. That as appears from the abstract of title hereinbefore referred to, this protestant is and was on and prior to -----, subject to the paramount title of the United States, the owner of the aforesaid placer mining location covering said parcel of land above described and the whole thereof, and the oil and gas well located thereon. That there are no conflicting claims asserted prior to -----, or subsequent to said date against said placer mining location or said well located thereon, and protestant's possession is undisputed by any other claimant prior to -----; that this protestant has not acquired any interest in said parcel of land or in said location since -----, from any claimant, who, on or since said last mentioned date claimed or held more than the maximum area allowed the claimant under the provisions of section 18 of said act of congress.

Protestant has filed no application other than said application hereinbefore mentioned, for any lease or permit under said act of congress, and has no interest direct or indirect, in any other application for lease or permit by stock ownership or otherwise except that this protestant -----.

10. That said land is situated within the Geological Structure or oil field known as -----, in the County of -----, State of -----.

11. That protestant has not been guilty of any fraud and never has had and has not now any knowledge or reasonable grounds to know of any fraud in connection with said placer mining claim and has at all times acted honestly and in good faith; that protestant does now and did at all times believe that said placer mining location had been made in good faith by the several locators thereof and that the work done and improvements constructed upon said land constituted a compliance with the law and that said work and improvements followed by said discovery of oil, entitle this protestant to patent for said land.

12. That protestant on the -----, duly prepared and filed in the United States Land Office at -----, his verified application for lease of said parcel of land under said act of congress, which said application is now pending in the said United States Land Office and is Serial No. -----, Series; that in the preparation and filing of said application and as a part of the proceedings connected therewith, this protestant has complied with each and all of the requirements of the said act of congress, and the rules and regulations of the Department of the Interior thereunder, and has done and performed each and everything requisite thereunder to entitle him to a lease under the provisions of said act of congress, of all of said parcel of land above

described. A copy of said application has been heretofore served upon said _____, above named, and reference is hereby made to the original of said application and the same is made a part hereof.

WHEREFORE, this protestant prays that the applications of said _____, (Serial No. _____, Series) and of _____ (Serial No. _____, Series) for permit to prospect and for lease of said parcel of land above described, and each and every part thereof and all other applications adverse to the rights and claims of this protestant, be denied and dismissed and that the claims of this protestant as hereinbefore set forth be confirmed and that he may have such other and further relief as may be meet in the premises.

Protestant.

Attorney for Protestant.

State of _____ }
County of _____ } ss.

I, _____, being first duly sworn, depose and say: I am the protestant named in the above, and who executed the foregoing protest. I have read the said protest and know the contents thereof. The same are true of my own knowledge except as to matters therein stated on information and belief and as to those matters I believe it to be true.

Subscribed and sworn to before me
this _____ day of _____

Notary Public

My commission expires _____

Form No. 4.

IN THE UNITED STATES LAND OFFICE.

In the Matter of Application
of

_____, (Serial No. _____)
for Permit to Prospect and for Oil Lease
upon Section _____ Township _____ North,
Range _____ West, _____ Base
and Meridian,

and
In the Matter of Application
of

_____ (Serial No. _____),
for Permit to Prospect and for Oil Lease
upon
Section _____ Township _____ North,
Range _____, _____ Base and
Meridian.

NOTICE OF PROTEST
OF

To _____ above named, and to _____,
its attorney, and to _____, above named:

You and each of you will take notice that _____, of the
_____ of _____, State of _____,
did duly make and file on _____, in the United States Land
Office at _____, his written protest and objection
to the allowance of the application of _____
(Serial No. _____) and to the allowance of the
application of the above named _____ (Serial No.
_____) for permit to prospect and for lease under the
act of congress approved February 25, 1920.

That a copy of said written protest and objection together with a
copy of the verified application of said _____ which was
filed in said United States Land Office, at _____, and
which application is referred to in said written protest, is attached
hereto, and made a part hereof, and is herewith served upon you.

Dated this _____ day of _____.

Attorney for said

Form No. 5.

BOND FOR MINERAL CLAIMANTS.

(Form approved by the Secretary of the Interior January 18, 1917,
under Stock-raising Homestead Act.)

Know all men by these presents: That I, _____,
(Give full name of principal and sureties, and address of each.)
of _____, _____ County (or we, _____, of _____,
_____ County _____, and _____,
of _____, _____ County, _____, as the case may be), a
citizen (or citizens) of the United States, or having declared my (or
our) intention to become a citizen (or citizens) of the United States,
as principal (or principals), and _____, of _____, _____ County,
_____, and _____ of _____, _____ County _____, as sureties,
are held and firmly bound unto the United States of America, for the
use and benefit of the hereinafter-mentioned entryman or owner of the
hereinafter-described land, whereof homestead entry has been made sub-
ject to the act of December 29, 1916 (39 Stat., 862), in the sum of _____
dollars (\$_____), lawful money of the United States, for the pay-
ment of which, well and truly to be made, we bind ourselves, our heirs,
executors, and administrators, successors, and assigns, and each and
every one of us and them, jointly and severally, firmly by these
presents.

Signed with our hands and sealed with our seals this _____ day of
_____, 19__.

The condition of this obligation is such that, whereas the above-
bounden _____ has acquired from the United States
the _____ deposits (together with the right to mine and remove
the same) situate, lying, and being within the _____ of sec. _____,
township _____, range _____, _____ land district, _____,
and whereas homestead entry, serial No. _____ has been made at
_____ land office, of the surface of said above-described land, under

the provisions of said act of December 29, 1916, by-----.

Now, therefore, if the above-bounden parties or either of them, or the heirs of either of them, their executors or administrators, upon demand, shall make good and sufficient recompense, satisfaction, and payment unto the said entryman or owner, his heirs, executors, or administrators, or assigns, for all damages to the entryman's or owner's crops or tangible improvements upon said homesteaded land as the said entryman or owner shall suffer or sustain or a court of competent jurisdiction may determine and fix in an action brought on this bond or undertaking, by reason of the above-bounden principal's mining and removing of the ----- deposits from said described land, or occupancy or use of said surface as permitted to said above-bounden principal under the provisions of said act of December 29, 1916, then this obligation shall be null and void; otherwise and in default of a full and complete compliance with either or any of said obligations, the same shall remain in full force and effect.

Signed and sealed in the presence -----
of and witnessed by the under- Principal.
signed: (The principal should sign first.)

Residence ----- Surety.

Residence -----

Residence -----
(Witnesses should give full names -----
and addresses of each.) Surety.

Residence -----
(The principal and sureties should
each sign full names and attach
seals.)



NOTES ON THE LAW OF MINING LOCATIONS AND LANDS
OPEN TO MINING IN CALIFORNIA.

By C. A. LOGAN.

One of the most frequent subjects of inquiry at the offices of this Bureau is the matter of mining law, as applied to the proper procedure for locating claims and holding same. The State Mining Bureau has published various bulletins on the subject, but stock of these is at present exhausted. The following notes are intended to make available for reference the main points of federal and state laws prescribing the methods to be followed in taking up mining claims on vacant public lands within this state, with some notes on lands available for mining.

These notes are based in the main upon those parts of the statutes which are of direct interest to the prospector who wants to make his location legal, and the writer has tried to avoid any technical or theoretical considerations not directly touching upon these details. Therefore no mention is made of the extralateral right nor of the other legal sinuosities that may arise. At the same time, it is believed that if the simple points mentioned are carefully attended to in making out the location notice and laying out the claim, the locator will avoid most of the dangers and vexations that later befall him when his location is faulty. The subject of mining law is a complex one, of such scope as to call for extended study by anyone who would master it. For a complete reference book on the subject the reader should consult Lindley¹ or one of the other standard authorities. An excellent reference book, much smaller but covering practical points, is Wilson's *Mining Laws*; also Ricketts' *Manual of American Mining Law*.

In preparing the following notes the writer has drawn freely upon lecture notes taken while attending a course of lectures delivered at the University of California by William Colby, mining attorney, to whom acknowledgement is here made. Lindley on Mines has also been used, as have numerous federal and state circulars dealing with the details concerned. Cases could be cited for most of the points covered.

Summarizing the requirements of the United States and California statutes, as applied to lode mining locations upon vacant government land within this state, it will be noted that the following indispensable requirements must be met in order to fully protect the interests of the claimant:

(1) Discovery, the most vital factor, which must precede location or any rights thereunder. (Federal and state requirement.)

(2) The location must be marked upon the ground so that the boundaries of the claim or claims can be readily traced by anyone coming on the property and desiring to know what land is claimed. (Federal and state requirement.)

(3) Where the state or district mining law requires that a record of

¹Lindley on Mines. A treatise on the American law relating to mines and mineral land, by Curtis H. Lindley, San Francisco, 1914.

the location be kept, the federal statute requires that this record must contain the following details:

1. The name of the lode or claim.
2. The name of the locator or locators.
3. The number of linear feet claimed in length along the course of the vein, each way from the point of discovery, with the width on each side of the center of the claim, and the general course of the vein or lode, as near as may be.
4. The date of location.
5. Such a description of the claim by reference to some natural object, or permanent monument, as will identify the claim located.

The state law incorporates these provisions of the federal statute, word for word.

(4) The state law (see paragraph 1426, *post*) specifies that a location notice must be posted upon the claim at the point where the discovery of valuable mineral is made, and that this notice must contain the information called for under the five divisions of the last paragraph.

(5) The state law also requires that a copy of the above notice must be filed for record within 30 days of the date of posting, in the office of the county recorder of the county in which the claim is situated.

Differing from the lode location requirements, the state laws regarding placer claims specify that where placer claims are taken by location according to the subdivisions of the public land survey and where the location notice specifies the legal subdivision of section, township and range, the boundaries of a claim so located and described need not be staked nor monumented. A prudent locator will, however, always stake his claim and when describing the same as above mentioned will ordinarily need at least an approximate survey to be sure the notice properly describes the land intended to be claimed.

Importance of Discovery in Initiating the Locator's Rights.

Upon a lode claim, discovery is defined as the actual finding of *ore in place*, not as float. The value of the ore is not a controlling factor, but the test is, according to Colby,² "would a prudent man be justified in spending money to develop it?" (See *Brook vs. Justice Mining Co.* 58 Fed. p. 120.)

While it has been remarked that the order in which the various steps required to complete a valid location is not necessarily invariable, it may be said in general that the claim is not safely secured against rival locators until a valid discovery of mineral has been made. Court decisions on the point have been at variance. In this state the first locator may get an injunction forbidding the second from coming upon the claim, pending decision of the matter. This would apparently give the first locator an advantage in the "race of diligence" to reach the mineral first. Prior possession is an important factor.

Where there is a contested area claimed by two or more locators, the senior locator might make a valid discovery of mineral in the contested area, but the junior locator or locators could not ordinarily

²W. E. Colby, Attorney-at-law and Lecturer on Mining Law, University of California.

do so, unless the senior locator so far forgot his own interests as to fail to take proper steps to prevent it. This point arose in a recent case decided by the local land office.

Neither the federal law nor the California statutes require that any particular form of opening or any certain amount of work be done to complete a valid discovery.

Marking the Claim, and the Shape of Claim.

In this state no particular manner of marking out the claim boundaries is required, but it is desirable to have substantial stakes at the four principal corners, the end centers, the discovery point and also at points where the side lines make angles. This of course refers to the location marks and not to the final survey for patent. While it is not absolutely necessary that such markers be maintained by the locator, it of course is advisable to keep such markers in place both for his own protection and as a matter of justice to other prospectors who may be seeking minerals in the same locality.

The ideal quartz mining claim, which will give the largest area allowed by the federal statute and the fullest exercise of the extralateral right, is 1500 feet long by 600 feet wide, and is a right-angled parallelogram with the side lines parallel to the lode and the end lines crossing the lode at right angles. The claim cannot extend more than 300 feet on each side of the center of the vein, measured at right angles to the side lines. The end lines must be parallel straight lines, but the side lines need not be either parallel or straight, and if the vein is sinuous, the side lines should follow it. Care should be exercised to see that the claim is so taken that the vein does not depart from the claim through a side line, as this would result in greatly cutting down the length of the claim and would curtail the exercise of the extralateral right, possibly with very serious loss to the locator. The law will give the locator only so much of the vein along the strike as he has of the apex within the boundaries of his claim. The end lines do not have to be of equal length and do not have to cross the vein at any particular angle. The possession of the apex within the boundaries of the claim is essential to the enjoyment of the extralateral right downward on the dip of the vein.

Form of Location Notice. Posting the Notice.

Neither the Federal nor the California statutes require any particular *form* that need be followed in writing the location notice, and it is not necessary to use any particular printed blank, although the blank is convenient and often safer as its use insures that attention will be called to the information required, preventing the omission of some important detail. Suggested forms that may be used as models in writing out either lode or placer location notices are shown herewith.

The courts as a rule have been liberal in dealing with the question of form of location notices, and as a rule inquire rather into the good faith of the locator than into the form of his notice. The notice must contain the details given under the five headings of paragraph 3 under requirements. The signatures of witnesses on the location notice naturally strengthen it in case of dispute, although not specifically required in California, and if it happened that two or more rival

locations were attempted upon the same claim on the same day, it would prove of value to show the hour of the posting. If the position of the claim with regard to section, township and range is known this should be shown. The old mining districts with their district recorders have become extinct, with possibly one exception, in this state.

The location notice must be posted at a conspicuous place on the claim, as it is intended to be a notice to all the world that the ground claimed has been removed from the public domain for mining purposes. It will be noted that the state law regarding placer locations says the location notice may be posted upon a tree, rock in place, stone, post or monument, and does not specifically mention that it is to be put at the point of discovery. As a matter of prudence, but not specifically required by law, the location notice should be maintained upon the claim. The test of the sufficiency of a location notice would be to take the notice as posted and recorded, and in the absence of stakes or lines, trace out the boundaries of the claim from the recorded description.

Assessment Work. Proof of Labor. Delinquent Colocator.

The annual assessment year now begins at noon, July first. The locator of a claim has one full year, beginning at noon of July first, next following the date of his location, during which to perform the first year's assessment work. One hundred dollars worth of labor must be done or improvements made upon each claim per annum. The test of the validity of assessment work done is: Does it facilitate the extraction of valuable mineral from the claim?

Three classes of work may be valid as assessment work or for credit toward the \$500 requirement for patent. (1) Work within the boundaries of the claim for the purpose of actually developing the mineral deposits in the claim. This may consist of excavation, drilling, erection of works *for mining* or placing of machinery for use *in mining*, the development of orebodies, or the actual extraction of mineral. A quartz mill does not satisfy the assessment requirement on a lode claim, but a dredger does on a placer claim. (2) Work on a group of claims for the joint benefit of all, by virtue of the community of interest between colocators or an agreement between locators of adjoining claims. (3) Work outside of a claim or group of claims, when such work tends to facilitate the extraction of valuable mineral from the claim or claims. This includes tunnels for the development of deposits above the line of tunnel; roads and trails, and the making of flumes and ditches to conduct water to placer mining claims.

As regards requirements of assessment work, an association placer, taken up as a unit by colocators, may be considered as a single claim, though containing more than 20 acres. All the assessment work for a group of adjoining claims may be done upon one claim if conclusively shown to benefit the entire group, and if \$100 is expended for each claim. The term "group of claims" as here used, is applied to a number of claims taken up by colocators and regarding which it was understood at the time of location that they were being so taken.

The proof of labor is an affidavit made by the owner of the claim or by some one in his behalf, acquainted with the facts, setting forth that during the year in question, certain amounts (not less than \$100

for each claim) have been expended for labor upon or for improvements upon the claim named. This affidavit must be filed for record in the office of the county recorder of the county in which the claim or claims are situated, within 30 days after July first each year (except as before mentioned for the fraction of a year between the date of location and the next July first.)

The California statute (see paragraph 1426s herewith) provides that the failure or neglect of any locator of a mining claim to perform assessment work as specified in the United States statutes shall disqualify such locator from relocating such claim or any part thereof within three years of the date of his original location, and any such attempted relocation is declared void. To prevent location of such a claim by others, such a delinquent locator would have to go upon the claim and prosecute his work to completion.

The United States statutes (section 2324 herewith) provide the general manner in which one locator of a claim who keeps up the assessment work on the claim may obtain relief from his fellow locators who fail to pay their shares of such expense. The California statute (paragraph 1426o herewith) sets forth in detail the procedure to be followed in serving or publishing the notice to the delinquent party, and the steps the delinquent may take to protect his interests within the 90-day period allowed him. Failure of such delinquent coowner to meet his share of the cost of assessment work within 90 days after personal service of notice, or within 90 days after the beginning of weekly publication of such notice of delinquency in the newspaper published nearest the claim, results in the delinquent's interest in the claim becoming the property of the owner or coowners who have paid for the assessment work.

Extent of the Right to Locate Claims and Those Eligible to Make Locations.

Neither the United States nor California mining laws limit the number of lode claims that may be located by one person. An individual may locate as many claims for lode mining as he is able to find separate valid discoveries of mineral for, the law requiring that such a discovery be made for each claim within the boundaries of the claim.

A single locator may not locate more than 20 acres of placer mining ground in one 'claim,' but an association of locators may take up an association placer, containing not more than 20 acres for each locator, and not more than 160 acres in a single such association 'claim' by a minimum of eight persons.

Women and minor children have equal rights with others in locating mining claims.

What May Be Located as Mineral.

It seems strange that dispute should arise as to whether or not a substance is mineral. Yet it is of recent record that the question of the mineral character has been raised in the case of such an important mineral as petroleum, by parties who were interested in having oil lands declared nonmineral. Besides the metals, which are minerals beyond dispute, the following substances have been held to be mineral, according to the decision of the United States Land Office and the

courts: Alum, amber, asphaltum (see petroleum), borax, brick clay, building stone, carbonates (of soda etc.) cement (gypsum), china clay, high-grade pottery clay, etc.; coal (special laws govern), diamonds and other precious stones, gravel, guano, gypsum, kaolin, limestone, marble, mica, natural gas (see petroleum), nitrates, onyx, petroleum (special withdrawals), potash (special legislation), phosphates (special legislation), salt (special law), sand, sandstone, slate, soda (nitrate and carbonate), stone of special commercial value, sulphur and umber.

There is sometimes question as to whether or not a certain deposit should be located as placer or lode. In such a case and in the absence of sufficient technical knowledge or lack of advice, there is nothing to prevent the location both as lode and placer, pending final determination of the character of deposit. In locating placer mining ground in which lodes occur, special attention should be paid to the provisions of law governing such cases. The Revised Statutes of the United States, title 32, chapter 6, section 2333, cover this point. It is provided that lodes known to exist within a placer claim for which patent is being sought must be described and separately purchased, and if the placer claimant, knowing of the presence of such lodes, fails to mention them in his application for placer patent, his failure to so do shall be construed as a declaration that he has no right of possession of such lodes. Quartz claims with a width of fifty feet may be taken up on *known* quartz veins within the boundaries of placer claims, but the complications that are apt to arise when a second party attempts to make such a location against the wishes of a hostile placer claimant, on whose claim he must trespass to make the lode location, are such as to call for the exercise of care. When a lode exists in a placer claim, but has not been discovered previous to the issuance of placer patent, the placer patent includes the lode or lodes that may be later discovered.

LANDS OPEN TO LOCATION FOR MINING.

Title 32, chapter 6, section 2319, Revised Statutes of the United States, provides that all valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States, and those who have declared their intention to become such. During recent years there have been many withdrawals of mineral lands and much special legislation regarding deposits of certain minerals. In fact there has been such a tendency ever since 1866, when a bill was presented in congress providing for the leasing of western mining lands on royalty. This was defeated by the western mining interests who substituted the mining law of 1866, which was later superseded by the enactment of 1872.

Under present conditions, lands known to contain coal, petroleum, oil shale, potash, phosphate, sodium salts (except common salt, on which one claim only can be located) can not be located and patented under the regular lode or placer laws but are obtainable under lease, subject to the control of the Secretary of the Interior. Land in certain national parks and national monuments is also not subject to entry. There have also been certain withdrawals of public lands for powersite

and kindred use, with a Federal Power Commission exercising certain powers of disposal, and with entries for other purposes not allowed. The status of these powersite withdrawals, as affecting the miner's rights, is somewhat uncertain, and whether or not he could successfully prosecute a claim to land taken up under the mining law within such power reserves is debatable, as the United States Land Office regulations seem to imply some leeway, depending on circumstances in each case. Certain Indian reservations in the western states, including a few in California, which have heretofore not been open to exploration for mining, have been thrown open for prospecting in the last few years, and rules and regulations have been set up under which such reservation lands may be mined. These rules are rather onerous, and would deter the ordinary small prospector. Among the requirements for working such lands is one calling for a bond to be executed in favor of the government for \$500 or more on each lease, depending on acreage, and the payment of annual rental of 25 cents and upward per acre, as well as payment of royalty on any ores or minerals sold. This reservation land can be mined only for metalliferous minerals. Claims are to be taken up according to the United States mining laws, and annual assessment work has to be done in addition to having a survey made and fulfilling all the other terms mentioned. Information regarding mining such Indian reservation lands can be had from the several superintendents of the reservations. The leases are issued by the Secretary of the Interior, through the local superintendents.

Vacant government land within the numerous national forests of this state is open to location and patent for mining purposes to the same extent as other vacant unreserved government land. The total area of the national forests in California is about 19,000,000 acres and the lands included lie for the most part in the mountainous eastern part of the state, away from the settled portions and in general above an elevation of 2500 feet. Maps of the different forests may be obtained from the various local offices of the United States Forest Service or from their office in the Ferry Building, San Francisco. There is, of course, a great deal of patented land within the boundaries of these forests, which was patented before the forest reserve was set aside, and the local forest service employes should be consulted about such lands if in doubt.

The speed with which the unreserved government lands (outside the national forests) in this state are being patented or otherwise withdrawn is shown by a comparison. On July 1, 1919, the General Land Office reported that the total acreage of such lands in California was 20,239,977 acres. On July 1, 1923, the total acreage was 18,091,187 acres, showing that over ten per cent of such lands had been patented or withdrawn in the four years concerned. The figures are from circulars of the General Land Office. The United States government maintains local land offices at the following points in this state, where information can be had regarding vacant government lands or steps taken to make entry for patent: El Centro, Eureka, Independence, Los Angeles, Sacramento, San Francisco, Susanville, and Visalia.

Mention should also be made here of the land included in stock-raising homesteads, patented under the act of December 29, 1916. Under the provisions of this act the Secretary of the Interior was

authorized to designate unreserved public lands in the public-land states, of which California is one, as stock-raising lands. This does not refer to lands within the national forests. Under the terms of section 9 of this act, it is provided that all patents issued thereunder "shall contain a reservation to the United States of all coal and other minerals in the lands so entered and patented, together with the right to prospect for, mine and remove the same"; the same section also provides that any person qualified to locate and enter the coal or other mineral deposits, or having the right to mine and remove the same under the laws of the United States, shall have the right at all times to enter upon the lands entered or patented under the act for the purpose of prospecting for the coal or other mineral therein. But he shall not injure or damage or destroy the permanent improvements of the entryman or patentee and shall be liable to and shall compensate the entryman or patentee for all damages to the crops on the land by reason of such prospecting. The prospector is required to do one of three things: (1) he must obtain the written consent or waiver of the homestead entryman or patentee; (2) he must pay damages to crops or other tangible improvements if and when an agreement is reached as to the amount of such damages; or, (3) in lieu of either of the foregoing provisions, he must execute a good and sufficient bond for not less than \$1,000 in favor of the United States for the use and benefit of the homesteader, to secure the payment of such damages. Subject to these provisions, he may occupy as much of the surface of such a homestead as may be reasonably necessary for the mining and removal of the mineral deposits within his mining claims. Where the mining location was made prior to the entry for homestead, the mining claimant must exercise diligence in filing a protest in the local land office of the district in which his claim is, setting forth the facts regarding his mining claim and the mineral character of the land, otherwise he is apt to awake too late to the fact that his claim has been given to the homesteader.

This act has been the cause of considerable complaint, and appears in some particulars to contradict itself. While it expressly reserves the mineral resources in such lands and affirms the right of qualified persons to enter the land for the purpose of prospecting for and mining mineral deposits, it also sets up restrictions which tend to discourage the prospector and which are discriminatory in favor of the homesteader.

Before passing from the subject of vacant public lands and the rights of the prospector thereon, it can not be too forcibly emphasized that, having once located a mining claim with the intention of holding and working the same, the only safe course for the locator to follow is to complete in the shortest possible time the \$500 worth of labor or improvements required for patent, to have the necessary survey made, and to press his application for patent with all diligence. Under the present laws, the miner has no means of making his claim known officially to the United States Land Office until he has completed the above work and has sought a patent, or until adverse claimants make it necessary for him to file a protest. If he spends only part of the year in the district where his claims are, it may happen that the published notice of application for patent by adverse

claimants may escape his attention, and patent may be given to the adverse claimant for the land within his mining location, in spite of the fact that he may have fulfilled all the requirements of law to hold his claim and may be actually developing the claim at the time. This state of affairs is possible because of the failure of the United States Land Office to examine the character of lands for which patent is sought unless a protest is made.

STATE LANDS OPEN TO MINING.

Besides the vacant government lands, there are within the State of California about 750,000 acres of land belonging to the state. This consists chiefly of sections numbered 16 and 36, thus far unsold, in each township, except where exchanges have been made or are in course of being made, with the federal government for administrative reasons. Much of this land, like the vacant government lands, is either mountainous or desert land having little value as a rule for agriculture but with mineral possibilities in many cases. The counties containing large acreages of this state land are as follows: San Bernardino, about 250,000 acres; Inyo, about 150,000 acres; Riverside, 50,000 acres; Lassen, about 60,000 acres; Modoc, about 30,000 acres; Imperial, 30,000 acres, with lesser amounts in other counties, there being some of this land in about forty counties. This land is sold subject to a reservation of one-sixteenth of all minerals ever found therein to the state. Unsold state lands may be prospected, and may be leased for mining purposes, under regulations prescribed by the State Surveyor General, Capitol Building, Sacramento, and requests for information regarding the location of such lands and regulations governing the sale or lease of same should be addressed to him.

The records and reports of the State Mining Bureau, as well as the various government reports on file in the offices of the Bureau, may be referred to for information about the geology and mineral resources of the entire state, and these records will often be found useful in giving the prospector a general idea of the character and mineral possibilities of the district where he intends to search for minerals.

OTHER LAWS AFFECTING THE MINING LOCATOR.

Hydraulic Mining.

Placer mining by the hydraulic process on streams which drain into any tributary of a navigable river in this state must be carried on under regulations laid down by the California Debris Commission, made up of three officers of the Corps of Engineers, United States Army. For information regarding steps to be taken in order to obtain written permission for hydraulic mining on the watersheds of the navigable rivers, inquiries should be addressed to Major U. S. Grant III, secretary, California Debris Commission, 85 Second street, San Francisco. The above restrictions do not apply on the Trinity, Klamath, Salmon, Smith or other rivers of the northern part of the state which are not navigable, but do cover work on any tributary of the Sacramento or San Joaquin or Feather rivers, which means all that part of the state whose streams flow into the great central valley.

Safety Regulations.

The Industrial Accident Commission of California is charged with the framing and enforcement of safety orders and rules for the protection of mine workers, and inquiries on any phase of this subject should be addressed to the commission at the State Building, Civic Center, San Francisco.

Use of Water for Mining.

The miner often wishes to use water that flows through or near by his claims. While the riparian right will permit the use by such an owner of water flowing through the claim where it is used, it is necessary to file an appropriation when desiring to make use of water where the diversion point is outside of the claim. For the formalities to be observed in making an appropriation, the inquirer should address State Water Commission, Department of Public Works, Forum Building, Sacramento. Water must be put to beneficial use as soon as possible, to hold it.

Use of Timber on Unpatented Mining Claims.

The law permits a locator to use for mining or other necessities *on the claim or claims concerned*, any timber growing thereon, but such timber can not be cut down and taken off the claim for other uses.

Use of Mining Claims for Other Purposes.

A mining claim can not be located as such and then used for other purposes such as a site for a store or summer resort, and such an attempted use would invalidate the location.

UNITED STATES MINING STATUTES.**Title XXXII, Chapter 6, Revised Statutes.**

SEC. 2319. All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States and those who have declared their intention to become such, under regulations prescribed by law, and according to the local customs or rules of miners in the several mining districts, so far as the same are applicable and not inconsistent with the laws of the United States.

Lode Claims.

SEC. 2320. Mining claims upon veins or lodes of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits, heretofore located, shall be governed as to length along the vein or lode by the customs, regulations, and laws in force at the date of their location. A mining claim located after the tenth day of May, eighteen hundred and seventy-two, whether located by one or more persons, may equal, but shall not exceed, one thousand five hundred feet in length along the vein or lode; but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located. No claim shall extend more than three hundred feet on each side of the middle of the vein at the surface, nor shall any claim be limited by any mining regulation to less than twenty-five feet on each side of the middle of the vein at the surface, except where adverse rights existing on the tenth day of May, eighteen hundred and seventy-two, render such limitation necessary. The end lines of each claim shall be parallel to each other.

Citizenship.

SEC. 2321. Proof of citizenship, under this chapter, may consist, in the case of an individual, of his own affidavit thereof; in the case of an association of persons unincorporated, of the affidavit of their authorized agent, made on his own knowledge, or upon information and belief; and in the case of a corporation organized under the laws of the United States, or of any state or territory thereof, by the filing of a certified copy of their charter or certificate of incorporation.

This is supplemented by an act of April 26, 1882, which provides:

“That applicants for mineral patents, if residing beyond the limits of the district wherein the claim is situated, may make any oath or affidavit required for proof of citizenship before the clerk of any court of record, or before any notary public of any state or territory.” (22 Stats. at Large, p. 49, Chap. 106.)

Extralateral Rights.

SEC. 2322. The locators of all mining locations heretofore made or which shall hereafter be made, on any mineral vein, lode, or ledge, situated on the public domain, their heirs and assigns, where no adverse claims exist on the tenth day of May, eighteen hundred and seventy-two, so long as they comply with the laws of the United States, and with state, territorial and local regulations not in conflict with the laws of the United States governing their possessory title, shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations. But their right of possession to such outside parts of such veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward as above described through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges. And nothing in this section shall authorize the locator or possessor of a vein, or lode which extends in its downward course beyond the vertical lines of his claim, to enter upon the surface of a claim owned or possessed by another.

Tunnel Claims.

SEC. 2323. Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession of all veins or lodes within three thousand feet from the face of such tunnel on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered from the surface and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid, but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins on the line of such tunnel.

Recording and Annual Assessments.

SEC. 2324. The miners of each mining district may make regulations not in conflict with the laws of the United States, or with the laws of the state or territory in which the district is situated, governing the location, manner of recording, amount of work necessary to hold possession of a mining claim, subject to the following requirements: The location must be distinctly marked on the ground so that its boundaries can be readily traced. All records of mining claims hereafter made shall contain the name or names of the locators, the date of the location, and such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim. On each claim located after the tenth day of May, eighteen hundred and seventy-two, and until a patent has been issued therefor, not less than one hundred dollars' worth of labor shall be performed or improvements made during each year.

Be it enacted by the senate and house of representatives of the United States of America in congress assembled, that section two thousand, three hundred and twenty-four of the Revised Statutes be, and the same is hereby, amended so that where a person or company has or may run a tunnel for the purpose of developing a lode or

lodes, owned by said person or company, the money so expended in said tunnel shall be taken and considered as expended on said lode or lodes, whether located prior to or since the passage of said act; and such person or company shall not be required to perform work on the surface of said lode or lodes in order to hold the same as required by said act. (18 Stats. at Large, page 315, Chap. 41.)

Patents.

Section 2325 of the federal statutes provides that after \$500 has been expended on a mining claim in work or improvements, a patent can be applied for, upon the claim being surveyed by a United States mineral surveyor, and by the payment of \$5 per acre for the land to the United States government.

PLACERS.

SEC. 2329. Claims usually called "placers" including all forms of deposit, excepting veins of quartz, or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivisions of the public lands.

Areas of Placer Claims.

SEC. 2330. Legal subdivisions of forty acres may be subdivided into ten-acre tracts, and two or more persons, or associations of persons, having contiguous claims of any size, although such claims may be less than ten acres each, may make joint entry thereof; but no location of a placer claim, made after the ninth day of July, eighteen hundred and seventy, shall exceed one hundred and sixty acres for any one person or association of persons, which location shall conform to the United States surveys; and nothing in this section contained shall defeat or impair any bona fide preemption or homestead claim upon agricultural lands, or authorize the sale of the improvements of any bona fide settler to any purchaser.

SEC. 2331. Where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat shall be required, and all placer mining claims located after the tenth day of May, eighteen hundred and seventy-two, shall conform as near as practicable with the United States system of public lands surveys, and the rectangular subdivisions of such surveys, and no such location shall include more than twenty acres for each individual claimant; but where placer claims can not be conformed to legal subdivisions, survey and plat shall be made as on unsurveyed lands; and where by the segregation of mineral land in any legal subdivision a quantity of agricultural land less than forty acres remains, such fractional portion of agricultural land may be entered by any party qualified by law, for homestead or preemption purposes.

Placer Boundaries.

SEC. 2333. Where the same person, association, or corporation is in possession of a placer claim, and also a vein or lode included within the boundaries thereof, application shall be made for a patent for the placer claim, with the statement that it includes such vein or lode, and in such case a patent shall issue for the placer claim, subject to the provisions of this chapter, including such vein or lode upon the payment of five dollars per acre for such vein or lode claim, and twenty-five feet of surface on each side thereof. The remainder of the placer claim, or any placer claim not embracing any vein or lode claim, shall be paid for at the rate of two dollars and fifty cents per acre, together with all costs of proceedings; and where a vein or lode, such as is described in section twenty-three hundred and twenty, is known to exist within the boundaries of a placer claim, an application for a patent for such placer claim which does not include an application for the vein or lode claim shall be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim; but where the existence of a vein or lode in a placer claim is not known, a patent for the placer claim shall convey all valuable mineral and other deposits within the boundaries thereof.

CALIFORNIA STATUTES REGARDING LOCATION OF MINING CLAIMS, MILL SITES AND ASSESSMENT WORK.

An act to amend the Civil Code of California by adding a new title thereto, to be numbered title X, in part IV of division second, consisting of sections 1426,

1426a, 1426b, 1426c, 1426d, 1426e, 1426f, 1426g, 1426h, 1426i, 1426j, 1426k, 1426l, 1426m, 1426n, 1426o, 1426p, 1426q, 1426r, and 1426s, providing for the manner of locating lode and placer mining claims, tunnel rights, mill sites, and prescribing the character and amount of assessment work on mining claims, and providing for proofs of such work, and for the recordation of location notices, and proof of labor, and for the enforcement of contributions from delinquent co-owners of mining claims, and prescribing the duties of county recorders respecting the recording of location notices of, and proofs of labor on, mining claims, tunnel rights, and mill sites, and the fees to be charged therefor, and repealing acts in conflict herewith.

[Approved March 13, 1909.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. The Civil Code of the State of California is hereby amended by adding a new title thereto, to be numbered title X, in part IV of second division, consisting of sections 1426, 1426a, 1426b, 1426c, 1426d, 1426e, 1426f, 1426g, 1426h, 1426i, 1426j, 1426k, 1426l, 1426m, 1426n, 1426o, 1426p, 1426q, 1426r, and 1426s, to read as follows:

§ 1426. Any person, a citizen of the United States, or who has declared his intention to become such, who discovers a vein or lode of quartz, or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposit, may locate a claim upon such vein or lode, by defining the boundaries of the claim, in the manner hereinafter described, and by posting a notice of such location, at the point of discovery, which notice must contain:

First—The name of the lode or claim.

Second—The name of the locator or locators.

Third—The number of linear feet claimed in length along the course of the vein, each way from the point of discovery, with the width on each side of the center of the claim, and the general course of the vein or lode, as near as may be.

Fourth—The date of location.

Fifth—Such a description of the claim by reference to some natural object, or permanent monument, as will identify the claim located.

§ 1426a. The locator must define the boundaries of his claim so that they may be readily traced, and in no case shall the claim extend more than fifteen hundred feet along the course of the vein or lode, nor more than three hundred feet on either side thereof, measured from the center line of the vein at the surface.

§ 1426b. Within thirty days after the posting of his notice of location upon a lode mining claim, the locator shall record a true copy thereof in the office of the county recorder of the county in which such claim is situated, for which service the county recorder shall receive a fee of one dollar.

§ 1426c. The location of a placer claim shall be made in the following manner: By posting thereon, upon a tree, rock in place, stone, post or monument, a notice of location, containing the name of the claim, name of locator or locators, date of location, number of feet or acreage claimed, such a description of the claim by reference to some natural object or permanent monument as will identify the claim located, and by marking the boundaries so that they may be readily traced; *provided*, that where the United States survey has been extended over the land embraced in the location, the claim may be taken by legal subdivisions and no other reference than those of said survey shall be required and the boundaries of a claim so located and described need not be staked or monumented. The description by legal subdivisions shall be deemed the equivalent of marking.

§ 1426d. Within thirty days after the posting of the notice of location of a placer claim, the locator shall record a true copy thereof in the office of the county recorder of the county in which such claim is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426e. The locator of a tunnel right or location, shall locate his tunnel right or location by posting a notice of location at the face or point of commencement of the tunnel, which must contain:

First—The name of the locator or locators.

Second—The date of the location.

Third—The proposed course or direction of the tunnel.

Fourth—A description of the tunnel, with reference to some natural object or permanent monument as shall identify the claim or tunnel right.

§ 1426f. The boundary lines of the tunnel shall be established by stakes or

monuments placed along the lines at an interval of not more than six hundred feet from the face or point of commencement of the tunnel to the terminus of three thousand feet therefrom.

§ 1426g. Within thirty days after the posting the notice of location of the tunnel right or location, the locator shall record a true copy thereof, in the office of the county recorder of the county in which such claim is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426h. If at any time the locator of any mining claim heretofore or hereafter located, or his assigns, shall apprehend that his original location notice was defective, erroneous, or that the requirements of the law had not been complied with before filing; or in case the original notice was made prior to the passage of this act, and he shall be desirous of securing the benefit of this act, such locator, or his assigns, may file an additional notice, subject to the provisions of this act; *provided*, that such amended location does not interfere with the existing rights of others at the time of posting and filing such amended location notice, and no such amended location notice or the record thereof, shall preclude the claimant, or claimants from proving any such title as he or they may have held under previous locations.

§ 1426i. Where a locator, or his assigns, has the boundaries and corners of his claim established by a United States deputy mineral survey, or a licensed surveyor of this state, and his claim connected with the corner of the public or minor surveys of an established initial point, and incorporates into the record of the claim, the field notes of such survey, and attaches to and files with such location notice a certificate of the surveyor, setting forth: *first*, that said survey was actually made by him, giving the date thereof; *second*, the name of the claim surveyed and the location thereof; *third*, that the description incorporated in the declaratory statement is sufficient to identify; such survey and certificate becomes a part of the record, and such record is prima facie evidence of the facts therein contained.

§ 1426j. The proprietor of a vein or lode claim or mine, or the owner of a quartz mill or reduction works, or any person qualified by the laws of the United States, may locate not more than five acres of non-mineral land as a mill site. Such location shall be made in the same manner as hereinbefore required for locating placer claims.

§ 1426k. The locator of a mill site claim or location shall, within thirty days from the date of his location, record a true copy of his location notice with the county recorder of the county in which such location is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426l. The amount of work done or improvements made during each year to hold possession of a mining claim shall be that prescribed by the laws of the United States, to wit: One hundred dollars annually.

§ 1426m. Whenever [a] mine owner, company, or corporation shall have performed the labor and made the improvements required by law upon any mining claim, the person in whose behalf such labor was performed or improvements made, or some one in his behalf, shall within thirty days after the time limited for performing such labor or making such improvements make and have recorded by the county recorder, in books kept for that purpose, in the county in which such mining claim is situated, an affidavit setting forth the value of labor or improvements made, the name of the claim, and the name of the owner or claimant of said claim at whose expense the same was made or performed. Such affidavit, or a copy thereof, duly certified by the county recorder, shall be prima facie evidence of the performance of such labor or the making of such improvements, or both.

§ 1426n. For recording the affidavit herein required, the county recorder shall receive a fee of fifty cents.

§ 1426o. Whenever a co-owner or co-owners of a mining claim shall give to a delinquent co-owner or co-owners the notice in writing or notice by publication provided for in section 2324, Revised Statutes of the United States, an affidavit of the person giving such notice, stating the time, place, manner of service, and by whom and upon whom such service was made, shall be attached to a true copy of such notice, and such notice and affidavit must be recorded in the office of the county recorder, in books kept for that purpose, in the county in which the claim is situated, within ninety days, after the giving of such notice; for the recording of which said recorder shall receive the same fees as are now allowed by law for recording deeds; or if such notice is given by publication in a newspaper, there shall be attached to a printed copy of such notice an affidavit of the printer or his foreman, or principal clerk of such paper, stating the date of the first, last and each insertion of such notice therein, and where the newspaper was published during that time, and the name of such newspaper. Such affidavit and notice shall be recorded as aforesaid, within one hundred and eighty days after the first publication thereof. The original

of such notice and affidavit, or a duly certified copy of the record thereof, shall be prima facie evidence that the delinquent mentioned in section 2324 has failed or refused to contribute his proportion of the expenditure required by that section, and of the service of publication of said notice; *provided*, the writing or affidavit hereinafter provided for is not of record. If such delinquent shall, within the ninety days required by section 2324, aforesaid, contributed to his co-owner or co-owners, his proportion of such expenditures, and also all costs of service of the notice required by this section, whether incurred for publication charges, or otherwise, such co-owner or co-owners shall sign and deliver to the delinquent or delinquents a writing stating that the delinquent or delinquents by name has within the time required by section 2324, aforesaid, contributed his share for the year -----, upon the ----- mine, and further stating therein the district, county and state wherein the same is situated, and the book and page where the location notice is recorded, if said mine was located under the provisions of this act; such writing shall be recorded in the office of the county recorder of said county, for which he shall receive the same fees as are now allowed by law for recording deeds. If such co-owner or co-owners shall fail to sign and deliver such writing to the delinquent or delinquents within twenty days after such contribution, the co-owner or co-owners so failing as aforesaid shall be liable to the penalty of one hundred dollars, to be recovered by any person for the use of the delinquent or delinquents in any court of competent jurisdiction. If such co-owner or co-owners fail to deliver such writing within said twenty days, the delinquent, with two disinterested persons having personal knowledge of such contribution, may make affidavit setting forth in what manner, the amount of, to whom, and upon what mine, such contribution was made. Such affidavit, or a record thereof, in the office of the county recorder of the county in which such mine is situated, shall be prima facie evidence of such contribution.

§ 1426p. The record of any location of a mining claim, mill site or tunnel right, in the office of the county recorder, as herein provided shall be received in evidence, and have the same force and effect in the courts of the state as the original notice.

§ 1426q. Copies of the records of all instruments required to be recorded by the provisions of this act, duly certified by the recorder, in whose custody such records are, may be read in evidence, under the same circumstances and rules as are now, or may be hereafter provided by law, for using copies of instruments relating to real estate, duly executed or acknowledged or proved and recorded.

§ 1426r. The provisions of this act shall not in any manner be construed as affecting or abolishing any mining district or the rules and regulations thereof within the State of California.

§ 1426s. The failure or neglect of any locator of a mining claim to perform development work of the character, in the manner and within the time required by the laws of the United States, shall disqualify such locators from relocating the ground embraced in the original location or mining claim or any part thereof under the mining laws, within three years after the date of his original location and any attempted relocation thereof by any of the original locators shall render such location void.

SEC. 2. All acts and parts of acts in conflict with this act, are hereby repealed.

SEC. 3. This act shall take effect and be in force on and after July 1, 1909.

FORMS FOR LOCATION NOTICES.

The following forms for mineral location notices have been found to fill the requirements of the statutes, in California:

NOTICE OF QUARTZ LODE LOCATION.

Notice is hereby given, That I, -----, have discovered a vein of rock in place, carrying valuable deposits, upon which I have erected a discovery monument and posted this notice, as hereinafter set forth; that in accordance with the provision of chapter VI, title XXXII of the Revised Statutes of the United States and the laws of the State of California, I hereby claim fifteen hundred linear feet of said vein, measured thereon as hereinafter set forth. Said discovery was made on the ----- day of -----, 19----. Immediately upon making the same, and on the ----- day of -----, 19----, I erected at the point of discovery, a substantial monument, consisting of a mound of rocks and ----- and posted thereon this notice.

The *general course of said vein is ----- and ----- . I claim in length thereon ----- feet ----- and ----- feet ----- from

*Make this description in accordance with the facts, as "The general course of said vein is north and south. I claim in length thereon (for example) 500 feet north

said discovery monument. I also claim three hundred feet on each side of the center of the vein. This vein or claim shall be known as and called the _____
 _____ It is situated in _____ Mining District, and
 in †Sec. _____, Tp. _____, R. _____, B. and M., in _____
 County, California, and the discovery monument _____ being placed about §

 from _____

That the following is a description of said location as marked upon the ground: ‡
 commencing at the _____ of said claim, a _____
 _____ from which initial point the discovery monument is distant
 about _____ feet in a _____ direction; _____
 thence || _____

Dated, this _____ day of _____, 19____.

Locator.

NOTICE OF LOCATION OF PLACER CLAIM.

Notice is hereby given, That _____
 citizen _____ of the United States, h _____ this _____ day of
 _____, 19____, discovered a valuable placer deposit within the limits
 of this claim; that by virtue of said discovery, _____
 _____ ha _____ located, and hereby locate and claim the following described land,
 situate in _____ Mining District, _____ County, California, to
 wit: * _____ of section _____
 township _____, range _____, B. and M., containing _____
 acres. † Said claim is hereby named _____ Placer Claim.
 Said claim is marked upon the ground as follows: ‡ _____

This notice is posted on a mound of rocks at the point of discovery, situated §

Dated and posted on the ground, this _____ day of _____, 19____.

Locator.

and 1000 feet south from said discovery monument.”

†If the claim is upon surveyed land, give the section, township and range, if possible. This is not required by law, but makes a much better description.

§Here refer to some natural object or permanent monument so as to identify the locality of the claim, in compliance with section 2324, Revised Statutes U. S. A road, house, tree, known mountain or peak, government corner, mill, or known mining claim, are such objects or monuments. As, “About one mile directly east from John Doe’s quartz mill and 400 rods west from the Last Hope mine,” etc.

‡Here state (for example): “Commencing at the N.E. corner of said claim, a mound of rocks 4 ft. high,” or at any other corner or point in the boundary; give the distance and direction from this initial monument to the discovery monument, and then locate the discovery with reference to some natural object or permanent monument.

||Here follows a description of the claim from the initial monument. For instance: “Thence 600 ft. northwesterly to the N.W. corner of said claim, at which point is a mound of rocks 2½ ft. high, marked so-and-so (if marked); thence 1500 ft. southwesterly to the S.W. corner of said claim, being a mound of rocks,” etc.; so going around the claim to the point of beginning.

*The statute provides that the locator must give “a description of the claim by reference to legal subdivisions of sections, if the location is made in conformity with the public surveys; otherwise a description with reference to some natural object or permanent monument as will identify the claim.”

†When not described by legal subdivisions, the description should conform to that contained in the final certificate of location of a lode claim.

‡The statute provides that, whether described by legal subdivisions or not, the location shall be marked by the locator on the ground, and as the affidavit to be filed later is not required to contain a description of the claim, we think this notice should state how the location is marked; as, for instance, “At the N.E. corner of said tract a mound of rocks 3 ft. high, marked so-and-so (if marked), and at the N.W. corner a stake in a mound of rocks, marked,” etc., and so on for each monument enclosing the claim.

§Here state where the discovery is located, as, for instance, “20 feet S.W. of the N.E. corner monument.”

NOTE: A duplicate of either of these notices must be filed for record with the county recorder within 30 days from the discovery; and the locator is allowed 30 days to mark his location on the ground.

The foregoing form of placer notice may be used for location of all deposits which are classed under placer laws and not excepted by The Leasing Act of February 25, 1920 (see Oil and Gas Rights, pp. 212-215, 218-285, ante).

LICENSE REQUIRED TO HANDLE MINING PROPERTY.

By EDWIN T. KEISER.¹

[The question as to whether or not a person handling mining property is required by the law to take out a real estate broker license has been raised many times. In order that those interested in the development of mines and mining in this state may have definite information on this subject, at the request of the State Mineralogist, the following notes have been prepared by Mr. Edwin T. Keiser, Commissioner, State Real Estate Department.]

As to whether or not a person selling mining property is required by the law to secure a real estate broker license, I first call your attention to section 1, chapter 605, Statutes 1919, which reads as follows: "It shall be unlawful for any person, copartnership or corporation to engage in the business, or act in the capacity of a real estate broker, or a real estate salesman within this state without first obtaining a license therefor."

Section 2, of the same chapter, reads as follows: "A real estate broker within the meaning of this act is a person, copartnership or corporation who, for a compensation, sells, or offers for sale, buys, or offers to buy, or negotiates the purchase or sale or exchange of real estate, or who, for compensation, negotiates loans on real estate, leases, or offers to lease, rents, or places for rent, or collects rents from real estate, or improvements thereon, for others as a whole or partial vocation."

The last sentence of the same section states that "One act, for a compensation, or buying or selling real estate of or for another, or offering for another to buy or sell or exchange real estate, or negotiating a loan on or leasing or renting or placing for rent real estate, or collecting rent therefrom shall constitute the person, copartnership or corporation making such offer, sale or purchase, exchange or lease, or negotiating said loan, or so renting or placing for rent or collecting said rent a real estate broker or salesman within the meaning of this act."

It can be readily seen from the above that any one who, for a compensation, buys or sells real estate for another is required to hold a real estate broker license, and that one act alone for a compensation constitutes such person a real estate broker or salesman.

I further call your attention to section 17, of the same act, which reads: "Any person or corporation acting as real estate broker or real estate salesman within the meaning of this act without a license as herein provided shall, upon conviction thereof, if a person, be punished by a fine of not to exceed two thousand dollars, or by imprisonment in the county jail or state prison for a term not to exceed two years, or by both such fine and imprisonment, in the discretion of the court; or if a corporation, be punished by a fine of not to exceed five thousand dollars."

Under section 20 of the act, "No person, copartnership or corporation engaged in the business or acting in the capacity of a real estate broker or a real estate salesman within this state shall bring or maintain any action in the courts of this state for the collection of compensation for the performance of any of the acts mentioned in section two hereof without alleging and proving that such person, copartner-

¹Commissioner, State Real Estate Department, Sacramento, Cal.

ship or corporation was a duly licensed real estate broker or real estate salesman at the time the alleged cause of action arose."

A broker, therefore, in order to collect for his services must be in the possession of a real estate broker license at the time the alleged cause of action arose. Many brokers have been defeated in their attempt to collect a commission because they were negligent and dilatory in the securing of a license from this department.

In regard to the application of the real estate act to mining property, I first call your attention to section 658, Civil Code of California, which defines real property, or immovable property, as:

1. Land;
2. That which is affixed to land;
3. That which is incidental or appurtenant to land;
4. That which is immovable by law.

Also, I call your attention to section 659 reading: "Land is the solid material of the earth, whatever may be the ingredients of which it is composed, whether soil, rock or other substance."

From the reading of this section it seems to me that a mine is real property.

Section 661, headed "Fixtures attached to mines," reads as follows: "Sluiceways, flumes, hose, pipes, railway tracks, cars, blacksmith-shops, mills, and all other machinery or tools used in working or developing a mine, are to be deemed affixed to the mine."

Section 662, under the head "Appurtenances," reads as follows: "A thing is deemed to be incidental or appurtenant to land when it is by right used with the land for its benefit, as in the case of a way, or watercourse, or of a passage for light, air, or heat from or across the land of another."

Taking into consideration the reading of the sections above referred to, my opinion is that mining property, all fixtures attached to mines, and all appurtenances thereto, are real estate. Therefore, any one selling or offering such property for sale for another for a compensation would be considered as a real estate broker or salesman within the meaning of the act. Therefore, such person should secure for himself, either a broker or a salesman license. One transaction is sufficient to constitute such person a real estate broker or salesman and should such person not have secured for himself a license at the time of negotiating and closing such transaction, he would be in violation of the law and liable to prosecution.

Further, should his right to a commission be disputed, he would not be able to bring or maintain an action in the civil courts of this state.

ADMINISTRATIVE DIVISION.

WALTER W. BRADLEY, Deputy State Mineralogist.

Personnel.

During the period, April 15–July 15, the following changes in personnel have taken place:

Mr. Forrest L. Campbell, librarian, has been transferred to the oil division as an inspector, with station at Los Angeles.

Mr. E. A. Lowe of San Francisco is temporarily filling the place of librarian.

IN THE OIL DIVISION:

Mr. R. M. Barnes, for nearly four years deputy supervisor at Coalinga, resigned to engage in commercial practice.

Mr. W. W. Copp, for the past year deputy supervisor at Taft, resigned to engage in commercial practice.

Mr. V. H. Wilhelm has been appointed Deputy Supervisor for District No. 5 with headquarters at Coalinga, to fill the position made vacant by the resignation of R. M. Barnes.

Mr. E. Huguenin, deputy supervisor, has been transferred from Santa Paula and is now in charge as Deputy Supervisor for District No. 4, with headquarters at Taft, to fill the position made vacant by the resignation of W. W. Copp.

Mr. H. A. Godde, formerly petroleum engineer in the Department of Petroleum and Gas, has been appointed Deputy Supervisor for District No. 2, with headquarters at Santa Paula, to succeed Deputy Supervisor E. Huguenin, transferred to District No. 4.

New Publications.

During the quarterly period covered by this issue, the following Bureau publications have been made available for distribution:

Bulletin No. 92, "Gold Placers of California," by Charles S. Haley. Accompanied by a topographic map in four colors showing distribution of the gravels. Price \$1.50, postpaid. Extra copies of the map are available, separately, at 50 cents apiece, postpaid.

Mining in California (quarterly), April 1924, being Chapter No. 2, of State Mineralogist's Report XX, price 25 cents.

Summary of Operations, California Oil Fields: Vol. 9, Nos. 8, 9, and 10, February, March and April, 1924, respectively.

Commercial Mineral Notes: Nos. 13, 14, 15, April-June, inc. These 'notes' carry the lists of 'mineral deposits wanted' and 'minerals for sale,' issued in the form of a mimeographed sheet, monthly. It is mailed free of charge to those on the mailing list for 'Mining in California.'

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Deputy State Mineralogist.

STATISTICS.

Figures on the 1923 production of several of California's commercial minerals were given in the April issue of 'Mining in California,' and data on a number of additional ones are here shown in advance of the publication of the complete and detailed bulletin in course of compilation at this writing (July 15).

COAL.

Coal production in California in 1923 totaled only 1010 tons valued at \$5,090, being credited to Mendocino and Riverside counties. None of it was marketed, but it was consumed for local camp purposes and for power and forge use in development work on the deposits. Besides the localities mentioned above, development work was also under way on coal deposits in San Benito and Shasta counties. In the former, at the property of the San Benito Coal Company, it is proposed to install an electric-power generating and by-product plant, rather than to ship the coal, owing to the distance from rail transportation.

Total Coal Production of California.

The very considerable output of coal in the years previous to 1883 was almost entirely from the Mount Diablo district, Contra Costa County. Later, the Tesla Mine in Corral Hollow, Alameda County, was an important producer for a few years. Stone Canyon, Monterey County, was also an important producer for a short time, and there has been some coal shipped from properties in Amador, Fresno, Orange, Riverside, and Siskiyou counties. The following tabulation gives the annual tonnages and values, according to available records:

Coal Output and Value by Years.

Year	Tons	Value	Year	Tons	Value
1861	6,620	\$38,065	1893	72,603	\$167,555
1862	23,400	134,550	1894	59,887	139,862
1863	43,200	248,400	1895	79,858	193,790
1864	50,700	291,525	1896	70,649	161,335
1865	60,530	348,048	1897	87,449	196,255
1866	84,020	483,115	1898	143,045	337,475
1867	124,690	716,968	1899	160,941	420,109
1868	143,676	826,137	1900	176,956	535,531
1869	157,234	904,096	1901	150,724	401,772
1870	141,890	815,868	1902	88,460	248,622
1871	152,493	876,835	1903	93,026	265,383
1872	190,859	1,097,439	1904	79,062	376,494
1873	186,611	1,073,013	1905	46,500	144,500
1874	215,352	1,238,274	1906	24,850	61,600
1875	166,638	958,169	1907	23,734	55,849
1876	128,049	736,282	1908	18,496	55,503
1877	107,789	619,787	1909	49,389	216,913
1878	134,237	771,863	1910	11,033	23,484
1879	147,879	850,304	1911	11,047	18,297
1880	236,950	1,362,463	1912	14,484	39,092
1881	140,000	805,000	1913	25,198	85,809
1882	112,592	647,404	1914	11,859	28,806
1883	76,162	380,810	1915	10,299	26,662
1884	77,485	309,950	1916	4,037	7,030
1885	71,615	286,460	1917	3,527	7,691
1886	100,000	300,000	1918	6,343	16,149
1887	50,000	150,000	1919	2,983	8,203
1888	95,000	380,000	1920	2,078	5,450
1889	121,280	288,232	1921	12,467	63,578
1890	110,711	283,019	1922	27,020	135,100
1891	93,301	204,902	1923	1,010	5,090
1892	85,178	209,711			
			Totals	5,205,155	\$23,085,678

The tonnages in the above table for the years 1861-1886 (incl.) are taken from the U. S. Geological Survey, "Mineral Resources of the U. S., 1910," p. 107. The values assigned for the years previous to 1883 are those given by W. A. Goodyear (Mineral Res., 1882, pp. 93-94), being an average of \$5.75 per ton. From 1887 to date the figures are those of the California State Mining Bureau.

DOLOMITE.

The production of dolomite for the year 1923 totaled 69,519 tons valued at \$142,615, being an increase over the 52,409 tons and \$114,911 of 1922, and came from a total of six quarries in Inyo, Monterey, and San Benito counties.

An important part of the tonnage being shipped is utilized as a refractory lining in the bottoms of open-hearth steel furnaces, as a substitute for magnesite. Part of the Inyo County material is used for its CO₂ by the chemical plants on Owens Lake, in the manufacture of soda ash and bicarbonate from the waters of the lake. Some also is used for terrazzo and for stucco dash-coat.

The 1923 output was distributed as follows :

County	Tons	Value
Inyo	47,542	\$79,793
Monterey and San Benito*	21,977	62,822
Totals	69,519	\$142,615

*Combined to conceal output of a single quarry in each.

Dolomite Production of California, by Years.

Amount and value of the output of dolomite, annually, have been as follows:

Year	Tons	Value
1915.....	4,192	\$14,504
1916.....	13,313	46,566
1917.....	27,911	66,416
1918.....	24,560	79,441
1919.....	24,502	67,953
1920.....	42,388	132,791
1921.....	31,195	99,155
1922.....	52,409	114,911
1923.....	69,519	142,615
Totals.....	289,989	\$764,352

FELDSPAR.

Feldspar was produced by five operators in two counties (Riverside and San Diego) during 1923, to the amount of 11,100 tons, valued at \$81,800, being more than double both the quantity and value of 1922 which were 4587 tons and \$37,109.

The product was used in the ceramic industry, principally in pottery, porcelain, enamel wares, also enamel brick and tile, being a constituent of both the body and the glaze, but more especially the latter. For the characteristics, grades, and marketing data of feldspar, the reader is referred to the excellent paper by Prof. Watts¹ and quoted in our report of last year.²

Total Feldspar Production of California.

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:

Year	Tons	Value	Year	Tons	Value
1910.....	760	\$5,720	1917.....	11,792	\$46,411
1911.....	740	4,560	1918.....	4,132	22,061
1912.....	1,382	6,180	1919.....	1,272	12,965
1913.....	2,129	7,850	1920.....	4,518	26,189
1914.....	3,530	16,565	1921.....	4,349	28,343
1915.....	1,800	9,000	1922.....	4,587	37,109
1916.....	2,630	14,350	1923.....	11,100	81,800
			Totals.....	54,721	\$318,098

FULLER'S EARTH.

Fuller's earth includes many kinds of unctious clays. It is usually soft, friable, earthy, nonplastic, white and gray to dark green in color, and some varieties disintegrate in water. In California, fuller's earth has been used in clarifying both refined mineral and vegetable oils, and for special chemical purposes; although its original use was in

¹Watts, A. S., The marketing of feldspar: Eng. & Min. Jour.-Press, Vol. 115, pp. 535-538, Mar. 24, 1923.

²Bradley, W. W., California mineral production for 1922; Cal. State Min. Bur., Bulletin 93, pp. 108-110, 1923.

fulling wool, as the name indicates. Production has come mainly from Calaveras and Solano counties, with other deposits noted also in Riverside, Fresno, Inyo, and Kern counties.

Clays of the montmorillonite and halloysite group ('rock soap') are being utilized by some of the oil refineries in lieu of true fuller's earth in the refining of petroleum products.

The production of 3650 tons, valued at \$55,125, here credited to 1923, as 'fuller's earth' is in reality colloidal clay of the montmorillonite class (sold under such local names as: 'bentonite,' 'otaylite,' 'shoshonite,' derived from the locality where found). Because of its being used for clarifying and filtering processes, we have placed it, for the purposes of this statistical report, under the 'fuller's earth' heading. After all, the practical test of a fuller's earth is not so much a chemical one, as a practical one; that is, its physical capacity to absorb basic colors and to remove these colors from solution in animal, vegetable or mineral oils, also from water.

The 1923 production in California shows a decrease in tonnage, but an increase in value and came from three properties, in Inyo and San Diego counties.

Fuller's Earth Production of California, by Years.

Fuller's earth was first produced commercially in this state in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899	620	\$12,400	1912	876	\$6,500
1900	500	3,750	1913	460	3,700
1901	1,000	19,500	1914	760	5,928
1902	987	19,246	1915	692	4,002
1903	250	4,750	1916	110	550
1904	500	9,500	1917	220	2,180
1905	1,344	38,000	1918	37	333
1906	440	10,500	1919	385	3,810
1907	100	1,000	1920	600	6,000
1908	50	1,000	1921	1,185	8,295
1909	459	7,385	1922	6,606	48,756
1910	340	3,820	1923	3,650	55,125
1911	466	5,294	Totals	22,637	\$281,324

NOTE.—Above production, in 1922–1923, was montmorillonite (hydrous aluminum silicate) a colloidal clay, sometimes called 'rock soap,' and in part locally called 'shoshonite' from its being found near Shoshone in Inyo County; and in part 'otaylite' from Otay, San Diego County.

GEMS.

The production of gem materials in California has been somewhat irregular and uncertain since 1911. The compilation of complete statistics is difficult owing to the widely scattered places at which stones are gathered and marketed in a small way. The materials reported in 1923 totaled \$13,220 in value, the increase over the figure of \$1,312 in 1922 being due mainly to a slight renewal of activity in the tourmaline district of northern San Diego County, and in part to shipments of quartz crystals from Calaveras County.

The following table shows the distribution of rough, uncut gem and jeweler's materials during 1923:

County	Value	Kind
San Diego.....	\$8,530	Tourmaline, kunzite, essonite and spessartite garnets, aquamarine and pink beryl, blue topaz, quartz crystals.
Butte.....	*4,690	{ Diamonds.
Calaveras.....		{ Quartz crystals.
Inyo.....		{ Turgite, opals, chalcedony, lapis lazuli.
Riverside.....		{ Quartz crystals, green beryl.
San Bernardino.....		{ Topaz, thomsonite.
Total value.....	\$13,220	

*Combined to conceal output of a single operator in each.

For a detailed listing of the industrial uses of precious and semi-precious stones, the reader is referred to our statistical report for 1922.¹

Total Production of Gem Materials in California.

The value of the gem output in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900.....	\$20,500	1912.....	\$23,050
1901.....	40,000	1913.....	13,740
1902.....	162,100	1914.....	3,970
1903.....	110,500	1915.....	3,565
1904.....	136,000	1916.....	4,752
1905.....	148,500	1917.....	3,049
1906.....	497,090	1918.....	650
1907.....	232,642	1919.....	5,425
1908.....	208,950	1920.....	36,056
1909.....	193,700	1921.....	10,954
1910.....	237,475	1922.....	1,312
1911.....	51,824	1923.....	13,220
		Total.....	\$2,159,024

GOLD.

Gold was the first and, for many years, the most important single mineral product of California. Although now surpassed for a number of years in annual value by petroleum, and by cement beginning with 1920, it still heads our metal list, and California continues to outrank all the other gold-producing states of the United States, including Alaska. In fact, at present California is producing approximately one-third of the gold mined in the entire United States.

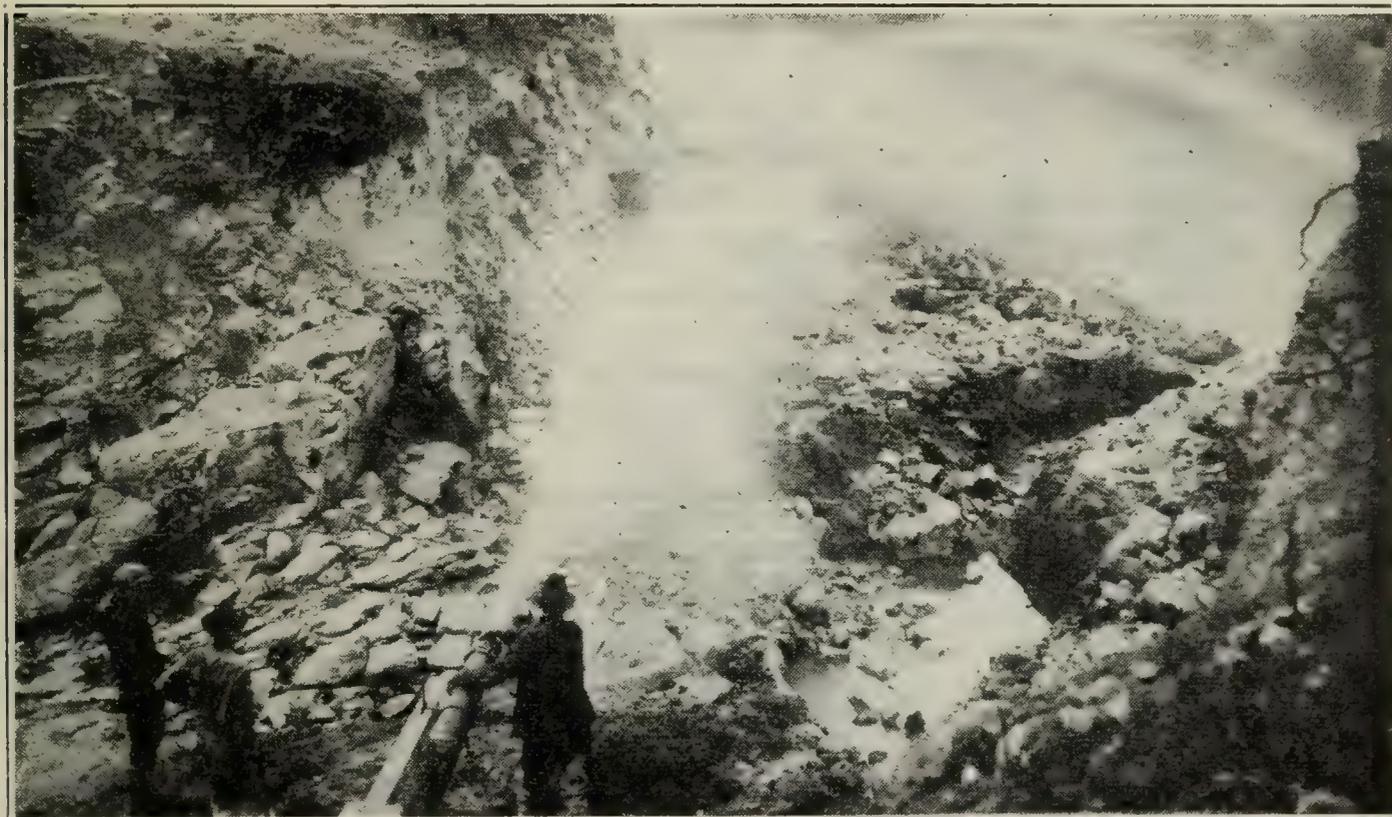
While there is some renewal of activity in the development of gold lode properties, it has not yet become reflected in an increased yield of the metal. The 1923 figures show a decrease from the 1922 yield. The continued shut-down of most of the copper mines which have always been important producers of by-product gold and silver, has also been an important factor.

¹California mineral production for 1922: Cal. State Min. Bur., Bulletin 93, pp. 115-117, 1923.

Outlook for 1924.

According to the mid-year review of the United States Geological Survey¹ for the first six months of 1924,

"Metal mining in California was rather active during the first six months of 1924, * * * as shown by reports received from the miners by J. M. Hill, of the San Francisco office of the Geological Survey. Most of the activity has been directed to the development of gold quartz mines rather than to production, for the output of gold and silver was less than in the first six months of 1923. Five of the large Mother Lode mines—the Argonaut, Plymouth, Shawmut, Central Eureka, and Moore—are deepening their shafts. The placer output was small, because of drought; a large number of hydraulic properties in the Klamath and Sierra mountains had almost no water and therefore made but small output. The dredges maintained production at about the normal rate, but fewer boats are working. The silver mines, particularly the California Rand, curtailed production in order to carry on extensive development. The lead producers in the southern part of the state have apparently been working at the normal rate. The production of copper has been further increased; the rate during the first six months of 1924 was about 4,000,000 pounds a month. The work of development at the Engels mine may restrict the output there during the rest of the year."



Elephant Deep Hydraulic Mine, at Volcano, Amador County, Cal.

Production in 1923.

The State Mining Bureau has never independently collected statistics of gold and silver production, as there is no necessity for duplicating the very thoroughly organized work of the U. S. Geological Survey covering those metals. The data here given relative to these two metals have been received through the courtesy and cooperation of Mr. J. M. Hill, Statistician in Charge of the San Francisco branch office of the Division of Mineral Resources. Anyone wishing fuller details of the production of these metals may obtain the same by applying to the U. S. Geological Survey, Washington, D. C., or to room 305, U. S. Custom House, San Francisco, California, for a copy of the 'separate' on the subject.

The gold production of California for 1923 was distributed, by counties, as follows :

¹U. S. Geol. Surv., Press Bulletin July 11, 1924.

Gold Production by Counties, 1923.

County	Value	County	Value
Amador	\$1,734,133	Nevada	\$2,282,155
Butte	487,393	Placer	75,732
Calaveras	1,205,784	Plumas	174,871
Del Norte	1,778	Sacramento	1,331,227
El Dorado	30,264	San Bernardino	210,923
Fresno	18,519	San Diego	822
Humboldt	2,260	Shasta	359,487
Imperial, Orange, Riverside*	1,126	Sierra	878,164
Inyo	36,702	Siskiyou	45,633
Kern	107,051	Stanislaus	174,814
Lassen, Merced, Modoc*	661	Trinity	617,841
Los Angeles	714	Tuolumne	261,936
Madera	12,074	Yuba	3,150,405
Mariposa	141,883		
Mono	34,661	Total	\$13,379,013

*Combined to conceal output of a single producer in each.

The decline in gold yield from the 1922 figure of \$14,670,346 was due to a lower production from the quartz mines, whereas the placer yield showed a slight increase. The tonnage of dry gold ores treated in 1923 was about 200,000 tons less, but the yield of gold from all other classes of ore was greater in 1923 than in 1922.

Total Gold Production of California.

Year	Value	Year	Value
1848	\$245,301	1886	\$14,716,506
1849	10,151,360	1887	13,588,614
1850	41,273,106	1888	12,750,000
1851	75,938,232	1889	11,212,913
1852	81,294,700	1890	12,309,793
1853	67,613,487	1891	12,728,869
1854	69,433,931	1892	12,571,900
1855	55,485,395	1893	12,422,811
1856	57,509,411	1894	13,923,281
1857	43,628,172	1895	15,334,317
1858	46,591,140	1896	17,181,562
1859	45,846,599	1897	15,871,401
1860	44,095,163	1898	15,906,478
1861	41,884,995	1899	15,336,031
1862	38,854,668	1900	15,863,355
1863	23,501,736	1901	16,989,044
1864	24,071,423	1902	16,910,320
1865	17,930,858	1903	16,471,264
1866	17,123,867	1904	19,109,600
1867	18,265,452	1905	19,197,043
1868	17,555,867	1906	18,732,452
1869	18,229,044	1907	16,727,928
1870	17,458,133	1908	18,761,559
1871	17,477,885	1909	20,237,870
1872	15,482,194	1910	19,715,440
1873	15,019,210	1911	19,738,908
1874	17,264,836	1912	19,713,478
1875	16,876,009	1913	20,406,958
1876	15,610,723	1914	20,653,496
1877	16,501,268	1915	22,442,296
1878	18,839,141	1916	21,410,741
1879	19,626,654	1917	20,087,504
1880	20,030,761	1918	16,529,162
1881	19,223,155	1919	16,695,955
1882	17,146,416	1920	14,311,043
1883	24,316,873	1921	15,704,822
1884	13,600,000	1922	14,670,346
1885	12,661,044	1923	13,379,013
		Total	\$1,763,972,282

GYPSUM.

During 1923, one operator each in Imperial, Kern, Riverside and San Bernardino counties produced a total of 86,410 tons of gypsum valued at \$289,136, compared with 47,084 tons, worth \$188,336 in 1922. The material was utilized mainly in cement manufacture, plaster and for fertilizer. The 1923 shipments of gypsum were the largest in the history of the industry in California, the increase being due to the opening up of a deposit in western Imperial County, by the Imperial Gypsum and Oil Company.

Total Production of Gypsum in California.

Production of gypsum annually in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887	2,700	\$27,000	1906	21,000	\$69,000
1888	2,500	25,000	1907	8,900	57,700
1889	3,000	30,000	1908	34,600	155,400
1890	3,000	30,000	1909	30,700	138,176
1891	2,000	20,000	1910	45,294	129,152
1892	2,000	20,000	1911	31,457	101,475
1893	1,620	14,280	1912	37,529	117,388
1894	2,446	24,584	1913	47,100	135,050
1895	5,158	51,014	1914	29,734	78,375
1896	1,310	12,580	1915	20,200	48,953
1897	2,200	19,250	1916	33,384	59,533
1898	3,100	23,600	1917	30,825	56,840
1899	3,663	14,950	1918	19,695	37,176
1900	2,522	10,088	1919	19,813	50,579
1901	3,875	38,750	1920	20,507	92,535
1902	10,200	53,500	1921	37,412	78,875
1903	6,914	46,441	1922	47,084	188,336
1904	8,350	56,592	1923	86,410	289,136
1905	12,859	54,500			
			Totals	681,052	\$2,455,808

LIME.

Lime to the amount of 70,894 tons, valued at \$788,834, was produced by nine plants in six counties during 1922, as compared with 57,875 tons valued at \$671,747 in 1922. There were two plants each in Kern, San Bernardino and Santa Cruz counties, and one each in Shasta, Siskiyou and Tuolumne County. Previous to this present report the lime output has been recorded in 'barrels;' but as that unit is variable, and as most of the operators are now reporting in 'tons,' we have adopted the short ton instead and have converted the figures in the table of annual production to that unit, as shown below.

So far as we have been able to segregate the data, these figures include only such lime as is used in building operations. A portion is hydrated lime. Limestone utilized in sugar making, for smelter flux, as a fertilizer, and other special industrial uses, are classified under 'Industrial Materials.' That consumed in cement manufacture is included in the value of cement.

Reports from the San Francisco district indicate that the market there is being adversely affected by the importation of Canadian lime against which there is an inadequate duty.

Lime Production of California by Years.

The following tabulation gives the amounts and value of lime pro-

duced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1894	37,350	\$318,700	1909	52,075	\$577,824
1895	39,776	386,094	1910	47,951	477,683
1896	30,275	261,505	1911	42,959	390,988
1897	28,780	252,900	1912	52,212	464,440
1898	29,786	254,010	1913	61,344	528,547
1899	29,985	314,575	1914	43,996	378,663
1900	31,252	283,699	1915	35,653	286,304
1901	31,738	334,688	1916	49,364	390,475
1902	44,866	369,616	1917	50,073	311,380
1903	49,659	418,280	1918	43,684	461,315
1904	57,945	571,749	1919	42,070	552,043
1905	61,700	555,322	1920	46,314	557,232
1906	68,927	763,060	1921	46,353	610,619
1907	68,422	756,376	1922	57,875	671,747
1908	39,639	379,243	1923	70,894	788,834
			Totals	1,392,917	\$13,667,911

LIMESTONE.

'Industrial' limestone was produced in nine counties during 1923, to the amount of 143,266 tons, valued at \$348,464, being an increase both in quantity and value over the 1922 output of 84,382 tons, worth \$282,181.

The amount here given does not include the limestone used in the manufacture of cement nor for macadam and concrete, nor of lime for building purposes; but accounts for that utilized as a smelter and foundry flux, for glass and sugar making, and other special chemical and manufacturing processes. It also includes that utilized for fertilizers (agricultural 'lime'), 'roofing gravel,' paint filler, whiting for paint, putty, kalsomine, terrazzo, paving dust, concrete filler, chicken grit, carbon dioxide gas, 'paving compound,' and facing dust for concrete pipe. That indicated in the table below as coming from Santa Clara County and a part of that from Los Angeles is calcareous marl sold for agricultural purposes. Of the total product in 1923 approximately 23,000 tons valued at \$101,000 was used for agricultural purposes.

Distribution of the 1923 output was as follows:

County	Tons	Value
El Dorado	95,274	\$163,987
Los Angeles	2,717	8,779
San Bernardino	5,859	28,324
Santa Clara	8,252	49,512
Santa Cruz	6,733	14,242
Tuolumne	3,140	7,680
Tulare	15,500	57,500
Contra Costa, Kern, Shasta*	5,791	18,440
Totals	143,266	\$348,464

*Combined to conceal output of a single operator in each.

Limestone Production of California by Years.

The following tabulation gives the amounts and value of 'industrial' limestone produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. These tonnages consist principally of limestone utilized for flux, glass and sugar making, agricultural, chemical, and other special industrial purposes. That utilized in cement manufacture is not included.

Year	Tons	Value	Year	Tons	Value
1894	15,420	\$19,275	1910	684,635	\$581,208
1895	71,355	71,690	1911	516,398	452,790
1896	68,184	71,112	1912	613,375	570,248
1897	36,796	38,556	1913	301,918	274,455
1898	27,686	24,548	1914	572,272	517,713
1899	30,769	29,185	1915	146,324	156,288
1900	32,791	31,532	1916	187,521	217,733
1901	76,937	99,445	1917	237,279	356,396
1902	71,422	90,524	1918	208,566	456,258
1903	125,919	163,988	1919	88,291	248,145
1904	40,207	87,207	1920	90,120	298,197
1905	192,749	323,325	1921	75,921	305,912
1906	80,262	162,827	1922	84,382	282,181
1907	230,985	406,041	1923	143,266	348,464
1908	273,890	297,264			
1909	337,676	419,921	Totals	5,663,316	\$7,402,428

MINERAL PAINT.

Mineral paint materials were produced in California in 1923 from a total of five properties in the following three counties: Nevada, Stanislaus and Ventura. The total amounted to 1049 tons, valued at \$11,773, being a decrease from the 1620 tons and \$13,277 of 1922. The material shipped from Nevada County is hematite; from Stanislaus, yellow ochre; and that from Ventura, red ochre.

Mineral Paint Production of California, by Years.

The first recorded production of mineral paint materials in the state was in the year 1890. The output, showing annual amount and value, since that time, is given herewith:

Year	Tons	Value	Year	Tons	Value
1890	40	\$480	1908	335	\$2,250
1891	22	880	1909	305	2,325
1892	25	750	1910	200	2,040
1893	590	26,795	1911	186	1,184
1894	610	14,140	1912	300	1,800
1895	750	8,425	1913	303	1,780
1896	395	5,540	1914	132	847
1897	578	8,165	1915	311	1,756
1898	653	9,698	1916	643	3,960
1899	1,704	20,294	1917	520	2,700
1900	529	3,993	1918	728	4,738
1901	325	875	1919	1,780	17,055
1902	589	1,533	1920	779	8,477
1903	2,370	3,720	1921	446	4,748
1904	270	1,985	1922	1,620	13,277
1905	754	4,025	1923	1,049	11,773
1906	250	1,720			
1907	250	1,720	Totals	19,741	\$188,448

PETROLEUM.

The crude oil production of California for 1923 amounted to a total of 262,875,690 barrels of clean oil, valued at \$242,731,309 at the well. This total of quantity is compiled from the monthly production reports filed by the operators with the State Oil and Gas Supervisor, to which have been added figures for the output of a number of small operators in the Los Angeles city field not under the jurisdiction of the Supervisor, and from one property in Santa Clara County.

The question of the value of the crude oil yield, at the well, is a difficult one to settle with exactitude, principally because a large part of the output is not sold until after refining. The large refiners are also large producers of crude oil which they send direct from well to plant, hence much of the crude is not sold as such. The values used in the statistical reports of the State Mining Bureau since 1914 have been derived from averages of actual sales of crude oil of all grades in each field of the state, and these averages applied to the total yield of the respective fields. This we feel is a safer measure of commercial values than market quotations, because quotations do not always mean sales.

Features of 1923.

The outstanding feature of the year 1923 in the oil industry of California was the continued increase in Los Angeles and Orange counties due to intensive drilling of new and gusher wells yielding high-gravity oil, with consequent overproduction. This necessitated the continued shutting-in of low-gravity wells in other fields of the state. As in 1922, this resulted in further decreased output of crude oil in Fresno, Kern and Santa Barbara counties. The peak of production came in the month of August, 1923, when the state's total amounted to 26,440,005 barrels, followed by a figure only slightly less for the month of September. The increase in Los Angeles County alone was more than four-fold, while the Orange County yield was 50 per cent greater than the previous year. As in 1922, Ventura County also increased, to the extent of approximately 25 per cent.

There were three reductions in 1923 in prices quoted for crude oil at the well, above 20° Baumé gravity, announced by the marketing companies, January 6, April 10, and October 9. The reductions were proportionately greater for the specific gravities above 28° than for those below. Both in 1922 and 1923, the price reductions to a limited extent, only, affected the production total by causing the shutting-in of wells yielding oil of the lower gravities and in the districts outside of the areas where intensive campaigns of new developments were taking place. The unprecedented increase in production taxed the storage, transportation, and refining facilities of all of the marketing concerns. Shipments by sea via the Panama Canal to Atlantic seaboard points advanced to important amounts and became of vital assistance in the situation.

Estimating in January the output of the year just closed, the State Oil and Gas Supervisor¹ presents the following observations:

"California again broke all previous records in its production of petroleum by producing 263,729,000 barrels in 1923. This is about 36 per cent of the amount

¹Bush, R. D., Weekly press bulletin, No. 431: Dept. of Petr. and Gas; Cal. State Min. Bur. Jan. 26, 1924.

produced in the entire United States, and almost double the amount produced by California in 1922, which was a record year. This great increase was due to the intensive and rapid development of the Huntington Beach, Santa Fe Springs and Long Beach fields, where initial productions of nearly all the wells were large. These three fields produced 69.4 per cent of the state's production in 1923. This tremendous production taxed the storage capacity and marketing facilities of the large companies, and caused new markets for California crude oil to be opened. About 92,000,000 barrels of crude was in storage at the end of 1923, as compared with 61,380,000 barrels at the beginning of the year, and notwithstanding about 54,455,000 barrels was shipped through the Panama Canal to eastern refineries.

"During September, 1923, production reached its maximum, and then declined, this decline continuing to the end of the year, in spite of the fact that production was resumed in some of the San Joaquin Valley fields where it had been shut in. In December, 1923, for the first time since December, 1920, storage decreased, or, in other words, consumption which includes oil shipped to eastern ports through the Panama Canal, was greater than the December production, which averaged daily 706,000 barrels. The indicated consumption of oil increased during the year from 451,613 barrels in December, 1922, to 711,459 barrels in December, 1923.

"There were three reductions in the price of oil in 1923; the first reduction was made on January 6, when all grades, including 20 degrees Baumé and above, were reduced, the highest gravity (35 degrees and above) being reduced 53 cents. The next reduction, on April 10, for the refinable oils, amounted to 41 cents for the highest grade. The third reduction, amounting to 18 cents on the highest grade, was made on October 9. Fuel oil, or the grades below 20 degrees Baumé, remained stationary during the year.

"A total of 1400 new wells was started in 1923, as compared with 1439 in 1922. During the year, 980 producing wells were completed.

"At the close of the year with the Santa Fe Springs, Huntington Beach and Long Beach fields almost completely developed, activity in the Los Angeles Basin centered in Torrance field, but this field does not give promise of being as prolific, or of developing as rapidly, as the above mentioned fields, since most of the acreage is held in comparatively large leases by the larger companies. Activity is also gradually increasing in the older fields of the San Joaquin Valley, and the outlook for the petroleum industry for the year 1924 looks bright at the present time. The year started out with an increase in the price of all grades of oil amounting to 25 cents, effective January 22, and the prospect of additional increases during the year is good."

Outlook for 1924.

The outlook for the current year is for a somewhat lower total quantity than in 1923. At the same time, consumption is showing an unexpected decline, due to a number of causes, as noted by Bush¹ elsewhere herein.

Production Figures.

The following table gives the production and value by counties for 1923, compared with the 1922 figures:

TABLE A.
Production and Value of Oil, by Counties.

County	1922		1923	
	Barrels	Value	Barrels	Value
Fresno.....	9,265,526	\$9,895,582	5,061,542	\$3,593,695
Kern.....	53,512,157	64,803,222	45,952,794	37,629,300
Los Angeles.....	37,726,367	52,930,093	158,665,019	154,063,733
Orange.....	31,049,491	36,483,162	46,474,921	40,897,930
San Luis Obispo.....	33,856	31,892	32,988	19,793
Santa Barbara.....	3,931,155	3,974,398	3,061,947	2,394,433
Ventura.....	2,933,685	5,236,628	3,610,794	4,109,084
San Mateo and Santa Clara*.....	15,985	26,288	15,685	23,341
Totals.....	138,468,222	\$173,381,265	262,875,690	\$242,731,309

*Combined to conceal output of a single operator in San Mateo County.

¹ Bush, R. D., Features of production, first half of 1924, p. 201, *ante*.

The foregoing totals show a state average price of \$0.923 per barrel for the year 1923, as compared to \$1.249 in 1922. As already noted in a preceding paragraph, the drop in value was due to an overproduction in the higher grades of crude oil and a consequently greater proportional drop in prices for the higher grades.

TABLE B.
Total Petroleum Production in California.

Year	Barrels	Value	Year	Barrels	Value
To and inc. 1875	(a) 175,000	(b) \$472,500	1900	4,329,950	\$4,152,928
1876	12,000	30,000	1901	7,710,315	2,961,102
1877	13,000	29,250	1902	14,356,910	4,692,189
1878	15,227	30,454	1903	24,340,839	7,313,271
1879	19,858	39,716	1904	29,736,003	8,317,809
1880	40,552	60,828	1905	34,275,701	9,007,820
1881	99,862	124,828	1906	32,624,000	9,238,020
1882	128,636	257,272	1907	40,311,171	16,783,943
1883	142,857	285,714	1908	48,306,910	26,566,181
1884	262,000	655,000	1909	58,191,723	32,398,187
1885	325,000	750,750	1910	77,697,568	37,689,542
1886	(a) 377,145	(b) 870,205	1911	84,648,157	40,552,088
1887	678,572	1,357,144	1912	89,689,250	41,868,344
1888	690,333	1,380,666	1913	98,494,532	48,578,014
1889	303,220	368,048	1914	102,881,907	47,487,109
1890	307,360	384,200	1915	91,146,620	43,503,837
1891	323,600	401,264	1916	90,262,557	57,421,334
1892	385,049	561,333	1917	95,396,309	86,976,209
1893	470,179	608,092	1918	99,731,177	127,459,221
1894	783,078	1,064,521	1919	101,182,962	142,610,563
1895	1,245,339	1,000,235	1920	103,377,361	178,394,937
1896	1,257,780	1,180,793	1921	112,599,860	203,138,225
1897	1,911,569	1,918,269	1922	138,468,222	173,381,265
1898	2,249,088	2,376,420	1923	262,875,690	242,731,309
1899	2,677,875	2,660,793			
			Totals	1,857,529,873	\$1,612,091,748

^a U. S. G. S. Min. Res. of U. S., 1886, p. 440, for quantities to and including 1886.

^b Values have been estimated for the years to and including 1886, after consulting a number of contemporaneous publications, including the Mining & Scientific Press, Reports of the State Mineralogist, and U. S. Reports. The figures for 1887 to date are from records of the State Mining Bureau.

Specific Gravities of Oils Produced.

The proportion of heavy and light oil produced in the various fields is shown in Table C, following, for which we are indebted to the Standard Oil Company. Under present practice, oil below 18° Baumé may be considered as largely refinable for fuel oil and lubricants, while the lighter oils yield varying amounts of the higher refined products with corresponding proportions of residuum and fuel oil. Specific gravities in California range from 8° Baumé in the Casmalia field, Santa Barbara County, to 56° Baumé in Ventura County.

California crude oils are all essentially of asphalt base, with a few notable exceptions. In the following localities are wells yielding crudes containing both asphalt and paraffine constituents: Oil City field, Coalinga; a few deep wells in East Side field, Coalinga; a considerable part of the Ventura County fields; Western Minerals area, south of Maricopa; Wheeler Ridge, Kern County.

TABLE C.

Production of Light and Heavy Oil, by Fields, 1923.

	Under 18° (barrels)	18° and over (barrels)	Total (barrels)
Kern River.....	6,734,652		6,734,652
McKittrick.....	2,221,903		2,221,903
Midway-Sunset.....	9,619,212	26,164,297	35,783,509
Lost Hills and Belridge.....	482,267	1,341,659	1,823,926
Wheeler Ridge.....		128,588	128,588
Coalinga.....	3,598,008	1,536,864	5,134,872
Santa Maria-Lompoc.....	1,781,971	1,189,361	2,971,332
Ventura-Newhall.....	61,292	3,641,704	3,702,996
Los Angeles-Salt Lake.....	1,093,351	128,755	1,222,106
Whittier-Fullerton.....	668,877	16,825,425	17,494,302
Santa Fe Springs.....		80,266,082	80,266,082
Huntington Beach.....	449,653	34,469,316	34,918,969
Signal Hill-Long Beach.....	78,886	68,838,681	68,917,567
Torrance-Redondo.....	377,282	2,783,335	3,160,617
Summerland.....	51,110		51,110
Watsonville.....	23,725		23,725
Dominguez.....		155,532	155,532
Totals.....	27,242,189	237,469,599	264,711,788

Oil in 'Storage.'

Field, refinery, pipe-line and tank-farm stocks of crude, residuum and tops totaled 91,925,153 barrels¹ on December 31, 1923, compared with 61,384,164 barrels on December 31, 1922, distributed as follows:

	Dec. 31, 1923	Dec. 31, 1922
Heavy crude, heavier than 20° A. P. I., including residuum.....	43,614,271	40,857,761
Refinable crude, 20° A. P. I. and lighter.....	35,559,054	17,613,591
Tops.....	12,751,828	2,912,812
Totals.....	91,925,153	61,384,164
Total quantity of above products held at refineries.....	29,763,653	11,809,691
Total quantity of above products held in fields, pipe-lines, and tank-farms.....	62,161,500	49,574,473
Total stocks as above.....	91,925,153	61,384,164

Proved Oil Land.

The total proved oil land of the state increased to 116,868 acres in 1923, from the 112,761 acres of 1922. Kern County increased 3395 acres, and Los Angeles, 1089 acres. Of this 1923 total, 19,932 acres, being owned by federal, state and city governments or for other reasons, are not assessable for the support of the Department of Petroleum and Gas of the State Mining Bureau. The acreage in 1923 was distributed by counties as follows:

¹Standard Oil Bulletin, February 1924, p. 11.

TABLE D.
Proved Oil Land and Number of Wells, 1923.

County	Land (acres)	Number wells
Fresno.....	14,600	883
Kern.....	72,371	5,817
Los Angeles.....	8,558	1,780
Orange.....	7,242	915
San Luis Obispo.....	772	18
San Mateo.....	-----	4
Santa Barbara.....	9,303	387
Santa Clara.....	80	12
Ventura.....	3,942	516
Totals.....	116,868	10,332

PUMICE AND VOLCANIC ASH.

The production of pumice and volcanic ash for the year 1923 amounted to 2936 tons valued at \$16,309 and came from properties in Imperial, Inyo and Kern counties. This is an increase both in tonnage and value over the 1922 shipments. The material from Imperial County is of the vesicular, block variety and was sold for abrasive purposes and for concrete aggregate; that from Inyo and Kern is the volcanic ash, or tuff, variety and was employed in making soap and cleanser compounds.

Total Pumice Production of California.

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not again until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909.....	50	\$500	1917.....	525	\$5,295
1910.....	-----	-----	1918.....	2,114	28,669
1911.....	-----	-----	1919.....	2,388	43,657
1912.....	100	2,500	1920.....	1,537	25,890
1913.....	3,590	4,500	1921.....	406	6,310
1914.....	50	1,000	1922.....	613	4,248
1915.....	380	6,400	1923.....	2,936	16,309
1916.....	1,246	18,092	Totals.....	15,935	\$163,370

QUICKSILVER.

Quicksilver was produced in California in nine counties during 1923, to the amount of 5458 flasks, valued at \$332,851, being approximately a 60% increase both in amount and value over the 1922 output of 3466 flasks and \$191,851. The average price received during 1923, according to the producers' reports to the State Mining Bureau, was \$60.98 per flask, as against \$55.35 in 1922, and the record average of \$114.03 for the year 1918.

The average of San Francisco quotations for 1923 was \$65.68 per flask, the price declining from \$70.70 in the first week of January to \$59.75 in the last week of December. For the current year, 1924, the quotations are ranging somewhat higher.

According to the Bureau of Foreign and Domestic Commerce records, there was imported a total of 18,073 flasks of quicksilver in 1923, mainly from Spain and Italy; and there was 318 flasks exported.

The tariff act of 1922 provides for an import duty of 25 cents per pound, or \$18.75 per flask (75 pounds, net), which became effective September 21, 1922.

The U. S. Geological Survey reports the total production of the United States for 1923 at 7937 flasks, valued at \$521,302 (using the \$65.68 average of quotations). Outside of California, the principal yield was from Texas, with a few flasks from Nevada, Oregon and Idaho. California's contribution was 69% of the total.

The increase in 1923 was due to resumption of production at the New Idria mine, San Benito County. There was no production from the Guadalupe mine, Santa Clara County, nor from the Oceanic mine, San Luis Obispo County. A rotary furnace has been installed at the Rinconada mine, in the latter county, and production begun.

The 1923 quicksilver production of California was distributed by counties, as follows:

Quicksilver Production by Counties, 1923.

County	Flasks	Value
Lake.....	17	\$1,050
Napa.....	157	9,759
Sonoma.....	528	31,147
Kings, Monterey, San Benito, San Luis Obispo, Santa Clara, Solano*.....	4,758	290,895
Totals.....	5,458	\$332,851

*Combined to conceal output of a single operator in each.

Total Quicksilver Production of California.

Total amount and value of the quicksilver production of California, as shown in available records, is given in the following tabulation:

Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850	7,723	\$768,052	\$99 45	1887	33,760	1,430,749	\$42 38
1851	27,779	1,859,248	66 93	1888	33,250	1,413,125	42 50
1852	20,000	1,166,600	58 33	1889	26,464	1,190,880	45 00
1853	22,284	1,235,648	55 45	1890	22,926	1,203,615	52 50
1854	30,004	1,663,722	55 45	1891	22,904	1,036,406	45 25
1855	33,000	1,767,150	53 55	1892	27,993	1,139,595	40 71
1856	30,000	1,549,500	51 65	1893	30,164	1,108,527	36 75
1857	28,204	1,374,381	48 73	1894	30,416	934,000	30 70
1858	31,000	1,482,730	47 83	1895	36,104	1,337,131	37 04
1859	13,000	820,690	63 13	1896	30,765	1,075,449	34 96
1860	10,000	535,500	53 55	1897	26,691	993,445	37 28
1861	35,000	1,471,750	42 05	1898	31,092	1,188,626	38 23
1862	42,000	1,526,700	36 35	1899	29,454	1,405,045	47 70
1863	40,531	1,705,544	42 08	1900	26,317	1,182,786	44 94
1864	47,489	2,179,745	45 90	1901	26,720	1,285,014	48 46
1865	53,000	2,432,700	45 90	1902	29,552	1,276,524	43 20
1866	46,550	2,473,202	53 13	1903	32,094	1,335,954	42 25
1867	47,000	2,157,300	45 90	1904	*28,876	1,086,323	37 62
1868	47,728	2,190,715	45 90	1905	24,655	886,081	35 94
1869	33,811	1,551,925	45 90	1906	19,516	712,334	36 50
1870	30,077	1,725,818	57 38	1907	17,379	663,178	38 16
1871	31,686	1,999,387	63 10	1908	18,039	763,520	42 33
1872	31,621	2,084,773	65 93	1909	16,217	773,788	47 71
1873	27,642	2,220,482	80 33	1910	17,665	799,002	45 23
1874	27,756	2,919,376	105 18	1911	19,109	879,205	46 01
1875	50,250	4,228,538	84 15	1912	20,600	866,024	42 04
1876	75,074	3,303,256	44 00	1913	15,661	630,042	40 23
1877	79,396	2,961,471	37 30	1914	11,373	557,846	49 05
1878	63,880	2,101,652	32 90	1915	14,199	1,157,449	81 52
1879	73,684	2,194,674	29 85	1916	21,427	2,003,425	93 50
1880	59,926	1,857,706	31 00	1917	24,382	2,396,466	98 29
1881	60,851	1,815,185	29 83	1918	22,621	2,579,472	114 03
1882	52,732	1,488,624	28 23	1919	15,200	1,353,381	89 04
1883	46,725	1,343,344	28 75	1920	10,278	775,527	75 45
1884	31,913	973,347	30 50	1921	3,157	140,666	44 56
1885	32,073	986,245	30 75	1922	3,466	191,851	55 35
1886	29,981	1,064,326	35 50	1923	5,458	332,851	60 98
				Totals	2,197,908	\$107,366,308	-----

*Flasks of 75 lbs. since June 1904; of 76½ lbs. previously.

SALT.

Most of the salt produced in California is obtained by evaporating the waters of the Pacific Ocean, plants being located on the shores of San Francisco, Monterey and San Diego bays, and at Long Beach. Additional amounts are derived from lakes and lake beds in the desert regions, mainly in Kern and San Bernardino counties. A small amount of valuable medicinal salts is obtained by evaporation of the water of Mono Lake, Mono County.

Distribution of the 1923 salt production of California, by counties was as follows:

County	Tons	Value
Alameda.....	177,389	\$585,585
Kern.....	18,921	97,336
San Bernardino.....	17,350	65,550
San Mateo.....	35,757	199,192
Los Angeles, Mono ¹ , Monterey, San Diego*.....	26,562	183,007
Totals.....	275,979	\$1,130,670

¹Medicinal salts. *Combined to conceal output of a single operator in each.

The above returns show an increase both in tonnage and value over the 1922 figures, establishing a new record for this industry in California. There were eight plants operating in Alameda County, and a total of ten plants in the other counties tabulated, being a decrease of four from the total number operated in 1922. The outlook for the current year, 1924, is that there will be an overproduction in the San Francisco Bay district at least, due to the dry season.

Production of Salt in California, by Years.

Amount and value of annual production of salt in California from 1887 is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887.....	28,000	\$112,000	1906.....	101,650	\$213,228
1888.....	30,800	92,400	1907.....	88,063	310,967
1889.....	21,000	63,000	1908.....	121,764	281,469
1890.....	8,729	57,085	1909.....	155,680	414,708
1891.....	20,094	90,303	1910.....	174,920	395,417
1892.....	23,570	104,788	1911.....	173,332	324,255
1893.....	50,500	213,000	1912.....	185,721	383,370
1894.....	49,131	140,087	1913.....	204,407	462,681
1895.....	53,031	150,576	1914.....	223,806	583,553
1896.....	64,743	153,244	1915.....	169,028	368,737
1897.....	67,851	157,520	1916.....	186,148	455,695
1898.....	93,421	170,855	1917.....	227,825	584,373
1899.....	82,654	149,588	1918.....	212,076	806,328
1900.....	89,338	204,754	1919.....	233,994	896,963
1901.....	126,218	366,376	1920.....	230,638	972,648
1902.....	115,208	205,876	1921.....	197,989	832,702
1903.....	102,895	211,365	1922.....	223,238	819,187
1904.....	95,968	187,300	1923.....	275,979	1,130,670
1905.....	77,118	141,925	Totals.....	4,586,527	\$13,208,993

SILVER.

Except for the silver mines of the Randsburg district in San Bernardino County the past five years, the production of silver in Cali-

ifornia is largely as a by-product from its association with copper, lead, zinc and gold ores. As explained under gold, the State Mining Bureau does not collect the statistics of silver production independently of the U. S. Geological Survey.

The average price of domestic silver during 1923 was 82¢ per ounce at New York as compared with \$1.00 (under the Pittman Act) in 1922 and 1921, and 54.8¢ in 1914. Purchases of silver by the government, under the Pittman Act ceased after June, 1923.

The following paragraph is quoted from the U. S. Geological Survey press bulletin, by courtesy of Mr. J. M. Hill,¹ statistician in charge of the San Francisco branch office:

"The output of silver in 1923 was 3,559,442 fine ounces, which was 459,377 ounces greater than in 1922. Due to the decline in prices from \$1.00 in 1922 to an average of \$0.82 an ounce in 1923, the value of the silver output was \$181,323 less. The output of silver from dry silver ores increased about 377,000 ounces, from copper ores about 20,000 ounces, and from lead ores 66,560 ounces, but from dry gold ores about 15,000 ounces less silver were recovered than in 1922."

The distribution of the 1923 silver yield, by counties, was as follows:

Silver Production by Counties, 1923.

County	Value	County	Value
Amador.....	\$15,153	Nevada.....	\$30,534
Butte.....	1,756	Placer.....	297
Calaveras.....	7,316	Plumas.....	243,970
Del Norte.....	9	Sacramento.....	2,566
El Dorado.....	185	San Bernardino.....	2,225,959
Fresno.....	128	San Diego.....	144
Humboldt.....	12	Shasta.....	47,706
Imperial, Orange, Riverside*	16,736	Sierra.....	6,134
Inyo.....	265,023	Siskiyou.....	298
Kern.....	33,151	Stanislaus.....	833
Lassen, Merced, Modoc*	54	Trinity.....	5,816
Los Angeles.....	6	Tuolumne.....	2,801
Madera.....	541	Yuba.....	6,760
Mariposa.....	1,735		
Mono.....	3,120	Total.....	\$2,918,743

*Combined to conceal output of a single producer in each.

¹U. S. Geol. Surv. Press Bulletin, July, 1924.

Silver Production of California, by Years.

The value of the silver produced in California each year since 1880 has been as follows, the data previous to 1887 being taken from the reports of the Director of the Mint. There are no data available for the years previous to 1880:

Year	Value	Year	Value
1880.....	\$1,140,556	1902.....	\$616,412
1881.....	750,000	1903.....	517,444
1882.....	845,000	1904.....	873,525
1883.....	1,460,000	1905.....	678,494
1884.....	(a) 4,185,101	1906.....	817,830
1885.....	2,568,036	1907.....	751,646
1886.....	1,610,626	1908.....	873,057
1887.....	1,632,004	1909.....	1,091,092
1888.....	1,700,000	1910.....	993,646
1889.....	1,065,281	1911.....	673,336
1890.....	1,060,613	1912.....	799,584
1891.....	953,157	1913.....	832,553
1892.....	463,602	1914.....	813,938
1893.....	537,158	1915.....	851,129
1894.....	297,332	1916.....	1,687,345
1895.....	599,790	1917.....	1,462,955
1896.....	422,464	1918.....	1,427,861
1897.....	452,789	1919.....	1,240,051
1898.....	414,055	1920.....	1,859,896
1899.....	504,012	1921.....	3,629,223
1900.....	(b) 724,500	1922.....	3,100,065
1901.....	(b) 571,849	1923.....	2,918,743
		Total.....	\$52,467,750

^a Lawver, A. M., in Production of Precious Metals in United States: Report of Director of Mint, 1884, p. 175; 1885.

^b Recalculated to 'commercial' from 'coining value,' as originally published.

LIBRARY.

E. A. LOWE, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey :

- Bulletin 752—Coal Resources of the Raton Coal Field, Colfax County, New Mexico. By Willis T. Lee.
- Bulletin 754—The Ruby-Kuskokwim Region, Alaska. By I. B. Mertie, Jr., and G. L. Harrington.
- Bulletin 723—Geology and Ore Deposits of the Manhattan District, Nevada. By Henry G. Ferguson.
- Bulletin 746—Geologic Literature on North America. By John M. Nickles.
- Prof. Paper 126—Geology of the Coastal Plain of Texas West of Brazos River. By Alexander Denssen.
- Prof. Paper 132—An Early Florule from Central Texas. By E. W. Berry.
- Prof. Paper 132-D—The Evolution and Disintegration of Matter. By Frank Wigglesworth Clarke.
- Prof. Paper 132-E—An Early Eocene Florule from Central Texas. By Edward Wilbur Berry.

Mineral Resources of the United States :

- Natural Gas in 1922.
- Stone in 1922. By G. T. Loughlin and A. T. Coons.
- Gold, Silver, Copper, Lead and Zinc in Arizona in 1922. By V. C. Heikes.
- Gold, Silver, Copper, Lead and Zinc in Montana in 1922. By C. N. Gerry.
- Gold, Silver, Copper, Lead and Zinc in California and Oregon in 1922. By James M. Hill.
- Gold, Silver, Copper, Lead and Zinc in Utah in 1922. By V. C. Heikes.
- Copper in 1922. By H. A. C. Jenison.
- Mineral Resources of the United States in 1920. By R. W. Stone.

Feldspar in 1922. By Frank J. Katz.
 Cobalt, Molybdenum, Nickel, Tantalum, Titanium, Tungsten, Radium, Uranium,
 and Vanadium in 1922. By Frank L. Hess.
 Gold, Silver, Copper, Lead and Zinc in Colorado in 1922.
 Part I—Metals, 1921.
 Part II—Non-Metals, 1921.
 Natural Gas Gasoline in 1922.
 Sulphur and Pyrites in 1923.
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Bulletin 214—Tests of Marine Boilers. By Henry Kreisinger, John Blizard,
 A. R. Mumford, R. J. Cross, W. R. Argyle, and R. A. Sherman.
 Bulletin 225—Stone Dusting or Rock Dusting to Prevent Coal Dust Explosions
 as Practised in Great Britain and France. By G. S. Rice.
 Bulletin 203—Central District Bituminous Coals as Water-Gas Generator Fuels.
 By W. W. Odell.
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 Natural Gas. By G. W. Jones and others.
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Howard, Pa.

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Pelahatchee, Miss.

Randolph, N. Y.

Reedley, Cal.

Torrance, Cal.

Tyrone, Pa.

Wahtoke, Cal.

San Joaquin, Cal.

Helm, Cal.

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For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.
 Architect and Engineer, San Francisco.
 Arizona Mining Journal, Phoenix, Arizona.
 Asbestos, Philadelphia, Pennsylvania.
 Brick and Clay Record, Chicago.
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 California Journal of Development, San Francisco.
 Cement, Mill and Quarry, Chicago, Illinois.
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 Graphite, Jersey City.
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 Mining and Oil Bulletin, Los Angeles.
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 Oil and Gas News, Kansas City.
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 Rock Products, Chicago, Illinois.
 Safety News, Industrial Accident Commission, San Francisco.
 Salt Lake Mining Review, Salt Lake City, Utah.
 Southwest Builder and Contractor, Los Angeles.
 Standard Oil Bulletin, San Francisco.
 Stone, New York.
 The Record, Associated Oil Company, San Francisco.
 Through the Ages, Baltimore.

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The following papers are received and kept on file in the library:

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 Blythe Herald, Blythe, Cal.
 Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
 Calaveras Prospect, San Andreas, Cal.
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Ione Valley Echo, Ione, Cal.
Lake County Bee, Lakeport, Cal.
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Mining Topics, Sacramento, Cal., and Unionville, Nev.
Mountain Democrat, Placerville, Cal.
Mountain Messenger, Downieville, Cal.
Nevada Mining Press, Reno, Nevada.
Oatman Mining News, Oatman, Arizona.
Oregon Observer, Grants Pass, Oregon.
Oroville Daily Register, Oroville, Cal.
Petroleum Reporter, Taft, Cal.
Placer Herald, Auburn, Cal.
Plumas Independent, Quincy, Cal.
Plumas National Bulletin, Quincy, Cal.
Randsburg Times, Randsburg, Cal.
San Diego News, San Diego, Cal.
Shasta Courier, Redding, Cal.
Siskiyou News, Yreka, Cal.
Stockton Record, Stockton, Cal.
Tuolumne Prospector, Tuolumne, Cal.
Ventura Daily Post, Ventura, Cal.
Weekly Trinity Journal, Weaverville, Cal.
Western Sentinel, Etna Mills, Cal.



PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of MINING IN CALIFORNIA was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of MINING IN CALIFORNIA, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes.'



EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

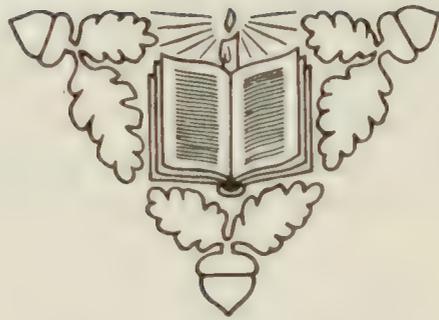
Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

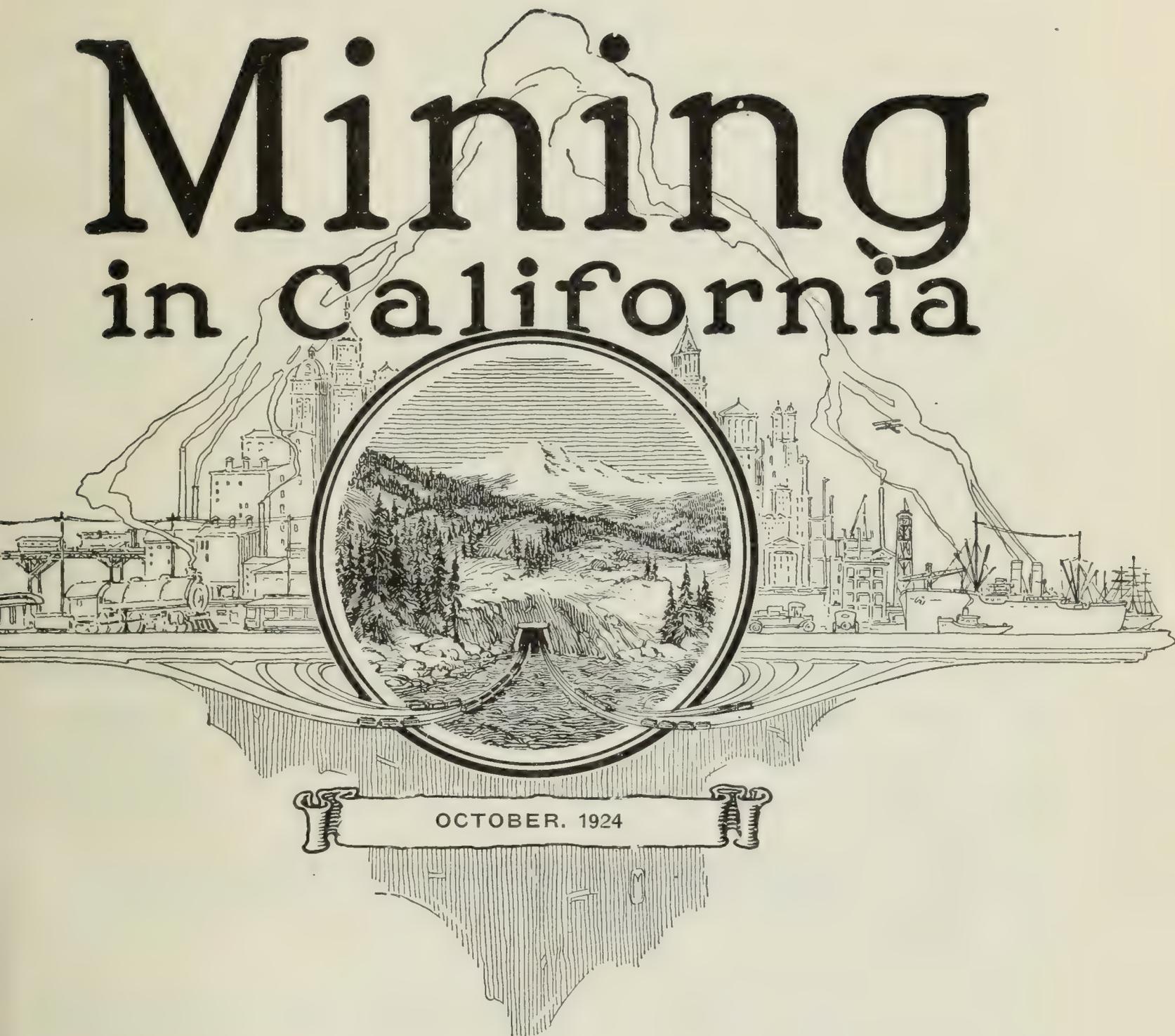
A list of current applications for positions and 'positions open' is carried in each issue. Notices are designated by a key number, and the name and address corresponding to any number will be supplied upon request, without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss. Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

- 21-32 Chemist or petroleum work. One and one-half years' experience. Age 24; single. References. Salary open.
- 21-33 Solution man. Cyanide Mill. Sixteen years' experience. Age 44; married. References. Salary open.
- 21-34 Mining or metallurgical work. Five and one-half years' general engineering experience, including assaying and mill work. Age 27; married. References. Salary open.
- 21-35 Mill construction or superintendent. Cyanide or oil flotation. Thoroughly experienced. Age 47; married. References. Salary open.
- 21-36 Assaying or helper. Two years' apprenticeship. Age 21; single. References. Salary wanted, \$100.
- 21-37 Petrographic work.
- 21-38 Shift boss or other supervisory position. Long experience from muck stick to management. Speaks Spanish fluently and can handle American or Mexican labor. Age 41. Salary open.



Mining in California



OCTOBER, 1924

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CALIFORNIA STATE
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CALIFORNIA STATE MINING BUREAU.

EXECUTIVE AND TECHNICAL STAFF

LLOYD L. ROOT

State Mineralogist

WALTER W. BRADLEY

Deputy State Mineralogist

MINING DIVISION

C. A. LOGAN, District Mining Engineer	- - - - -	Sacramento
C. MCK. LAIZURE, District Mining Engineer	- - - - -	San Francisco
W. BURLING TUCKER, District Mining Engineer	- - - - -	Los Angeles
C. D. HULIN, Geologist	- - - - -	San Francisco
FRANK SANBORN, Mineral Technologist	- - - - -	San Francisco

DEPARTMENT OF PETROLEUM AND GAS

R. D. BUSH, State Oil and Gas Supervisor	- - - - -	San Francisco
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NOTE.—A detailed report of the activities of the Department of Petroleum and Gas is issued monthly by the State Mining Bureau, entitled 'Summary of Operations, California Oil Fields.'

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

LLOYD L. ROOT

State Mineralogist

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CHAPTER OF

REPORT XX OF THE STATE
MINERALOGIST

COVERING

MINING IN CALIFORNIA

AND THE

ACTIVITIES OF THE STATE MINING BUREAU



CALIFORNIA STATE PRINTING OFFICE
FRANK J. SMITH, Superintendent
SACRAMENTO, 1924

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CALIFORNIA STATE MINING BUREAU
LLOYD L. ROOT
STATE MINERALOGIST

OUTLINE MAP
OF
CALIFORNIA

SCALE



- LEGEND -

- Mining Division Boundaries.
- Mining Division Offices.

MEXICO

PREFACE.

The State Mining Bureau is maintained for the purpose of assisting in all possible ways in the development of California's mineral resources.

As one means of offering tangible service to the mining public, the State Mineralogist for many years has issued an annual or a biennial report reviewing in detail the mines and mineral deposits of the various counties.

The weak point in work of this character has been that the results of field investigations were so long in preparation that they had lost much of their usefulness by the time they finally appeared in print.

As a progressive step in advancing the interests of the mineral industry, publication of the Annual Report of the State Mineralogist in the form of monthly chapters was begun in January, 1922, and continued until March, 1923.

Owing to a lack of funds for printing, quarterly publication was begun in September, 1923.

For the same reason, beginning with the January, 1924, issue, it has been necessary to charge a subscription price of \$1 per calendar year, payable in advance; single copies, 25 cents apiece. 'Mining in California' will continue to be sent without charge to our exchange list, including schools and public libraries, as are also other publications of the State Mining Bureau.

Pages are numbered consecutively throughout the year and an index to the complete reports is included annually in the closing number.

Such a publication admits of several improvements over the old method of procedure. Each issue contains a report of the current development and mining activities of the state, prepared by the district mining engineers. Special articles dealing with various phases of mining and allied subjects by members of the staff and other contributors are included. Mineral production reports formerly issued only as an annual statistical bulletin are published herein as soon as returns from producers are compiled. The executive activities, and those of the laboratory, museum, library, employment service and other features with which the public has had too little acquaintance also are reported.

While current activities of all descriptions will be covered in these chapters, the Bureau will not discontinue its practice of issuing from time to time technical reports on special subjects. A list of such reports now available is appended hereto, and the names of new bulletins will be added in the future as they are completed.

The chapters will be subject to revision, correction and improvement. Constructive suggestions from the mining public will be gladly received, and are invited.

The one aim of the Mining Bureau is to increase its usefulness and to stimulate the intelligent development of the wonderful, latent resources of the State of California.

DISTRICT REPORTS OF MINING ENGINEERS.

In 1919-1920 the Mining Department was organized into four main geographical divisions, with the field work delegated to a mining engineer in each district working out from field offices that were established in Redding, Auburn, San Francisco and Los Angeles, respectively.

This move brought the Bureau into closer personal contact with operators, and it has many advantages over former methods of conducting field work.

To continue this system most effectively with the limited funds available for the present biennium, the Redding and Auburn field offices were consolidated and moved to Sacramento on June 1, 1923.

The boundaries of each district were adjusted and the counties now included in each of the three divisions, and the locations of the branch offices, are shown on the accompanying outline map of the state. (Frontispiece.)

Reports of mining activities and development in each division, prepared by the district engineer, will continue to appear under the proper field division heading.

Although the petroleum industry is but little affiliated with other branches of mining, oil and gas are among the most valuable mineral products of California, and a report by the State Oil and Gas Supervisor on the current development and general conditions in the state's oil fields is included under this heading.

SACRAMENTO FIELD DIVISION.

C. A. LOGAN, Mining Engineer.

Nevada County.

MEADOW LAKE DISTRICT.

Geography.

This district is in a section of the Sierra Nevadas where glaciation and active erosion have uncovered the granitic rocks over a wide area. The elevation varies from 5700 feet along Fordyce Creek to 7800 feet on Old Man Mountain. Fordyce Lake and Meadow Lake lie on the east side of the district. On account of rugged topography and deep snowfall, transportation has been expensive, and this has retarded development. During the past two years an old road has been rebuilt by the Pacific Gas and Electric Company from the state highway near Cisco to Lake Fordyce, a distance of eight miles. When work on the dam at this lake is finished it would be easy to extend this road across it, connecting with the old road from Truckee to Summit City with probably less than a mile of new work needed. This would give an outlet to many of the idle prospects, cutting the distance to the railroad to less than one-third of the present haul, which is over 30 miles long over a rough road.

History.

The first discovery and locations were made in 1863 by Hartley, on claims now part of the Excelsior Mine. It has been said that 1200 locations were made in 1865, and in 1866, 400 houses were built, a stock board was established and town lots were sold at high prices in Summit

City, beside Meadow Lake. The zone of oxidation was very shallow, in most places only a few feet deep, and when sulphide ores were reached and free gold was no longer easily won, the camp was deserted by nearly everyone save Hartley, who made an occasional profitable run at the Excelsior with a 10-stamp mill. Two cabins are all that remain today of Summit City.

In 1895, the Washington Mine (now the High Grade) was equipped with an aerial tramway and some ore was shipped. Two companies operated at the Excelsior Mine between 1897 and 1910; and for several years following 1898, the Pennsylvania Mine at Carlyle was worked. The California Mine was also equipped with a good plant, but this has been junked. But, although hundreds of shallow shafts have been sunk and ore is in evidence on many dumps, there has been little production in the past twenty-five years and the district is practically deserted.

In spite of the great amount of work done, there has never been any adequate report upon the mines of the district and it is hard to get an



Meadow Lake District, Nevada County, from High Grade Mine.

idea of the characteristics of the deposits or the extent of development of any of the claims from any literature accessible to the general public. Only brief mention is found in state and government publications. Notes taken during a trip to the district in August, 1924, are set down to furnish something definite for public reference, as a basis for further inquiries.

Geology.

Most of the veins are in granodiorite, which is the country rock of nearly the entire area, although diorite and diabase occur in the Black Mountains and diabase porphyrite on the east, north of Fordyce Lake. The country rock and vein fillings all tend toward the basic end of the igneous rock series and ores are sometimes complex, generally with high sulphide content, and pyrite and copper sulphides are prominent. In many veins free quartz is not noticeable and gangue minerals suggest basic dikes. At times the separation between vein and wall rock is

indistinct, indicating a segregation or replacement, and in certain instances the evidence of the ore having segregated out is plain. Elsewhere veins appear to be ultra basic dikes. The strongest veins cut diagonally across the lines of jointing. The occasional abrupt termination of the lesser veins against unaltered and unbroken granodiorite suggests joint fillings.

Contrary to the general rule, the vein outcrops are marked by depressions, especially where they cross ridges, and are black, or rusty from oxidation of the sulphides.

Mining Claims.

Bokay Bonanza Claims. Peter Bokay, Cisco, California, owner. There are three claims, of which one is on the ledge, nearly a mile southwest of Meadow Lake spillway. The vein is of white quartz, unusual in this district, and is a foot wide, striking east and dipping 45° south. It has been exposed a few hundred feet along the strike and prospected to a depth of 40 feet by an inclined shaft. The quartz carries arsenopyrite and pyrite and is reported to assay \$18 a ton in gold. The road from Meadow Lake to Excelsior Mine passes within 600 feet.

Champion Group of two claims is in the west half of Sec. 35, T. 18 N., R. 13 E., between the Tola Group and Lake Fordyce. A vein about 5 feet wide strikes N. 15° W. and dips nearly vertical. It has been slightly developed by a short open cut and a shaft 45 feet deep. The ore carries pyrite and arsenopyrite. A few tons of ore have been crushed in a small makeshift mill, now in ruins.

Canadian Group (formerly Omaha, Mohawk, Montreal) borders Phoenix Lake on the south, extending across the east slope of Old Man Mountain. The principal work was on the Bessie D. Claim. A base vein 6 feet to 9 feet wide, carrying 7% sulphides, strikes northwest and dips southwest nearly vertical on the Bessie D and adjoining Phoenix Claim. In the early days there was a 10-stamp mill on this group, and some good cleanups were made. No work has been done lately. On the same vein to the northwest is the Three Johns Extension Claim.

Excelsior Mine contains 4 patented claims and is in the west half of Sec. 27, T. 18 N., R. 13 E., about 4700 feet southwest of Meadow Lake dam, and at an elevation of 7000 feet (aneroid). The main vein strikes about N. 30° W. and shows an iron stained outcrop as much as 100 feet wide. The central portion of the vein is of quartz at least 15 feet wide. About 300 feet northeast is a strong parallel vein 5 feet to 9 feet wide. The dip of the footwall of the main vein is 50° southwest. Both walls are granodiorite.

Development comprises a shaft 180 feet deep on the dip of the main vein, with levels at 60 feet and 120 feet depth. First level was drifted southeast 300 feet under the mill, and from the second level ore was stoped and milled for a length of 40 feet to the surface, just northwest of the shaft. Two tunnels, each about 300 feet long, run in early days, are caved.

Surface plant includes a mill with rock-breaker, 10 stamps and plates in good order, 9 small cyanide tanks, machine shop well equipped with tools and housing a 12-inch x 14-inch compressor, drill sharpener, etc.

Power was formerly furnished by water brought 4700 feet in pipe from Meadow Lake, but this is smashed flat in places.

The last operations were by the Excelsior Consolidated Gold Mining Company, since when it has come into the possession of Peter Bokay, Cisco, California.

The ore is estimated to carry 10% to 20% sulphides, which are principally pyrite, with some zincblende, arsenopyrite, traces of copper and some magnetite. Mill tests of large and small lots of ore gave an average of \$7 a ton by amalgamation only, with some results reported as high as \$12 a ton. The concentrates were, as a rule, low grade. From one run of 600 tons made in 1888, an average of \$6 a ton was reported. At that time there were no plates in the mill and the pulp was run over canvas and the gold amalgamated in a tub. The sulphides were very low grade, reported not worth saving from that run.

Edison Claim is a relocation of the old Pennsylvania at Carlyle, on Fordyce Creek, at an elevation of 5700 feet in the south one-half of Sec. 4, T. 17 N., R. 13 E. There are old shafts 40 and 100 feet deep, respectively, and an open cut from which considerable ore was mined. The last work was started in 1898 and continued for several years. An old mill of 8 stamps was moved from the U. S. Grant Mine in 1901 and some ore was milled that plated \$5.25 a ton, although the total value per ton was reported to have been as high as \$18 with concentrates assaying \$50 a ton. The mill has been burned and bridges are out on the road to Cisco, 8 miles distant.

Fourth of July Claim is one-fourth mile west of Meadow Lake and one-fourth mile south of the site of Summit City. A vein 5 feet to 9 feet wide strikes north 50° west and dips 50° southwest. A shaft, full of water, is said to be 60 feet deep with drifts 40 feet each way on the vein. The vein is traceable at intervals for 3000 feet. One thousand tons or more of heavy sulphide ore, carrying principally pyrite, is on the dump here. Idle. Estate of John Clark, owner.

Freeman Group (Cash-on-Dump). Comprises four claims in the northwest one-quarter Sec. 27, T. 18 N., R. 13 E., west of Black Mountain and one-half mile from Meadow Lake, beside the road to Excelsior Mine.

The vein here is a black, very hard rock, probably a dike. It strikes north 38° west and dips 60° southwest, and is from three feet to eight feet wide. This vein appears to be along the west side of a fault which is marked by a depression running northwest. The vein cuts diagonally across the joint planes of the granodiorite. On the northwest, the vein has been opened by a cut 200 feet long and perhaps 500 tons of ore have been extracted and piled up. Just southeast of this cut the vein is faulted west about 50 feet. On the southeast segment the vein has been stripped for about 500 feet showing the same character of ore, but more pyrite and quartz, than on the northwest. There is a shaft here, reported 80 feet deep, but full of water. On the southwest end the vein is again apparently faulted. Owners, Wm. Vineyard of Wheatland and Miss Ella Freeman of Cisco, California.

Great Eastern Group (California Mine). As the California Mine, this property was once well equipped with a 20-stamp mill and machinery and was operated for some time. The operations, like so

many others in the district, terminated in financial difficulty and the equipment has since been junked. In recent years the claims have been held by assessment without any production. The discovery point on Great Western Claim is 1056 feet south 16° east from Meadow Lake dam and the claim adjoins the Fourth of July on another vein. The vein strikes north 50° west and the gossan outcrop can be traced 1000 feet, with a width of 10 feet to 15 feet. An open cut 100 feet long on the northwest part of the claim shows the vein 15 feet wide on top, tapering to 3 feet on the southeast end at the bottom of the cut. The vein carries pyrite, some bornite and other copper sulphides. On the southeast part of the claim is an old 3-compartment shaft reported 200 feet deep, and an old tunnel about 200 feet long running toward the shaft. Adjoining on the southeast is the Great Eastern Claim, on the same vein. There is a shaft here 25 feet deep. The vein shows 8 feet wide here.

Many tests and assays of ore from these claims have been reported. These have shown an ore characteristically high in sulphides, sometimes as high as 20%. These sulphides are mostly pyrite. Copper is present sometimes in paying quantity but usually subordinate. Many assays indicated payable ore from \$9 a ton up. The ore exposed is in different stages of oxidation, and as comparatively shallow depth has been reached, mill tests made may not indicate the proportions of free gold and sulphide in depth. These tests showed 65% to 77% recovery on the plates.

High Grade Group (Washington) is on the south slope of Old Man Mountain in the north half of Sec. 3 or 4, T. 17 N., R. 13 E. Elevation at camp, 7450 feet (aneroid). Owners, A. Milton Setter and Estate of John P. Clark.

The vein strikes north 48° west and dips 80° west. It has been prospected by stripping and by short adits. No. 2 adit is 60 feet above the camp and only 10 feet long. No. 3 adit, at the camp level, is 40 feet long, and shows the vein 10 feet wide, of which a width of 3 feet next the footwall is claimed to be rich. Copper sulphides occur and the vein is heavily mineralized. No. 4 adit is 40 feet below the camp level, and was crosscut to the vein then drifted on it for 164 feet. In this adit the vein has an average width of six feet. The foreman in charge of the work reported the average assay here was \$39 gold per ton and 1% copper, and 20 assays from No. 3 adit are claimed to have averaged \$18 a ton. The side of the mountain is very steep, and the vein can be traced easily toward the summit. It is estimated there are 400 feet of backs on the vein from No. 4 adit to the highest part of the apex. The mine was operated in 1895, when an aerial tramway 2700 feet long was put up from the property to Carlyle, where the elevation is 1700 feet lower. Some ore was shipped to a smelter. Later, another company operated for a short time but failed to make a payment on the purchase price at the time required, and quit. They also had a tramway and moved out 700 tons of ore to Carlyle, which still lies there, as the road thence to Cisco is now impassable. The mine is in a very inaccessible location, and could be best operated through a lower adit from the vicinity of Carlyle, if prospects justified.

Kentuck and *U. S. Grant Claims* are patented and are at Carlyle, 2700 feet due south from the High Grade Claim. The U. S. Grant was

worked in the sixties and equipped with an 8-stamp mill, making some production, but it has been idle and deserted many years.

Kentucky Claim is on the saddle on the east side of Old Man Mountain, just east of Three Johns Claim. It has a shaft 40 feet deep in heavy pyrite ore.

Lost Hope Group of 2 claims, formerly Quebec, is in Sec. 33, T. 18 N., R. 13 E., one-half mile north of Phoenix Lake. An old shaft is reported 90 feet deep. The vein strikes a little north of west. The vein averages 4 feet wide on top, but, in an old adit 225 feet long, is wider. Assays \$4.80 to \$18 a ton, with a high percentage of copper. It is about 2000 feet from the shaft to the end of the road to High Grade, and thence $3\frac{1}{2}$ miles by road to Summit City.

Monte Carlo Group of 2 claims is on a vein 300 yards west of the Excelsior vein. It strikes north 45° west and dips 55° southwest. This vein is dense, fine grained and very hard, looking in places like low-grade iron ore. South of the shaft a few feet on Monte Carlo No. 2 claim the ore merges gradually into the granodiorite, which itself is seen to carry some sulphides in this zone, so that a deposit by segregation is indicated. Quartz is noticeable only in places. The shaft mentioned is 40 feet deep and the vein at the collar is 7 feet wide. This produced in the sixties, but the amount of work done is negligible. The vein shows only at intervals across the claims. James Gribben and Peter Bokay, owners.

Sacramento Claim is the northwest extension of Three Johns, lying northwest of Phoenix Lake, with the Bullion Claim between them. The vein is wide, but here practically undeveloped.

Sylvanite No. 1 and *No. 2* are relocations of the Bella and Johanna claims, respectively, at the old camp of Carlyle. No. 1 is on a gossan-capped vein carrying 2% copper with a little gold and silver, and has been prospected by a few shallow cuts. No. 2 has an open cut. Both are wide veins.

Tellurium Claims are on the High Grade road, 2 miles from Summit City. They are reported to carry considerable arsenic.

Three Johns Claim lies across the saddle on the east side of Old Man Mountain, and about 800 feet east of the High Grade vein. In the saddle the Three Johns vein shows 12 feet in width, of heavy pyrite ore. On the north side of the saddle the vein is up to 16 feet wide, strikes northwest and dips southwest, and has been opened by an adit, now caved. At the saddle, the vein turns, striking nearer south. The *Fraction Claim* adjoins the Three Johns on this end on the same vein. The High Grade and Three Johns veins converge on the south slope. The Bug Claim of the High Grade group adjoins the Fraction Claim, and a cross vein covered by the *Triangle Claim*, 829 feet long, crosses the area between the High Grade and Fraction.

Tola Group comprises Tola, Red Top, Beulah, Sunnyside, Goo Goo and Sunrise claims in the southeast quarter of Sec. 27 and adjoining parts of Secs. 26, 34 and 35, T. 18 N., R. 13 E., between Fordyce and Meadow lakes. The claims are 8 miles from Cisco via Fordyce Lake road and one-half mile trail. The owner is Mrs. Jack Anderson,

Auburn. The country rock is in part diabase porphyrite and in part granodiorite, and glaciated.

On Sunrise Claim the vein strikes north 53° west and dips west nearly vertical. It is six feet wide, decreasing to a foot and a half wide, 150 feet southeast near the south end of the claim. On the Red Top Claim the vein outcrop is wide and rusty. It strikes north 40° west and shows pyrite, arsenopyrite, marcasite and other minerals in the black fine-grained country rock. Quartz seams in the joints carry arsenopyrite and pyrite with scant traces of copper. Only a little surface work has been done on these claims. On the Beulah Claim, an adit was run 20 feet on a narrow seam of sulphide ore, one inch to three inches wide, and a shallow shaft was started years ago on a quartz vein three feet wide. On the Sunnyside Claim, a vein three feet wide strikes north 63° west and dips 60° southwest. An adit at an elevation of 6875 feet has been run 45 feet. This shows pyrite and copper sulphides. The vein is reported 7 feet wide in the bottom of a winze, 25 feet below the floor of the adit. The vein outcrop can be seen at intervals for 900 feet from here to the northwest end line, which is on the mountain saddle at an elevation of 7065 feet. The outcrop is a gossan cap, unprospected northwest of the adit. The vein is $4\frac{1}{2}$ feet wide at the northwest end of the claim. There are parallel veins on both sides of the Sunnyside vein. These are undeveloped.

A few small shipments of sorted ore have been made from the Sunnyside, and are reported to have returned \$45 to \$50 a ton. The ore is valuable principally for copper, but carries considerable gold and silver. Numerous assays showed from 2% to 9% copper, \$8 and more in gold and 1 to 3 ounces silver per ton.

The claims could be worked by adits, as the slopes are steep. There is a water right and plenty of timber, and a good dwelling house on the Sunnyside Claim.

SUMMARY.

Meadow Lake district was the scene of a rush between 1863 and 1866, but developments did not come up to expectations. Seven quartz mills, with a total of 62 stamps, were built before 1868, but by 1877 only 25 inhabitants remained of the 5000 or more there in 1866. The ores worked yielded from \$3 to \$37 a ton generally, but some went higher, and it is likely that \$6 to \$10 a ton would be a fair figure for the value of ore now in sight, although a great many higher assays are quoted. Quite a few pockets have been found in the district, notably one reported from the 60-foot level of the Excelsior Mine in 1889. The total bullion yield has been possibly over \$200,000; up to 1877 it was estimated to have been \$125,000. Some selected lots of sorted ore have been shipped to the smelters. Most of the ore is very heavy with pyrite, and concentrates generally proved to be low grade, and at some properties were reported too low grade to be worth saving. The veins show gossan outcrops and at many properties copper sulphides occur, in amounts varying from a trace to small bunches of ore with as much as 30 per cent copper. The working season for surface work and hauling is only about six months and development has therefore been slow and expensive. Transportation has been a problem. None of the veins have been developed any deeper than the Excelsior, 180 feet deep, and

it is an interesting speculation as to what they might prove in depth, considering the widespread occurrence of copper already noted.

Chlorination, and roasting previous to amalgamation, were practiced. Cyanide tests were made on ores from a few properties and reported successful, but no real cyanide plant was ever installed. Copper and other base metal oxides would no doubt interfere. Oil flotation has been tried on small lots of ore, one lot of the low-grade pyrite ore giving 72 per cent recovery by this method.

There are many scattered prospects in the district not mentioned above. In some of these, small amounts of nickel, cobalt and lead ores have been found, but they have never been developed to commercial production.

Sierra County.

GRAVEL MINES OF HOWLAND FLAT RIDGE.

Howland Flat Ridge is an andesite covered ridge extending in a southwesterly direction from Mount Fillmore in the northwestern corner of Sierra County for a distance of eleven miles to the old camp of Scales. The accompanying claim map shows the mines and the geography of this district. The ridge is seen to lie between Canyon Creek on the southeast and Slate Creek on the northwest. These two tributaries of North Fork of Yuba River flow in deep, nearly parallel canyons, from two to three miles apart. The elevation of Mount Fillmore is 7816 feet and that of Scales is 4300 feet, where the top of the channel is exposed. The country is consequently one of rather heavy snowfall. Scales is 58 miles from Marysville via Strawberry Valley by auto road.

There has been considerable activity in the southern part of this area during the past year. The completion of the Bullards Bar dam has been an incentive for investigation of several properties for hydraulic mining. There is also a great deal of unworked drift mining territory along this ridge. The map shows in a general way the areas of ground that have been worked out. Some claims have also been worked besides those indicated.

Some figures were compiled by C. W. Hendel, for many years a civil and mining engineer and deputy mineral surveyor at La Porte, showing the production of a number of the old drift mines on the northern end of this ridge. These figures from Hendel's private records are as follows:

Union Company -----	\$1,500,000 00	from width of 1700 feet
Hawkeye Company -----	400,000 00	from width of 800 feet
Pittsburg Company -----	400,000 00	from width of 900 feet
Monumental Company -----	300,000 00	from width of 1028 feet
Empire Company -----	800,000 00	from width of 1672 feet
Down East Company -----	400,000 00	from width of 400 feet

Further figures furnished by Hendel and quoted by R. W. Raymond¹ in a government report printed in 1875 indicate that the average pay per square yard, 4½ feet high, was:

Down East Company -----	\$10 80
Union Company -----	8 10
Hawkeye Company -----	9 45
Pittsburg Company -----	7 38

¹ Mineral resources west of the Rocky Mountains, 1875.

equal to an average of \$0.95 per square foot, $4\frac{1}{2}$ feet high. The drift mines in the immediate vicinity of Howland Flat were opened from 1855 to 1868, and the camp reached its zenith of production between 1862 and 1866 when it was said to be shipping about \$600,000 a year. Not all the mines paid dividends, and some of the best properties, such as the Union, broke the operating companies before they were made to yield a profit.

Estimates made years ago of the amounts of hydraulic gravel at present available in the areas shown on this map are:

Howland Flat and Pine Grove-----	1,375,000 cu. yds.
St. Louis, Greenwood and Grass Flat-----	2,850,000 cu. yds.
Port Wine Ridge-----	500,000 cu. yds.
Poverty Hill -----	4,000,000 cu. yds.
Scales and Mount Pleasant-----	30,000,000 cu. yds.

The army engineers making the above estimates concluded there are ultimately available 60,000,000 cubic yards at Scales and Mount Pleasant. Poverty Hill Mines and part of the Scales diggings are on the La Porte channel and its junction with the Port Wine channel. The drift mining possibilities of the Port Wine channel are not yet fully indicated by the work done, but enough has been accomplished to show the presence of a good sized channel. The front ground has been quite extensively hydraulicked.

Properties are mentioned below in their order on the map beginning at the south end. The district is reached from the Marysville-La Porte road, taking a branch road $2\frac{1}{2}$ miles above Strawberry Valley which passes up the ridge through Scales, Port Wine and northward.

Scales Syndicate (formerly *Neocene P. M. Co.* or *Cleveland Mine*). Harris Hammond et al., 512 Chancery Building, San Francisco. Andrew Nesbit, superintendent at mine, address via Strawberry Valley, Yuba County. Scales is about 58 miles by auto road from Marysville.

The ground includes the Gold Cup, Oversight and Relocation claims and others not shown on the map. Considerable ground has been hydraulicked in the past. The bank is 50 to 150 feet high, 'tight' or slightly cemented in places, and contains a great many large boulders, which offer the principal operating problem. The channel is about one-fourth of a mile wide and the property is claimed to cover a mile and a half in length on it.

Preparations are under way at present (October, 1924) to resume hydraulic mining as soon as winter storms furnish a water supply. Three giants will be used. Two new high line derricks have been installed to handle boulders. Two to three thousand inches of water from Rock Creek will be used and a five months water supply is anticipated. There is a pipe line about 2000 feet long. The 4-foot flume has a grade of 3% to 6%. About 25 men will be employed when actively operating.

Tailing is to be stored behind the new Bullards Bar dam at a cost of 3 cents a cubic yard, computed on the basis of yardage washed from the pit.

Poverty Hill Mines. *Metals Exploration Company* has been drilling this property during the summer and fall of 1924 to get data preliminary to hydraulic mining. The company has just been granted a

permit to divert water from several tributaries of Slate Creek for mining purposes. Tailing will be stored behind the new dam at Bullards Bar. The Washington and claims intervening between it and Poverty Hill on the west slope of the ridge are also included in the plans. Attempts were made nearly sixty years ago to bottom the channel on the Washington Claim by running adits and sinking inclines, but these did not reach bottom. Judson Estate and Henry Kingdon are owners¹ of Poverty Mill Mines; O. C. Ermatinger is owner of Washington Claim. C. H. Munroe, manager, and Arthur Hughes, superintendent, for Metals Exploration Company.

Mount Pleasant Mine (Ladies and Mount Pleasant claims). Frank Donohue, owner. Address, Strawberry Valley, Yuba County. These claims adjoin Scales Syndicate property on the northeast on the Port Wine channel. The channel is about 1000 feet wide, of which width 800 feet is considered good hydraulic ground.

The owner has been prospecting the property during 1924 with a Keystone drill. The outside holes were 1200 feet apart on the east and west rims. One hole in the channel is reported to have been drilled 176 feet, and to have been all in gravel except 12 feet. This gravel is said to have prospected well for hydraulicking all the way. Drilling is to be continued in 1925.

Washington and National Claims. O. C. Ermatinger et al., owners. Under bond to *Metals Exploration Company*.

Iowa Shaft Claim. D. Brablan Estate, 775 Twelfth street, Oakland, California,

Three shafts have been sunk on this claim. The elevation of the surface is about 4900 feet and the perpendicular distance to bedrock was 318 feet. The third and last shaft was an incline run about 1880 and reported 600 feet long. The channel is said to have been worked for 1200 feet in length, beginning about 300 feet from the Washington line and about under the ditch. The width worked and average value are uncertain, but it is thought to have been about 600 feet wide, and, although statements of value vary, it appears to have been profitable, as 10 cars per man was reported to be a shift's work. The gravel on bedrock was rocky and cemented, and the pay gravel mined was 16 feet above bedrock.

Blue Gravel (Bonanza) Claim. O. C. Ermatinger, C. A. Edgar and wife, owners. Some drilling was done in 1921 on this claim and on the adjoining Hardscrabble, which see.

Hardscrabble Claim. Mrs. Alice Brown and Henry Morse, Oakland; Ed Westall, Sierra City, owners. Twelve drill holes put down on this and Blue Gravel Claim in 1921 are locally reported to have indicated a channel 800 feet wide, carrying 80 feet of gravel, which is covered with 140 feet of pipe clay, with total depth to bedrock about 400 feet.

The elevation (aneroid) of bedrock in the hydraulic pit on the Hardscrabble is 4750 feet. This is 85 feet higher than bedrock of Port Wine channel as found in drill holes. The last mining done on this ground was in 1920 by *Lewis, Gilman and Moore*. Besides the hydraulic pit, an adit has been run 700 feet in from the face of the cut. While

¹ Records of ownership of claims have not been checked, and can not be vouched for. Title to unpatented claims especially is often uncertain.

claimed to be good hydraulic ground, there was said to be insufficient pay on bedrock for profitable drifting.

Poor Boy Consolidated. John Masson et al., owners, Strawberry Valley. There is a bedrock adit 450 feet long on this claim which has not yet reached gravel.

Bella Union Consolidated. Oscar Grant, San Jose; Thomas Jones, Dunsmuir, et al., owners. An adit was started in 1887 from near Canyon Creek, under an agreement with Grant to run 900 feet for one-half interest in the property. It was run 860 feet in bedrock and a raise was put up 60 feet, but they were apparently not far enough back. Estimates made in 1915 were said to show that an adit 2500 feet long might be needed.

Monitor and Bon Ton Claims. Phelan Estate, O. C. Ermatinger, Richard Kingdon, James Bevan and Henry Decker, owners.

Topsy Claim. E. Prosser, Martinez, owner.

Lucky Gold Hill Claim. John Lassiatt, owner. This is a relocation of the old Lucky Hill Claim, on which two prospect shafts were sunk and a short adit was run in early days. One of the shafts was reported to have reached rim gravel.

Canada Claim. O. F. Caya and Sherman Estate, owners. The front ground on the Slate Creek side has been mined.

Sailor Claim. John Masson, owner. This is also one of the old claims worked by hydraulicking in the early days.

Erie Claim. Mrs. M. France and John Masson, owners. Hydraulicked in the early days.

Eagle Claim. Liberty and Company, owners. The front ground was hydraulicked and the back has been prospected partly by an adit.

Queen, Monte Cristo and Enterprise Claims. James Modglin, owner. Queen Claim was hydraulicked in the early days. The Monte Cristo was worked through a tunnel and incline and produced up to and during the seventies over half a million dollars, at the average rate of \$6.47 a cubic yard. They worked through to the east side of the channel.

Happy Hollow Group. (Arizona, Manzanita.) Formerly *Union Consolidated* mine.

The mine originally contained five claims and was worked from early days until 1895. It was opened by adits, an incline and drifts. The Happy Hollow adit was run in from the east slope 2050 feet in a westerly direction into the Port Wine channel, and 700 feet upstream. The gravel mined in later years was 10 feet deep and was mined 5½ feet high. The gold was fine and high grade. Total production was over half a million dollars, and the gravel mined up to 1873 was said to average \$12.25 a cubic yard for a total of 37,810 cubic yards.

Highland Mary Claim. Mrs. R. Conlin et al., owners.

Pioneer Mine. This property was extensively worked from the seventies, first as a hydraulic mine, then as a drift. The gravel body on this ground was very wide, as it was at or near the junction of two

channels, one coming down from Table Rock through the Jenny Lind and Excelsior claims, the other across the Clipper Ship, Star and Caledonia claims. The portion of ground hydraulicked, between 40 and 50 acres, is said to have produced \$300,000 or more. The later drift operations were through a tunnel 1600 feet long, from which an incline 140 feet long, giving a perpendicular depth of 35 feet, was sunk and the gravel breasted four feet high. The entire depth was 230 feet, of which 120 feet was quartz gravel, and the portion breasted was sufficiently tight or cemented to require blasting.

Wahoo and West Point Claims. Frank R. Wehe and Arnot Estate, owners. The Wahoo adit was run 700 feet westward from the east slope and the rim gravel or bench was mined upstream for 1300 feet. At the north end of the working an incline was sunk 500 feet in an attempt to bottom the channel, but the gravel and bedrock were still pitching westward.

Ohio and Suffolk Claims. Have been worked out according to report. The Suffolk tunnel was in all over 2000 feet long and was connected with the surface by an air shaft 322 feet deep. The channel was 600 feet wide here and was breasted 70 to 80 feet wide.

Rifle Claim. Sam Ah Tye, Quincy, owner. The front ground, on the Slate Creek side, was hydraulicked. There was also a bedrock tunnel 2000 feet long to tap the back, or Port Wine channel, but the amount of breasting done in this is unknown.

Challenge Claim. J. J. Johnson, San Jose. The front ground has been mined.

Excelsior Claim. A bedrock tunnel 1400 feet long, tapped what was considered an overflow of gravel, 200 feet wide, which was drifted. The property was also hydraulicked. C. E. Bauer, Courtland, California, et al., owners.

Caledonia Claim. John McBride. The front of claim has been mined, beginning in the fifties, and off and on until recent years.

Star Claim. Like the Caledonia, this claim was extensively worked in early days. The ground mined on the front or northwest ends of the Star, Caledonia and Excelsior claims was considered to be part of a smaller channel which joined the Port Wine channel on the Pioneer or Manzanita.

Roscoe, Keystone, Excelsior and Constitution Claims. Wm. F. Schwering, owner. A tunnel is being run from the *Clipper Ship* to the Constitution and Roscoe claims to get the back, or Port Wine channel. The *Clipper Ship Claim*, formerly operated by E. H. Wemple, who is driving the tunnel, was hydraulicked.

Jenny Lind and California. On the California Claim, the gravel was separated from the main channel by the Table Rock lava flow.

Miners Home. *Table Rock Mining Company* has been drifting an upper lead for several years and has been producing coarse gold. Holdings include Miners Home, Union and Hawkeye, on which the lower lead was profitably mined in the early days. Described in the Bureau's report on the Mines and Mineral Resources of Sierra County.

SUMMARY AND CONCLUSION.

The notes above are brought together from many sources for the purpose of making conveniently available under one cover as many as possible of the facts of interest to the miner concerning the district. These notes include a good deal of information not heretofore published, relating to the results of prospecting and mining there in later years. It is thought that enough has been given to show that the area still contains considerable unworked gravel, in addition to the well known resources of hydraulic ground at the southern end. A great deal of ground should now be available for hydraulicking if the charge of 3 cents a yard for tailing storage does not prove too high. Much of the deep gravel, the existence of which has been indicated by uncompleted prospecting, is so deeply buried by andesite and pipe clay that if payable it can be worked only by drifting. The returns realized from mines already drifted out indicate the possibilities for profit from this kind of operation.

The attached map is approximate in the case of certain claim boundaries, but has been corrected in some particulars from the plat books of the U. S. Land Office. Part of the area has not been covered by the public land survey, and many of the claims have not been patented, so that such claim surveys have not been properly checked. The map is intended principally to give an idea of the geography and relative positions of the claims.

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SAN FRANCISCO FIELD DIVISION.

C. MCK. LAIZURE, Mining Engineer.

The entire time of the district engineer was taken up with office duties, and no field work was undertaken during the quarter covered by this report.

LOS ANGELES FIELD DIVISION.

W. B. TUCKER, Mining Engineer.

Kern County.

ANTIMONY.

Earl Maharg and *F. B. Houghawott*, of Long Beach, have located four claims in Sec. 4, T. 10 N., R. 15 W., 24 miles northwest of Rosamond. The sulphide of antimony, stibnite, occurs on the contact of limestone and porphyry. The vein strikes east with a dip to the north.

Development consists of a shaft 30 feet deep. In the shaft a lens of ore has been exposed, which shows a width of 12 inches to 2 feet. The ore mined is said to run 20% antimony. One man is employed.

ARSENIC.

Contact Mine is located on Sec. 10, T. 10 N., R. 15 W., 21 miles northwest of Rosamond, on the south slope of Pine Mountain.

Holdings consist of three claims: Contact, Music and Taylor Horse, a total of 60 acres. Elevation 3700 feet. Owner, B. D. Standeford of Rosamond. Under lease to J. H. Felker and C. Gross of Los Angeles.

Country rock is limestone and shale. The ore occurs in small, irregular lenses in shale, which has been altered to a carbonized slate, along an intrusion of diorite in the vicinity of the contact between the limestone and shale. The ore is arsenopyrite, associated with pyrite. Width of ore developed varies from 6 to 12 inches. The vein strikes east and dips 80 degrees north.

Developments consist of a vertical shaft 50 feet deep, with a drift west for a distance of 20 feet; also a tunnel driven east along the vein for 50 feet. It is reported that 27 tons of ore were shipped in 1923, the average assay value being 40% arsenic. During the present year 25 tons of ore has been mined and hauled to Rosamond for shipment. Four men are employed under the supervision of J. H. Felker of Los Angeles.

San Bernardino County.

DOLOMITE, LIMESTONE AND SILICA.

Deposits of dolomite, limestone and silica occur in Secs. 13 and 18, T. 2 N., R. 5 and 6 W., 1½ miles north of Keenbrook, a station on the Santa Fe Railroad. Holdings consist of 800 acres owned by *John P. Lawton* of Sierra Madre. The deposit of silica being developed is near Mountain View Camp.

MAGNESITE.

Cima Magnesite Deposit is located 11 miles northeast of Cima. Owners, Knight and Johnson of Cima. The deposit has been leased by Bruce Gatewood of Cima. Open cuts have exposed four feet of ore.

San Diego County.

CLAY.

Extensive exposures of Eocene Tertiary clay or shale occur in the bluffs of Rose Canyon, about 10 miles north of the city of San Diego. These deposits extend for a distance of three miles north of Ladrillo, a station on the Atchison, Topeka and Santa Fe Railroad.

Practically all the brick and tile manufacturers of San Diego secure their clay and shale from this area.

Five miles northeast of Cardiff, on Rancho Las Encinitas, are extensive beds of fire clay. The principal exposures are being developed by the *Vitrified Products Corporation* of San Deigo.

BRICK.

BRICK AND TILE MANUFACTURERS.

The following companies are now engaged in the manufacture of common brick, building tile and vitrified brick:

San Diego Brick and Tile Company, William Roffe, president. This

company controls 100 acres of Eocene Tertiary clay and shale in Rose Canyon. The plant is located in Rose Canyon, near Ladrillo.

The clay is mined from the west side of the canyon and hauled in cars to chutes along the side of the roadway, about 50 feet above the yard. Two-ton side-dump cars haul it from the bin to the dry pan and stiff mud machine, which have a capacity of 7 tons per hour. The tile and brick are burned in field kilns.

Equipment consists of kilns and dry press with a capacity of 20,000 brick. Operated by electric power, oil being used as fuel.

Manufacturing common red brick, building tile, hollow tile and vitrified brick.

Union Brick Company, J. Fred Trogarth, president. The company's plant is located in Rose Canyon, 10 miles north of San Diego. The clay mined is from exposures of Eocene Tertiary clay and shale in the bluffs of Rose Canyon. It is thin-bedded, hard, and yellowish in color, forming a bank 50 feet or more in height. Underlying this material is a bed of plastic clay or shale, blue-gray in color.

The plant is equipped with dry pan and two presses; bricks and building tile are burned in field kilns, three such kilns being in operation. Fuel oil is used for burning, and electric power for operating the presses. The company is manufacturing common red brick and building tile.

Vitrified Products Corporation, Victor Kremer, president; George W. Kummer, secretary. Offices 523 Spreckels Building, San Diego, California. This company owns a deposit of fire clay, located 5 miles northeast of Cardiff, in Lot 18, Rancho Las Encinitas. The clay bank has been exposed on the east and west sides of a small hill, by two opencuts. The bed of clay is about 25 feet thick, with an overburden of 2 feet of soil. The clay near the surface is mottled red, but near the bottom of the cuts it is white to gray in color. The clay mined from these opencuts is hauled in cars to loading bins, then transported in motor trucks to Cardiff, whence it is shipped over the railroad to the company's plant at Old Town, San Diego. The company also owns 175 acres containing a large deposit of clay shale near Linda Vista.

The brick and tile plant has a grinding capacity of 200 tons per day, producing 50,000 common brick and 50,000 hollow tile per day.

The company is manufacturing hollow building, and wall tile, flue lining, face, building, sewer and vitrified brick, fire brick and clay. They also produce electric conduit pipe, vitrified sewer pipe, glazed and wall block.

Plant: From railroad cars the clay and shale is elevated to storage bins, with a capacity of 250 tons. These bins are divided into ten compartments. The material from the bins passes through ten chutes onto two 20-inch belt conveyors, then is elevated to two American Machinery Company's dry pans. From the dry pans, the ground material is elevated by two 18-inch bucket elevators and passed over two wire screens, the oversize being returned to the dry pans. The through-size goes to a pug-mill, where it is mixed with water and then passed to the clay auger machine for tile or brick. Rejects from the tile and brick cutting machines are conveyed by belt conveyor to an elevator, and returned to the pug-mill or mixer.

The plant is equipped with a twelve-tunnel dryer. Heat for drying is generated in a furnace with oil used as fuel. There are four down-draft kilns, one 38-foot and three 32-foot kilns; also two outdoor kilns for burning common red brick. Five hundred horsepower is required to operate the plant. Forty men are employed.

COPPER.

Daley Copper Mine comprises 100 acres of patented land, located in Sec. 11, T. 13 S., R. 1 E., 7 miles southwest of Ramona. Elevation 1650 feet. Owner, Sarah M. Daley of San Diego. Under option to the *Southern California Mining and Smelting Company*, George W. Lindsay, president; J. W. Ott, secretary and treasurer; M. W. Tanner, superintendent. Offices Twenty-eighth and Upas streets, San Diego.

The deposit was discovered in 1894, and operated from 1915 to 1916 by the *San Jacinto Mining and Milling Company*. In 1916 it was bonded to the Southern California Mining and Smelting Company of San Diego, which operated the property until December, 1923, and then after a short shutdown resumed operations.

A mineralized zone 150 feet in length by 50 feet in width occurs on the contact of granite and schist. Surface croppings show brown oxides of copper, malachite, and some azurite. The oxidized zone has a depth of 30 feet. Here the sulphide zone was encountered, and chalcopyrite associated with pyrite is finely disseminated throughout the schist. It is stated that ore mined will average from 2% to 3% copper, with 6 ozs. of silver. The mineralized silicified schist is cut by a porphyry dike 12 to 15 feet wide, that strikes N. 50° E., with a dip of 70° SE. The general trend of the ore zone is N. 45° E., dip 47° NW.

Development consists of a vertical shaft 115 feet deep. A crosscut tunnel driven southeast 50 feet connects with the shaft 50 feet below the collar of the shaft.

Mine Equipment: 12-h.p. gas engine hoist, 4½ x 4½-inch Rix compressor, cars, and air drills.

Smelter: 50-ton reverberatory furnace. A 12-h.p. Jumbo gas engine driving a Connerville blower, 6 x 9-inch crusher and link belt elevator. Six men are employed.

GOLD.

Since the Fourteenth Report of the State Mineralogist, 1914, there has been a revival of interest in gold mining throughout the county, the principal districts affected being Descanso, Deer Park and Julian, where some of the old properties are being reopened.

The principal gold belt extends southward a distance of 45 miles from the Montezuma district, east of Warner's to the Mexican boundary. The most productive district has been the Julian district.

Geology of Julian District.

The country rock is a metamorphic slate or mica schist with a north-westerly strike and nearly a vertical dip. At some points it has been injected with granitic matter in thin sheets parallel to the foliation of the schist. When this occurs, a rock results which closely resembles a granitic gneiss. Small intrusive areas of granite also appear. The mineralization of this area is in fissure veins of quartz, which, both in

dip and strike, are generally parallel to the schistosity of the country rock. These veins are essentially 'stringer leads' and are usually small in width, following the curving strike of the schists as they swing westward toward Julian. Several parallel veins have been recognized, four of which have been regarded as continuous for several miles. The farthest east is known as the Chariot vein, those succeeding to the westward being known as the Ready Relief, Cable and Ruby.

In the Descanso and Deer Creek districts, the auriferous quartz veins occur in the granite. In Pine Valley district, which is on the west slope of the Laguna Range, the quartz veins occur in a mica schist.

MINES.

Descanso Mine (formerly known as Ellis Mine) comprises 17 claims located in Sec. 24, T. 15 S., R. 3 E., near the town of Descanso. Elevation 3500 feet. Owner, Descanso Mining Syndicate; A. B. E. Shute, president, Hollywood, California. Under lease to the *Descanso Mining Company*, Dr. B. F. Stanwood, president; J. J. Curl, secretary. Offices 413 Bancroft Building, San Diego.

A series of parallel veins of quartz occur in the granite, the general course being east. Practically all the development work has been confined to the Magdalena vein, which dips 80° north. An incline shaft has been sunk on this vein to a depth of 230 feet, and the company proposes to sink to the 300-foot level before drifting on the vein. The vein developed varies in width from 12 inches to 3 feet. The quartz shows a small percentage of free gold associated with pyrite, marcasite, galena and pyrrhotite. The vein has been drifted on 80 feet west on three levels above the 200-foot level. Ore developed is said to assay from \$10 to \$50 per ton in gold.

Equipment: 15-h.p. gas engine hoist, 8 x 8-inch Fairbanks-Morse compressor driven by 25-h.p. Western gas engine, blacksmith shop, cars, air drills and Cameron pump. There is a mill building with no equipment; however, the company is planning to install a 25-ton concentration plant. Four men are employed.

Gold Standard and *North Star Mines* are situated in the Deer Park Mining district, in Sec. 12, T. 15 S., R. 4 E., 6 miles northwest of Descanso. Elevation 5200 feet. The Gold Standard group comprises six claims; the North Star group has four claims. Owner, J. F. Gage of Deer Park.

Two parallel veins of quartz occur in the granite on the Gold Standard group. These veins have a general northerly course. Gold Standard veins dip 45° west. The North Star vein dips 35° west. The east vein on the Gold Standard has an average width of 4 feet. North Star vein varies from 4 to 8 inches. The principal development work has been confined to the east vein on the Gold Standard claims, and North Star vein. The quartz ore contains free gold associated with pyrite and marcasite.

Developments on the Gold Standard group consist of two tunnels, the upper tunnel being driven 150 feet north on the vein; 50 feet below is the other tunnel driven north 190 feet. On the North Star vein an incline shaft has been sunk to a depth of 50 feet. A crosscut tunnel has been driven 190 feet east to cut the North Star vein.

Mine equipment consists of $4\frac{1}{2} \times 4\frac{1}{2}$ -inch Rix compressor, air drills, ore cars and blacksmith shop.

Mill: Twenty-ton ore bin, 20-ton ball mill, amalgamation plates, Cottrell concentrator; driven by 20-h.p. White gas engine. Four men are employed.

Golden Chariot Mine is located in Sec. 14, T. 13 S., R. 4 E., 4 miles southeast of Banner, in the Julian Mining district. Claims: Golden Chariot, Golden Chariot No. 1 patented and two claims held by location. Elevation 3500 feet. Owner, Adelaide Elliot of San Francisco. Under lease and bond to the *Golden Chariot Mining Company*; C. A. Ferrin, president; Miss Polly Young, secretary; William E. Dozier, superintendent. Offices, Berkeley, California.

The property was discovered in 1871. Worked from 1871 to 1886, producing \$700,000. Worked from 1913 to 1914 by *Chariot Mining and Milling Company* of San Francisco. The present company commenced operations in March, 1923.

The Chariot vein occurs on the contact of mica schist and granite, the former being the footwall and the latter the hanging-wall. The vein is 2 to 4 feet wide, strikes N. 20° W. and dips 65° NE. The ore occurs in lenses of quartz on the contact, and it is stated when encountered is high grade. The ore shoots are short. The vein is faulted to the east by a series of step faults. The quartz is free milling, containing a small percentage of pyrite and tellurium. Concentrates are reported to assay \$600 per ton.

Developments: Three shafts have been sunk on the vein: No. 1 shaft is 200 feet, No. 2 is 300 feet, and No. 3 is 150 feet. No. 1, the main working shaft, has been sunk on an incline of 65° and is on the vein to the 100-foot level. At this point the contact flattened to 45° . From the 100-foot level to the 200-foot level the shaft is in the footwall. On the 100-foot level the vein was drifted on south 200 feet. On the 200-foot level a drift was driven 150 feet south from the shaft in the footwall slate; then as a crosscut 100 feet east to the contact; then run 150 feet south, connecting with the old stope from No. 2 shaft. The most productive area worked was from No. 2 shaft, about 185 feet south of No. 1 shaft. The lens of ore worked is said to have been 65 feet in length by 185 feet deep and 4 feet in width. The present development work is confined to sinking a winze from the 200-foot level on the contact, in the hope of picking up a faulted section of the vein.

Mine equipment: 15-h.p. Foos gas engine hoist, 8 x 8-inch Ingersoll-Rand compressor, Ingersoll-Rand drill sharpener, blacksmith shop and dwellings.

Mill: Two 1000-lb. stamps, amalgamation plates, Wilfley concentrator. Mill driven by 15-h.p. Foos gas engine. Five men are employed.

Bibl: State Mineralogist Reports VI, p. 86; IX, p. 147; XIII, p. 337; XIV, p. 658.

Last Chance Mine is located in Sec. 4, T. 14 S., R. 3 E., in Boulder Creek mining district. Elevation 3200 feet. Holdings consist of five claims. Owner, F. E. Fuler. Under option to *International Gold*

Mines Company; L. E. Meyer of San Diego, president. Five parallel veins having a general northwesterly course occur in the granite. Veins have an average width of two feet.

Development consists of a vertical shaft 100 feet deep. There is a 5-stamp mill on the property. Two men are employed.

Ready Relief and North Hubbard Group of Mines is situated in Secs. 10 and 11, T. 13 S., R. 4 E., three miles southeast of Banner in the Julian mining district. Elevation 2900 feet.

The Ready Relief Group, comprising 10 claims, is owned by Annie Laurie and Mary A. Baily of Julian; the North Hubbard Claim is owned by G. W. Hazzard of San Diego. Total area 225 acres. Under lease and bond to *Lone Pine Mining and Milling Company*, 427 Spreckels Building, San Diego. A. J. Lindsay, president; Anna M. Pederson, secretary; S. C. Blackman, manager.

This group of mines has been one of the most productive in the Julian district. The present company started operations on the property during the latter part of 1923. The strike of the schist belt in which the North Hubbard-Ready Relief vein occurs is northwest, and varies but little from this over a wide area. The country rock is a dark gray schist, having a dip of 80° E. The vein of the Ready Relief and North Hubbard mines is in the form of quartz, which has been subjected to stress, producing a folding of the vein. In places in the mines, several of these folds of the vein lie side by side. Where this condition occurs, the pay shoot is large. The thickness of individual rolls varies from a few inches to six feet, and, where the folds parallel each other, a width of from 12 to 20 feet was noted. The vein is in the form of a 'stringer lead' with occasional wide lenses of quartz. The vein strikes N. 60° and dips 70° NE. Width varies from 2 to 6 feet. The quartz shows free gold, some pyrite and tellurium.

Developments consist of three tunnels on the Ready Relief, total length 1500 feet. The Ready Relief shaft is 220 feet deep. South Hubbard tunnel is 300 feet, shaft 275 feet. Redman shaft is 115 feet deep. North Hubbard tunnel is 800 feet in length.

Ready Relief Workings: Lower tunnel 500 feet, intermediate tunnel 500 feet, and upper tunnel 530 feet, all on the vein.

North Hubbard Workings: Crosscut tunnel driven south 200 feet to the vein, with drifts 400 feet northwest and 200 feet southeast on the vein. Average value of ore mined is stated to be \$15 per ton.

Mine Equipment: 5-drill Ingersoll-Rand compressor driven by 32-h.p. Fairbanks-Morse gas engine, Ingersoll-Rand drill sharpener, air drills, cars, blacksmith and machine shop, and dwellings.

Mill Equipment: On the North Hubbard, five 850-lb. stamps driven by 25-h.p. Fairbanks-Morse gas engine. On Ready Relief, 50-ton mill, 7 x 10-inch Universal crusher, No. 43 Marcy ball mill, Denver quartz mill, amalgamation plates and Wilfley concentrator. The mill is driven by a West Coast gas engine. It is stated that a recovery of about \$12 per ton is made on the plates, with a high-grade concentrate said to be rich in tellurium. Thirty men are employed.

Bibl: State Mineralogist Reports VI, p. 87; VIII, p. 513; IX, p. 147; X, p. 543; XI, p. 378; XIII, p. 344; XIV, p. 657.

Stonewall Mine is located on the Cuyamaca Grant, on the south bank of the Cuyamaca Reservoir. The property was purchased September 1, 1923, by R. M. Dyar of Beverly Hills, California, and A. B. Smith of Cleveland, Ohio. Idle.

Bibl: State Mineralogist Reports VI, p. 89; VIII, p. 515; IX, p. 143; X, p. 540; XI, p. 382; XII, p. 243; XIII, p. 345; XIV, pp. 660-662.

IRON.

Iron Master Group of Claims is located six miles east of Lakeside, in T. 15 S., R. 1 E. Eight claims have been located by B. F. Stanwood and associates of San Diego. The iron occurs as magnetite in granite. Not enough development work has been done to determine the extent of the deposit. Two feet of ore is exposed in one prospect hole of shallow depth.

Lake View Group of Claims is located in T. 15 S., R. 1 E., on the south slope of El Capitan Mountain, three miles northeast of Lakeside. Holdings comprise five claims. Elevation 1300 feet. Owners, B. F. Stanwood and associates of San Diego. Ore occurs as hematite and magnetite. Analysis of ore stated to show 70% iron with low phosphorus and sulphur content.

MANGANESE.

A mile and a half northwest of Jacumba are surface indications of manganese in the form of superficial deposits of the oxide. Some manganese stained croppings are in the vicinity of Campo.

Jacumba Manganese Group of Claims is located one mile northwest of Jacumba in Secs. 5 and 6 T. 18 S., R. 8 E. Elevation 2900 feet. Eight claims have been located by B. F. Stanwood and J. J. Curl of San Diego.

A number of silicified outcrops, with general northwest strike, occur in the granite. At a number of points these outcrops are heavily stained with manganese oxides. Analysis of ore extracted from different prospect holes is reported as:

Manganese -----	7% to 22%
Iron -----	14%
Silica -----	16% to 25%

Only assessment work has been done on the claims.

OIL FIELD DEVELOPMENT OPERATIONS.

By R. D. Bush, State Oil and Gas Supervisor.

From July 5, 1924, to and including October 4, 1924, the following new wells were reported as ready to drill:

Company	Sec.	Twp.	Range	Well No.	Field
COLUSA COUNTY:					
Prize Oil & Gas Co.....	17	14	1	1	Colusa County
CONTRA COSTA COUNTY:					
Wm. Edwards.....	31	2	2	1	Contra Costa County
KINGS COUNTY:					
Associated Oil Co.....	12	23	18	1	Kings County
KERN COUNTY:					
Vandruff Petroleum, Inc.....	25	25	18	1	Devils Den
Associated Oil Co.....	26	30	24	1-A	Elk Hills
Associated Oil Co.....	26	30	24	52	Elk Hills
Belridge Oil Co.....	34	30	24	6	Elk Hills
Belridge Oil Co.....	34	30	24	9	Elk Hills
Pacific Oil Co.....	35	30	24	4	Elk Hills
Pacific Oil Co.....	35	30	24	6	Elk Hills
Pacific Oil Co.....	35	30	24	77	Elk Hills
Standard Oil Co.....	31	30	25	Kern Co. 19	Elk Hills
Pan-American Petroleum Co.....	20	28	28	Crampton 4-G	Elk Hills
Wilmar Oil Co.....	20	28	28	4	Kern River
Wilmar Oil Co.....	20	28	28	5	Kern River
L. M. Howland.....	2	29	28	9	Kern River
Kern River Oil Fields Co., Ltd.....	14	29	28	1	Kern River
Combined Oil Co.....	14	31	22	16	Midway
Manley & McGinn.....	15	31	22	9	Midway
Christine Oil Syn.....	21	31	22	3	Midway
Retrieve Petroleum Co.....	21	31	22	1	Midway
Brookshire Oil Co.....	24	31	22	13	Midway
Associated Oil Co.....	35	31	22	32	Midway
Balboa Oil Co.....	24	31	23	31	Midway
Midland Oilfields Co., Ltd.....	24	31	23	9	Midway
Midland Oilfields Co., Ltd.....	24	31	23	10	Midway
Midland Oilfields Co., Ltd.....	24	31	23	11	Midway
Midland Oilfields Co., Ltd.....	24	31	23	12	Midway
Pacific Oil Co.....	25	31	23	30	Midway
Pacific Oil Co.....	25	31	23	122	Midway
Pacific Oil Co.....	27	31	23	35	Midway
Pacific Oil Co.....	19	31	24	10	Midway
Pacific Oil Co.....	19	31	24	11	Midway
Southwest Petroleum Co.....	28	31	24	2	Midway
Pacific Oil Co.....	29	31	24	10	Midway
North American Oil Cons.....	30	31	24	10	Midway
North American Oil Cons.....	30	31	24	11	Midway
North American Oil Cons.....	30	31	24	12	Midway
North American Oil Cons.....	30	31	24	13	Midway
General Petroleum Corp.....	32	31	24	Buena Vista 6	Midway
Pacific Oil Co.....	33	31	24	24	Midway
Pacific Oil Co.....	33	31	24	IXL 57	Midway
Midland Oilfields Co., Ltd.....	34	31	24	1-B	Midway
Midland Oilfields Co., Ltd.....	34	31	24	3	Midway
Bell-Evans Oil Co., Inc.....	35	32	23	5	Midway
Victor Oil Co.....	35	32	23	11	Midway
Victor Oil Co.....	35	32	23	12	Midway
Big Ten Oil Co.....	36	32	23	8	Midway
Big Ten Oil Co.....	36	32	23	9	Midway
Formax Oil Co.....	36	32	23	17	Midway
Midway Oil Co.....	36	32	23	Alpine 8	Midway
Surprise Oil Co.....	36	32	23	5	Midway

Company	Sec.	Twp.	Range	Well No.	Field	
KERN COUNTY—Cont nued.						
Pacific Oil Co.-----	3	32	24	38	Midway	
Pacific Oil Co.-----	3	32	24	41	Midway	
Honolulu Consolidated Oil Co.-----	4	32	24	72	Midway	
Pacific Oil Co.-----	5	32	24	34	Midway	
Honolulu Consolidated Oil Co.-----	6	32	24	37	Midway	
Honolulu Consolidated Oil Co.-----	6	32	24	57	Midway	
Honolulu Consolidated Oil Co.-----	6	32	24	67	Midway	
Calivada Oil Co.-----	34	32	24	2	Midway	
Calivada Oil Co.-----	34	32	24	5	Midway	
Barnsdall Oil Co.-----	17	11	23	Hazelton 1	Sunset	
Havenstrite & Baker-----	17	11	23	15	Sunset	
E. G. Lewis-----	17	11	23	15	Sunset	
General Petroleum Corp.-----	18	11	23	313-A	Sunset	
General Petroleum Corp.-----	18	11	23	314-B	Sunset	
Pliocene Oil Co.-----	18	11	23	3	Sunset	
Ruby Oil Co.-----	2	11	24	11	Sunset	
Frankel Orloff Oil Co.-----	25	11	24	1	Sunset	
Atlas Oil Co.-----	30	12	23	6	Sunset	
B. B. & O. Oil Co.-----	28	12	24	29	Sunset	
Midway Oil Co.-----	28	12	24	9	Sunset	
Midway Oil Co.-----	34	12	24	210	Sunset	
Midway Oil Co.-----	35	12	24	396	Sunset	
Standard Oil Co.-----	36	12	24	M. J. M. & M. 55	Sunset	
Wesco Petroleum Co.-----	36	29	20	21	Temblor	
Jared How-----	29	29	21	1	Temblor	
W. S. McWhorter-----	20	11	20	1	Wheeler Ridge	
Standard Oil Co.-----	27	11	20	Kern Co. Lease No. 2	14 3	Wheeler Ridge Wheeler Ridge
General Petroleum Corp.-----	28	11	20	Kern Co. Lease No. 2	15	Wheeler Ridge
Standard Oil Co.-----	28	11	20	Kern Co. Lease No. 3	1	Kern County
General Petroleum Corp.-----	31	12	18	Tejon 1	1	Kern County
Standard Oil Co.-----	5	27	20	Kruse Comm. 1	1	Kern County
Union Oil Co.-----	4	29	25	Rio Bravo 1	1	Kern County
Leonard Jones-----	33	30	29	1	1	Kern County
Red Rock Oil Assn.-----	19	30	33	1	1	Kern County
J. F. McMahon-----	7	31	22	1	1	Kern County
Hovey Hills Oil Co.-----	19	31	22	1	1	Kern County
LOS ANGELES COUNTY:						
United Oil Co. & Henderson Petroleum Corp.-----	3	3	13	Dominguez 2	Dominguez	
Shell Co.-----	33	3	13	Reyes 3-A	Dominguez	
Shell Co.-----	33	3	13	Reyes 13	Dominguez	
Shell Co.-----	33	3	13	Reyes 14	Dominguez	
Shell Co.-----	33	3	13	Reyes 14-A	Dominguez	
Union Oil Co.-----	33	3	13	Callender 7	Dominguez	
Union Oil Co.-----	33	3	13	Carson 3	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 1	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 1-A	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 1-B	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 2	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 3	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 4	Dominguez	
Associated Oil Co.-----	34	3	13	DeFrancis 5	Dominguez	
Shell Co.-----	34	3	13	Reyes 11	Dominguez	
Shell Co.-----	34	3	13	Reyes 12	Dominguez	
Shell Co.-----	34	3	13	Reyes 16	Dominguez	
Shell Co.-----	34	3	13	Reyes 17	Dominguez	
Shell Co.-----	34	3	13	Reyes 18	Dominguez	
Marland Oil Co.-----	3	4	13	Dominguez 2	Dominguez	
Marland Oil Co.-----	3	4	13	Dominguez 3	Dominguez	
Marland Oil Co.-----	3	4	13	Dominguez 4	Dominguez	
A. T. Jergens Trust-----	10	4	12	14	Long Beach	
A. T. Jergens Trust-----	19	4	12	15	Long Beach	
Moss & Stephenson-----	28	4	12	1	Long Beach	
Pan-American Pet. Co.-----	29	4	12	Pyle-Coffin 1	Long Beach	

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
San Martinez Oil Co.-----	29	4	12	Booth Comm. 5	Long Beach
Shell Co.-----	29	4	12	Alamitos 20	Long Beach
Shell Co.-----	29	4	12	Alamitos 21	Long Beach
Shell Co.-----	29	4	12	Alamitos 22	Long Beach
Shell Co.-----	29	4	12	Alamitos 23	Long Beach
Shell Co.-----	29	4	12	Coseboom 6	Long Beach
Shell Co.-----	29	4	12	Coseboom 7	Long Beach
Shell Co.-----	29	4	12	Dolley 1	Long Beach
Shell Co.-----	29	4	12	Kent-Garth 4	Long Beach
Shell Co.-----	29	4	12	Patton Wilson 4	Long Beach
Bolsa Chica Oil Co.-----	30	4	12	Mutual 3	Long Beach
United Oil Co.-----	13	4	13	Bixby 2	Long Beach
United Oil Co.-----	13	4	13	Bixby 2 1	Long Beach
Arcadia Oil Co.-----	31	1	11		Montebello
Standard Oil Co.-----	6	2	11	Temple 15	Montebello
Standard Oil Co.-----	1	2	12	Baldwin 63	Montebello
Marine Oil Corp.-----	7	3	13		Rosecrans
Union Oil Co.-----	17	3	13	Honowitz 1	Rosecrans
Barnsdall Oil Co.-----	18	3	13	O'Dea 2	Rosecrans
Charles B. Behr-----	18	3	13		Rosecrans
E. J. Miley-----	18	3	13	Athens 2	Rosecrans
Pacific Petroleum Corp.-----	18	3	13	Athens 2	Rosecrans
Union Oil Co.-----	18	3	13	Athens 6	Rosecrans
Union Oil Co.-----	18	3	13	Howard Park 4	Rosecrans
Union Oil Co.-----	18	3	13	Howard Park 5	Rosecrans
Union Oil Co.-----	18	3	13	Trust 2	Rosecrans
Superior Oil Co.-----	19	3	13	Maxwell 2	Rosecrans
Superior Oil Co.-----	19	3	13	Van Nuys 1	Rosecrans
Union Oil Co.-----	19	3	13	Rosecrans 4	Rosecrans
Union Oil Co.-----	19	3	13	Rosecrans 5	Rosecrans
Associated Oil Co.-----	20	3	13	Higgins 1	Rosecrans
Associated Oil Co.-----	20	3	13	Higgins 2	Rosecrans
Associated Oil Co.-----	20	3	13	Hoge 1	Rosecrans
Associated Oil Co.-----	20	3	13	Wanka 1	Rosecrans
Barnsdall Oil Co.-----	20	3	13	Rosecrans 2	Rosecrans
Marine Oil Corp.-----	20	3	13		Rosecrans
E. J. Miley-----	20	3	13	Marland Miley 1	Rosecrans
E. J. Miley-----	20	3	13	Marland Miley 2	Rosecrans
E. J. Miley-----	20	3	13	Marland Miley 3	Rosecrans
E. J. Miley-----	20	3	13	Marland Miley 4	Rosecrans
Petroleum Midway Co., Ltd.-----	20	3	13	Colby 1	Rosecrans
Superior Oil Co.-----	20	3	13	Maxwell Comm. 3	Rosecrans
Petroleum Midway Co., Ltd.-----	31	2	11	Matern Two	
				Twin 2	Santa Fe Springs
				Off 4	Santa Fe Springs
Bandini Petroleum Co.-----	5	3	11	Matern Three 8	Santa Fe Springs
Petroleum Midway Co., Ltd.-----	6	3	11		
Petroleum Securities Co.-----	19	4	13	Kleinmeyer 1-B	Torrance
Petroleum Securities Co.-----	19	4	13	Kleinmeyer 4-A	Torrance
Petroleum Securities Co.-----	19	4	13	Kleinmeyer 5-A	Torrance
Petroleum Securities Co.-----	19	4	13	Kleinmeyer 6-A	Torrance
Petroleum Securities Co.-----	19	4	13	Kleinmeyer 7-A	Torrance
Petroleum Securities Co.-----	19	4	13	Kleinmeyer 8-A	Torrance
Standard Oil Co.-----	19	4	13	Joughin 8	Torrance
Standard Oil Co.-----	19	4	13	Joughin 11	Torrance
Superior Oil Co.-----	19	4	13		Torrance
Superior Oil Co.-----	19	4	13	51	Torrance
Superior Oil Co.-----	19	4	13	Torrance 46	Torrance
Standard Oil Co.-----	30	4	13	Joughin 12	Torrance
Petroleum Midway Co., Ltd.-----	5	4	14	Crocker Comm. 2	Torrance
Petroleum Midway Co., Ltd.-----	5	4	14	Redondo Imp.	
				Co. 2	Torrance
General Petroleum Corp.-----	8	4	14	Carson 4	Torrance
Petroleum Midway Co., Ltd.-----	8	4	14	Dawson 2	Torrance
Petroleum Midway Co., Ltd.-----	8	4	14	Gish 4	Torrance
C. C. M. O. Co.-----	9	4	14	Del Amo 100	Torrance
C. C. M. O. Co.-----	9	4	14	Del Amo 101	Torrance
Petroleum Midway Co., Ltd.-----	9	4	14	Craven Comm. 2	Torrance
Shell Co.-----	9	4	14	Redondo 3	Torrance
Bernard LeMohn-----	13	4	14		Torrance
Standard Oil Co.-----	13	4	14	Carson 1	Torrance

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Standard Oil Co.-----	13	4	14	Dominguez 11	Torrance
Standard Oil Co.-----	13	4	14	Ross Comm. 1	Torrance
Petroleum Midway Co., Ltd.-----	14	4	14	Carlson 1	Torrance
Petroleum Midway Co., Ltd.-----	14	4	14	Carlson 5	Torrance
C. C. M. O. Co.-----	15	4	14	Torrance 67	Torrance
C. C. M. O. Co.-----	15	4	14	Torrance 73	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 19	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 20	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 21	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 22	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 25	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 26	Torrance
Standard Oil Co.-----	15	4	14	Marble Fee 27	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 20	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 21	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 22	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 23	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 24	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 25	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 26	Torrance
C. C. M. O. Co.-----	16	4	14	Del Amo 30	Torrance
C. C. M. O. Co.-----	16	4	14	Torrance 59	Torrance
Fullerton Oil Co.-----	16	4	14	Barlow 2	Torrance
Fullerton Oil Co.-----	16	4	14	Cotton 3	Torrance
Fullerton Oil Co.-----	16	4	14	Cotton 5	Torrance
Fullerton Oil Co.-----	16	4	14	Cotton 7	Torrance
Fullerton Oil Co.-----	16	4	14	Salen 1	Torrance
Petroleum Midway Co., Ltd.-----	16	4	14	Gilman 2	Torrance
Standard Oil Co.-----	16	4	14	Potter Comm. 1	Torrance
Standard Oil Co.-----	16	4	14	Potter Comm. 2	Torrance
Standard Oil Co.-----	16	4	14	Quandt 1	Torrance
Standard Oil Co.-----	16	4	14	Quandt 2	Torrance
Standard Oil Co.-----	22	4	14	Marble Fee 23	Torrance
Standard Oil Co.-----	22	4	14	Marble Fee 24	Torrance
Standard Oil Co.-----	22	4	14	Marble Lease 2-1	Torrance
Petroleum Securities Co.-----	24	4	14	3-A	Torrance
Petroleum Securities Co.-----	24	4	14	Kleinmeyer 1	Torrance
Petroleum Securities Co.-----	24	4	14	Kleinmeyer 2-A	Torrance
Petroleum Securities Co.-----	24	4	14	Kleinmeyer 15-A	Torrance
Petroleum Securities Co.-----	24	4	14	Kleinmeyer 16-A	Torrance
Petroleum Securities Co.-----	24	4	14	Kleinmeyer 17-A	Torrance
Sentinel Oil Co.-----	24	4	14	Joughin 12	Torrance
Sentinel Oil Co.-----	24	4	14	Joughin 13	Torrance
Sentinel Oil Co.-----	24	4	14	Joughin 14	Torrance
Shell Co.-----	24	4	14	Scarborough 7	Torrance
Standard Oil Co.-----	24	4	14	Joughin 9	Torrance
Standard Oil Co.-----	24	4	14	Joughin 10	Torrance
Standard Oil Co.-----	24	4	14	Joughin 13	Torrance
Standard Oil Co.-----	24	4	14	Joughin 14	Torrance
Standard Oil Co.-----	24	4	14	Joughin 15	Torrance
Standard Oil Co.-----	24	4	14	Joughin 16	Torrance
Standard Oil Co.-----	24	4	14	Joughin 17	Torrance
Standard Oil Co.-----	24	4	14	Joughin 18	Torrance
Superior Oil Co.-----	24	4	14	Torrance 47	Torrance
Superior Oil Co.-----	24	4	14	Torrance 48	Torrance
Superior Oil Co.-----	24	4	14	Torrance 49	Torrance
Superior Oil Co.-----	24	4	14	Torrance 50	Torrance
Superior Oil Co.-----	24	4	14	Torrance 53	Torrance
Superior Oil Co.-----	24	4	14	Torrance 54	Torrance
Associated Oil Co.-----	17	2	11	Gregg 1-A	Whittier
Vosburgh Oil Corp.-----	33	1	11	Vosburgh 1	Los Angeles County
Standard Oil Co.-----	19	2	11	Culp. Comm. 1	Los Angeles County
Standard Oil Co.-----	16	2	14	Stocker 1	Los Angeles County
Petroleum Midway Co., Ltd.-----	7	3	11	Ducommun 1	Los Angeles County
Joseph B. Dabney-----	7	3	13	Athens 1	Los Angeles County
E. J. Miley-----	7	3	13	Athens 1	Los Angeles County
Union Oil Co.-----	17	3	13	Gray 1	Los Angeles County
Associated Oil Co.-----	18	3	13	Haviland 1	Los Angeles County
Barnsdall Oil Co.-----	18	3	13	O'Dea 1	Los Angeles County

Company	Sec.	Twp.	Range	Well No.	Field
LOS ANGELES COUNTY—Cont.					
Star Petroleum Co.....	18	3	13	Shoemaker 1	Los Angeles County
Union Oil Co.....	18	3	13	Athens 3	Los Angeles County
Union Oil Co.....	18	3	13	Rosecrans 3	Los Angeles County
Union Oil Co.....	19	3	13	Gordon 1	Los Angeles County
Pan-American Petroleum Co.....	1	3	14	Anderson Western 1	Los Angeles County
McFadden-McDowell & Bering.....	8	3	14	1	Los Angeles County
Federal Drilling Co.....	12	3	14	Barbour 1	Los Angeles County
Shell Co.....	12	3	14	Leonis 1	Los Angeles County
A. D. Kneuper.....	17	3	16	1	Los Angeles County
E. J. Miley.....	17	4	10	1-A	Los Angeles County
Union Oil Co.....	15	4	16	Newhall-Saugus 1	Los Angeles County
Associated Oil Co.....	15	4	17	Newhall 1	Los Angeles County
MONTEREY COUNTY:					
Oil Producers Co.....	26	21	9	Trescony 1	Monterey County
ORANGE COUNTY:					
Standard Oil Co.....	29	5	11	Bolsa 18	Huntington Beach
Standard Oil Co.....	34	5	11	Jones Comm. 4	Huntington Beach
General Petroleum Corp.....	2	6	11	Dabney 3	Huntington Beach
The Petroleum Co.....	2	6	11	Wilson 3	Huntington Beach
Southern Calif. Drilling Co.....	2	6	11	1	Huntington Beach
Pan-American Pet. Co.....	11	6	11	Johnson 2-A	Huntington Beach
Monarch Development Co.....	28	6	10	Newport 2	Newport
Monarch Development Co.....	28	6	10	Orange Co. 2	Newport
A. J. Delaney.....	29	6	10	1	Newport
Associated Oil Co.....	23	3	10	Hualde 41	Orange County
Pasadena Oil Co.....	28	6	10	3	Orange County
RIVERSIDE COUNTY:					
L. R. Clark.....	5	3	2	1	Riverside County
SACRAMENTO COUNTY:					
W. Z. Pay.....		9	7	1	Sacramento County
SAN BERNARDINO COUNTY:					
Hesperia Oil & Gas Co.....	29	4	4	1	San Bernardino Co.
SAN DIEGO COUNTY:					
L. Overbaugh & Rufus Choate.....	11	17	2	1	San Diego County
SAN LUIS OBISPO COUNTY:					
R. B. Blodget.....	2	32	22	1	San Luis Obispo Co.
SANTA BARBARA COUNTY:					
General Petroleum Corp.....	6	9	33	Bradley 1	Santa Maria
Frank E. Johnston and Frank D. Adams.....	200 feet E. from Submarine Oil Co's line			1	Summerland
S. W. Lea, et al.....		4	25	1	Santa Barbara Co.
James F. Nugent Oil Co.....		4	25	1	Santa Barbara Co.
SONOMA COUNTY:					
Herbert N. Witt.....		5	6	2	Sonoma County
TULARE COUNTY:					
R. H. Shannon.....	15	22	27	1	Tulare County
H. T. Johnson.....	17	24	28	1	Tulare County
VENTURA COUNTY:					
Montebello Oil Co.....	4	3	19	Shiells 117	Bardsdale
Nat King.....	34	2	20	1	Conejo
Oak Ridge Oil Co.....	18	3	20	Willard 16	South Mountain
Santa Paula Oil Co.....	18	3	20	Santa Paula 19	South Mountain
Oak Ridge Oil Co.....	13	3	21	Harvey 14	South Mountain
Associated Oil Co.....	27	3	23	Lloyd 9-A	Ventura
Associated Oil Co.....	27	3	23	Lloyd 16	Ventura

Company	Sec.	Twp.	Range	Well No.	Field
VENTURA COUNTY—Continued.					
General Petroleum Corp.....	28	3	23	Notten 5	Ventura
General Petroleum Corp.....	28	3	23	Notten 6	Ventura
Shell Co.....	28	3	23	Edison 2	Ventura
H. W. Schroeder.....	12	2	19	1	Ventura County
Shell Co.....	27	3	23	Gosnell 8	Ventura County
YOLO COUNTY:					
Yolo Land & Oil Assn.....	27	10	1	1	Yolo County.



SPECIAL ARTICLES.

Detailed technical reports on special subjects, the result of research work or extended field investigations, will continue to be issued as separate bulletins by the Bureau, as has been the custom in the past.

Shorter and less elaborate technical papers and articles by members of the staff and others are published in each number of 'Mining in California.'

It is anticipated that these special articles will cover a wide range of subjects both of historical and current interest; descriptions of new processes, or metallurgical and industrial plants, new mineral occurrences, and interesting geological formations, as well as articles intended to supply practical and timely information on the problems of the prospector and miner, such as the text of new laws and official regulations and notices affecting the mineral industry.

OIL AND GAS RIGHTS.

By A. H. RICKETTS, of the bar of the Supreme Court of the United States, of California and of Nevada.

PART VI.

CALIFORNIA MINERAL LEASING ACT.

General Subjects Treated.

- § 1. Lands Reserved to State. Use of Surface.
- § 2. Partial Title Retained by State.
- § 3. Classification of Lands.
- § 4. Prospecting Permits. Monument and Notice.
- § 5. Leases.
- § 6. Royalty.
- § 7. Conditions. Prevention of Waste.
- § 8. Competitive Bidding. Bonus. Terms of Lease.
- § 9. Prospecting and Leasing of Other Minerals.
- § 10. Sale or Lease of Mineral Deposits by Purchaser from State Permitted. Provisos.
- § 11. Cancellation of Prospecting Permit or Lease.
- § 12. Limitation of Permits and Leases.
- § 13. Rights of Way for Pipe Lines. Eminent Domain.
- § 14. Easements.
- § 15. Assignment and Subletting of Lease. Relinquishment of Lease. Least Must Contain Certain Provisions. Age and Sex of Employees. When Wages Must be Paid. Amplification of Provisions of Lease.
- § 16. Judicial Proceedings.
- § 17. Trespass.
- § 18. Rules and Regulations. Boundary Lines.
- § 19. Disposition of Funds.
- § 20. Appropriation for Administrative Purposes.
- § 21. Unconstitutional Provisions.
- § 22. Repeal of Acts.

The California Mineral Leasing Act of May 25, 1921,¹ christened by the Supreme Court of that state as the "State Oil Leasing Act,"² although it also relates to other mineral substances, reads as follows:

§ 1. Lands Reserved to State. Use of Surface.

All coal, oil, oil shale, gas, phosphate, sodium, and other mineral deposits in lands belonging to the state, or which may become the property of the state, are hereby reserved to the state; *provided, however*, that nothing in this act shall apply to lands acquired by the state on a sale of delinquent taxes, except such land, the deed for which is required to be filed in the surveyor general's office. Such deposits are reserved from sale except upon a rental and royalty basis, as herein provided for;

¹ Statutes and Amendments, 1921, p. 404.

² *McNeil vs. Kingsbury*, Surveyor General (decided Feb. 14, 1923), 190 Cal. 406, 213 Pac. 50.

and a purchaser of any lands belonging to the state, or which may become the property of the state, shall acquire no right, title or interest in, or to, such deposits except as hereinafter expressly provided; and the right of such purchaser shall be subject to the reservation of all coal, oil, oil shale, gas, phosphate, sodium, and other mineral deposits, and to the conditions and limitations prescribed by law providing for the state and persons authorized by it to prospect for, mine, and remove such deposits, and to occupy and use so much of the surface of said land as may be required for all purposes reasonably extending to the mining and removal of such deposits therefrom.

§ 2. Partial Title Retained by State.

All applications to purchase state lands which may be filed subsequent to the passage of this act, and all sales shall be subject to and contain a reservation to the state of one-sixteenth of all coal, oil, gas, and other mineral deposits in all land so acquired, as hereinafter provided for, and all certificates of purchase and patents issued therefor, shall contain such reservation.

§ 3. Classification of Lands.

The surveyor general may from time to time classify any or all state land for its different possible values and uses, and, when he deems it advisable, may require the state mineralogist, director of agriculture or other organization, agency or institution of the state government to make such classification. It is hereby expressly made the duty of any such officer, organization, agency or institution to make such classification and to render a report thereon upon the application of the surveyor general.³

§ 4. Prospecting Permits. Monuments and Notice.

The surveyor general is hereby authorized, upon the payment to him of fifty cents per acre, for each acre in area embraced within the boundaries of the lands proposed to be prospected and under such rules and regulations as he may prescribe, to grant to any person or association of persons who are residents of the State of California and citizens of the United States or who have declared their intention of becoming such, or corporations ninety per cent of whose stockholders are citizens of the United States a prospecting permit, which shall give the exclusive right, for a period not exceeding two years, to prospect for oil or gas, upon not exceeding six hundred forty acres of land wherein such deposits of oil or gas belong to the state and are not within any known geological structure of a producing oil or gas field, upon condition that the permittee shall begin drilling operations within six months from the date of the permit, and shall within one year from and after the date of the permit, drill one or more wells for oil or gas to a depth of not less than one thousand feet each, unless valuable deposits of oil or gas shall be sooner discovered, and shall, within two years from date of the permit, drill for oil or gas to an aggregate depth of not less than two thousand feet unless valuable deposits of oil or gas shall be sooner discovered. The surveyor general may, if he shall find that the permittee has been unable with the exercise of diligence to test the land

³ Id.

in the time granted by the permit, extend any such permit for such time, not exceeding two years, and upon such conditions as he shall prescribe. Whether the lands sought in any such application and permit are surveyed or unsurveyed the applicant shall, prior to filing his application for permit, locate such land in a reasonably compact form and according to the legal subdivisions of the public land surveys if the land be surveyed; and in an approximately square or rectangular tract, if the land be an unsurveyed tract, the length of which shall not exceed two and one-half times its width; the land to be surveyed by the surveyor general at the expense of the applicant for the permit in such form as the surveyor general shall deem to be to the best interest of the state; *provided, however*, that in case of prospecting permits and leases to river beds, lake beds, overflowed, tide and submerged lands, the width or length of the prospecting permit or lease along the shore line, measured on an east and west or north and south line, shall not exceed one-quarter mile. If the applicant shall cause to be erected upon the land for which a permit is sought a monument not less than four feet high, at some conspicuous place thereon, and shall post a notice in writing on or near said monument, stating that an application for permit will be made within thirty days after the date of posting said notice, giving the name of the applicant, the date of the notice, and such a general description of the land to be covered by such permit by reference to courses and distances from such monument and such other natural objects and permanent monument as will reasonably identify the land, stating the amount thereof in acres, he shall during the period of thirty days following such marking and posting, be entitled to a preference right over others to a permit for the land so identified; *provided, however*, that applicant shall, as a part of his application for a permit, show that within two days after the posting of the said notice, he recorded a copy of the same in the county recorder's office of the county in which the said land is situated. The applicant shall, within ninety days after receiving a permit, mark each of the corners of the tract described in the permit upon the ground with substantial monuments, so that the boundaries can be readily traced on the ground, and shall post in a conspicuous place upon the lands a notice that such permit has been granted and a description of the lands covered thereby; *provided, however*, that where the boundaries of the land sought to be prospected or developed under lease are wholly or partially in river or lake beds, overflowed, tide and submerged lands, the notice shall be conspicuously posted on a monument as close to a corner of the land as possible and shall specifically describe the area to be developed by courses and distances so that the limits of the area can be easily determined; *provided further, however*, that in no case shall permits or leases be granted covering tide, overflowed or submerged lands fronting on an incorporated city, or for a distance of one mile on either side thereof; *provided further, however*, that in case of an application for a permit or a lease covering tide, overflowed or submerged land by anyone other than the littoral or riparian proprietor, said littoral or riparian proprietor shall have six months within which to file an application for a permit or lease, but if said littoral or riparian proprietor fails to comply with the requirements of this act and its rules and regulations made in pursuance hereof, his preferential rights shall

thereupon cease and forever be terminated, and the original applicant shall be permitted to proceed with his application.⁴

§ 5. Leases.

Upon establishing to the satisfaction of the surveyor general that valuable deposits of oil or gas have been discovered within the limits of the land embraced in any permit, the permittee shall be entitled to a lease for one-fourth of the land embraced in the prospecting permit; *provided*, that the permittee shall be granted a lease for as much as one hundred sixty acres of said lands, if there be that number of acres within the permit. The area to be selected by the permittee shall be in compact form and if surveyed, to be described by the legal subdivision of the public land surveys; if unsurveyed, to be surveyed by the surveyor general at the expense of the applicant for lease in accordance with the rules and regulations to be prescribed by the surveyor general, and the lands leased shall be conformed to and taken in accordance with the legal subdivisions of such surveys; deposits made to cover expense of survey shall be deemed appropriated for that purpose, and any excess deposit may be repaid to the person or persons making such deposits or their legal representative. Such lease shall be for a term of twenty years upon a royalty of five per centum in amount or value of the production and the annual payment in advance of a rental of one dollar per acre, the rental paid for any one year to be credited against the royalties as they accrue for that year, with the right of renewal as prescribed in section eight hereof. The permittee shall also be entitled to a preference right to a lease for the remainder of the land in his prospecting permit at a royalty of not less than twelve and one-half per centum in amount or value of the production, and under such other conditions as are fixed for oil or gas leases in this act, the bonus and royalty to be determined by competitive bidding or fixed by such other method as the surveyor general may by regulations prescribe; *provided*, that the surveyor general shall have the right to reject any and all bids.

⁴In the case cited in note 2 *supra*, it was sought by writ of mandate to compel the surveyor general of the state to issue to petitioner for the writ a prospecting permit for oil upon the grounds of the Norwalk State Hospital for the insane at Norwalk, California. The application was based upon section 1 of the State Oil Leasing Act. The court said: that that officer was without authority to grant the permit. It also appears that the petitioner for the writ insisted that the "provisions of Sec. 3 of the Oil Leasing Act by which the surveyor general is not only authorized to classify the land of the state for its different possible values and uses but is also authorized to require the state mineralogist, the director of agriculture or other organization, agency or institution of the state government to make such classification is an indication that the statute was intended to be applicable to all lands owned by the state. The very general provisions of this section do not point with any clearness to the construction that lands of the state purchased for the purposes of the state and devoted to such purposes, are intended to be subject to sale or exploitation under the terms of the act.

"The legislators who passed this statute would undoubtedly be astonished to find an oil derrick erected upon the state capitol grounds under the authority vested in the surveyor general of the state by this statute and no doubt would be equally surprised to see noisy oil well drilling outfits invade the grounds of hospitals for the insane where peace and quiet are so essential to proper treatment and recovery of the patients.

"The statute expressly mentions river beds, lake beds, overflowed, tide, and submerged lands as subject to the issuance of prospecting permits (§ 4, Stats. 1921, p. 405), and also reserves 1/16 only of the mineral rights in state lands sold by the state (§ 10). We can not see that these provisions concerning lands held by the state by virtue of its sovereignty, and its public lands offered for sale under its public land laws, shed any light upon the question as to whether or not the statute was intended to apply to such lands already devoted to a public use."

§ 6. Royalty.

Until the permittee shall apply for lease to the one-quarter of the permit area heretofore provided for he shall pay to the State of California twenty per centum of the gross value of all oil or gas secured by him from the lands embraced within his permit and sold or otherwise disposed of, or held by him for sale or other disposition.

§ 7. Conditions. Prevention of Waste.

All permits and leases of lands containing oil or gas, made or issued under the provisions of this act, shall be subject to the condition that no wells shall be drilled within two hundred feet of any of the outer boundaries of the lands so permitted or leased, unless the adjoining lands have been patented or the title thereto otherwise vested in private owners, and to the further condition that the permittee or lessee will, in conducting his explorations and mining operations, use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by him to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits. Violations of the provisions of this section shall constitute grounds for the forfeiture of the permit or lease, to be enforced through appropriate proceedings in courts of competent jurisdiction.

§ 8. Competitive Bidding. Bonus. Terms of Lease.

All unappropriated deposits of oil or gas situated within the known geologic structure of a producing oil or gas field and the unentered lands containing the same not subject to preferential lease, may be leased by the surveyor general to the highest responsible bidder by competitive bidding under general regulations to qualified applicants in areas not exceeding six hundred forty acres and in tracts which shall not exceed in length two and one-half times the width, the surveyed land to be leased according to legal subdivisions, the unsurveyed land to be surveyed by the surveyor general, at the expense of the lessee, in such form as the surveyor general shall deem to be to the best interest of the state; *provided, however*, that in case of leases to river bed, lake bed, overflowed, tide and submerged lands, the width or length of the lease along the shore line, measured on an east and west or north and south line, shall not exceed one-quarter mile, such leases to be conditioned upon the payment by the lessee of such bonus as may be accepted and of such royalty as may be fixed in the lease, which shall not be less than twelve and one-half per centum in amount or value of the production, and the payment in advance of a rental of not less than one dollar per acre per annum thereafter during the continuance of the lease, the rental paid for any one year to be credited against the royalties as they accrue for that year. Leases shall be for a period of twenty years, with the preferential right in the lessee to renew the same for successive periods of ten years upon such reasonable terms and conditions as may be prescribed by the surveyor general, unless otherwise provided by law at the time of the expiration of such periods.

Whenever the average daily production of any oil well shall not exceed ten barrels per day, the surveyor general is authorized to reduce

the royalty on future production when in his judgment the wells can not be successfully operated upon the royalty fixed in the lease. The provisions of this paragraph shall apply to all oil and gas leases made under this act.

§ 9. Prospecting and Leasing of Other Minerals.

The right to prospect, and lease lands containing any other minerals shall be acquired in a similar manner as the right to prospect for and develop oil and gas, under such reasonable and proper rules and regulations, as the surveyor general shall from time to time prescribe.

§ 10. Sale or Lease of Mineral Deposits by Purchaser from State Permitted, Provisos.

For the purpose, however, of promoting the sale of state land, and the more active cooperation of the owner of the soil, and to facilitate the development of its mineral resources the state hereby constitutes the purchaser of the soil, its agent for the purposes herein named and in consideration hereof, relinquishes to and vests in the purchaser of state lands an undivided fifteen-sixteenths of all oil and gas and the value of the same that may be upon or within any state land purchased after the passage of this act. The purchaser of the soil is hereby authorized to sell or lease to any person, firm or corporation the oil and gas and other minerals that may be thereon or therein upon such terms and conditions as such purchaser and owner may deem best, subject, however, to the provisions of this act and the reservations herein contained; *and provided, further*, that the lessee or purchaser shall in every case pay to the state an undivided one-sixteenth of the mineral produced or the value thereof at the well or mine as may be determined by the surveyor general; *provided further, however*, that upon the discovery of oil or gas in paying quantities on adjoining lands the purchaser shall within three months thereafter begin or cause to be started the drilling of a well upon his land, which drilling shall be continuous, as may be provided for by appropriate rules and regulations, prescribed by the surveyor general.⁵

§ 11. Cancellation of Prospecting Permit or Lease.

The surveyor general shall reserve and may exercise the authority to cancel any prospecting permit or lease upon failure by the permittee to exercise due diligence and care in the prosecution of the prospecting work in accordance with the terms and conditions stated in the permit or lease and shall insert in every such permit or lease issued under the provisions of this act appropriate provisions for its cancellation by him.

§ 12. Limitation of Permits and Leases.

No person, association or corporation, shall take or hold, under the terms of this act, more than one oil or gas permit or lease; no corporation shall hold any interest as a stockholder of another corporation in more than one lease and no person or corporation shall take or hold any interest or interests as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease

⁵ See note 4, *supra*.

under the provisions hereof, which, together with the area embraced in any direct holding of a lease, under this act, or which, together with any other interest or interests as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease under the provisions hereof, for any kind of mineral leased hereunder, exceeds in the aggregate an amount equivalent to the maximum number of acres of the respective kind of minerals allowed to any one lessee under this act. Any interest held in violation of this act shall be forfeited to the State of California by appropriate proceedings for that purpose in the superior court for the county in which the property, or some part thereof, is located, except that any ownership or interest forbidden in this act which may be acquired by descent, will, judgment, or decree may be held for two years and not longer after its acquisition; *provided*, that nothing herein contained shall be construed to limit or to prevent any number of lessees under the provisions of this act from combining their several interests so far as may be necessary for the purposes of constructing and carrying on the business of a refinery, or of establishing and constructing as a common carrier a pipe line or lines of railroads to be operated and used by them jointly in the transportation of oil from their several wells, or from the wells of other lessees under this act, or the transportation of coal; *provided, further*, that if any of the lands or deposits leased under the provisions of this act shall be subleased, trusteeed, possessed, or controlled by any device permanently, temporarily, directly, indirectly, tacitly, or in any manner whatsoever, so that they form part of, or are in any wise controlled by any combination in the form of an unlawful trust, with consent of lessee, or form the subject of any contract or conspiracy in restraint of trade in the mining or selling of coal, phosphate, oil, oil shale, gas, or sodium entered into by the lessee, or any agreement or understanding, written, verbal, or otherwise to which such lessee shall be a party, of which his or its output is to be or become the subject, to control the price or prices thereof or of any holding of such lands by any individual, partnership, association, corporation, or control in excess of the amounts of lands provided in this act, the lease thereof shall be forfeited by appropriate court proceedings.

§ 13. Rights of Way for Pipe Lines. Eminent Domain.

Rights of way through all state lands are hereby granted for pipeline purposes for the transportation of oil or natural gas to any applicant possessing the qualifications provided in section four of this act, to the extent of the ground occupied by the said pipe line and twenty-five feet on each side of the same under such regulations as to survey, location, application, and use as may be prescribed by the surveyor general and upon the express condition that such pipe line shall be constructed, operated, and maintained as common carriers; *provided*, that the surveyor general shall in express terms reserve and shall provide in every lease of oil lands hereunder that the lessee, assignee, or beneficiary, if owner or operator or owner of a controlling interest in any pipe line or of any company operating the same which may be operated accessible to the oil derived from lands under such lease, shall at reasonable rates and without discrimination accept and convey the oil of the state or of any citizen or company not the owner of any pipe line,

operating a lease or purchasing gas or oil under the provisions of this act; *provided*, that no right of way shall hereafter be granted over said lands for the transportation of oil or natural gas except under and subject to the provisions, limitations, and conditions of this section. Failure to comply with the provisions of this section or the regulations prescribed by the surveyor general shall be ground for forfeiture of the grant by appropriate proceedings prosecuted in the superior court for the county in which the property, or some part thereof, is located; *and provided, further*, that all of the rights and privileges as are now, or as may hereafter be provided by law, respecting the acquisition of rights of ingress, egress and regress over the property of another, by proceedings in eminent domain, are hereby expressly given to a permittee or lessee so that such permittee or lessee may carry on the operations contemplated under the terms of this act.

§ 14. Easements.

Any permit, lease, occupation, or use permitted under this act shall reserve to the surveyor general the right to permit upon such terms as he may determine to be just, for joint or several use, such easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in this act, and the treatment and shipment of the products thereof by or under authority of the state, its lessees, or permittees, and for other public purposes; *provided*, that said surveyor general, in his discretion, in making any lease under this act, may reserve to the state the right to lease, sell, or otherwise dispose of the surface of the lands embraced within such lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for use of the lessee in extracting and removing the deposits therein; *provided, further*, that if such reservation is made it shall be so determined before the offering of such lease; *and provided, further*, that the said surveyor general, during the life of the lease, is authorized to issue such permits for easements herein provided to be reserved.

§ 15. Assignment and Subletting of Lease. Relinquishment of Lease. Lease Must Contain Certain Provisions. Age and Sex of Employees. When Wages Must Be Paid. Amplification of Provisions of Lease.

No lease issued under the authority of this act shall be assigned or sublet, except with the consent of the surveyor general. The lessee may, in the discretion of the surveyor general, be permitted at any time to make written relinquishment of all rights under such a lease and upon acceptance thereof be thereby relieved of all future obligations under said lease, and may with like consent surrender any legal subdivision of the area included within the lease. Each lease shall contain provisions for the purpose of insuring the exercise of reasonable diligence, skill, and care in the operation of said property; a provision that such rules for the safety and welfare of the miners and for the prevention of undue waste as may be prescribed by said surveyor general shall be observed, including a restriction of the workday to not exceeding eight hours in any one day for underground workers except in cases of emergency; provisions prohibiting the employment of any

boy under the age of sixteen or the employment of any girl or woman, without regard to age, in any mine below the surface; provisions securing the workmen complete freedom of purchase; provision requiring the payment of wages at least twice a month in lawful money of the United States, and providing proper rules and regulations to insure the fair and just weighing or measurement of the coal mined by each miner, and such other provisions as he may deem necessary to insure the sale of the production of such leased lands to the public at reasonable prices, for the protection of the interests of the state, for the prevention of monopoly, and for the safeguarding of the public welfare.

§ 16. Judicial Proceedings.

Any permit or lease issued under the provisions of this act may be forfeited and canceled by an appropriate proceeding in the superior court for the county in which the property, or some part thereof is located, whenever the lessee or permittee fails to comply with any of the provisions of the permit or the lease, or of the general regulations promulgated under this act and in force at the date of the lease or permit; and the lease may provide for resort to appropriate methods for the settlement of disputes or for remedies for breach of specified conditions thereof.

§ 17. Trespass.

Any person, or association of persons, corporate or otherwise, who enters or has entered upon any land or lands coming under the provisions of this act, and who is holding, or attempting to hold or develop, any such land, is guilty of a trespass, and the claims being exerted are hereby declared to be null and void, and any property placed upon the said land is hereby declared forfeited to the state, and the surveyor general is hereby authorized and empowered to issue a prospector's permit or lease on the said land to any qualified claimant who shall comply with the provisions of this act after it becomes effective; *provided, however*, that the surveyor general may, and he is hereby expressly authorized and empowered to grant a lease, on a royalty of twelve and one-half per centum of the production, to any qualified person, or association of persons, corporate or otherwise, who shall apply therefor within three months after the passage of this act, and who, at least six months prior to the passage of this act, was operating a producing well or wells, or who was drilling the same, or actually mining for or otherwise developing the mineral products on the said area of lands; *provided, further, however*, that in case of such a lease the area shall be limited to that which is necessary for the operation of the wells or mines, and the surveyor general shall have the right to call for competitive bids for the lease or leases upon the surrounding area of land as hereinbefore provided for.

§ 18. Rules and Regulations. Boundary Lines.

The surveyor general of the state is authorized to prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of this act, also to fix and determine the boundary lines of any structure, or oil or gas field, for the purpose of this act.

§ 19. Disposition of Funds.

All moneys received by the surveyor general under the provisions of this act from rents, fees, bonuses and royalties accruing from the use of state school land shall be paid into the "school fund," all other moneys received under the provisions of this act shall be deposited in the "general fund."

§ 20. Appropriation for Administrative Purposes.

For the purposes of administering this act, there is hereby appropriated out of any money in the state treasury, not otherwise appropriated, the sum of ten thousand dollars to be expended by the surveyor general, and the state controller is directed to draw his warrant in favor of the person or persons entitled to the same, upon demand of the surveyor general approved by the board of control, and the state treasurer is directed to pay the same.

§ 21. Unconstitutional Provisions.

If any section, subsection, sentence, clause or phrase of this act is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this act. The legislature hereby declares that it would have passed this act, and each section, subsection, sentence, clause and phrase thereof, irrespective of the fact that any one or more other sections, subsections, sentences, clauses or phrases be declared unconstitutional.

§ 22. Repeal of Acts.

All acts and parts of acts, inconsistent herewith, are hereby repealed.



APPENDIX TO PART VI.

**RULES AND REGULATIONS CONCERNING OIL AND GAS
PERMITS AND LEASES (INCLUDING PENALTIES AND
RESTRICTIONS) AND ALSO PERMITS AND LEASES
TO DEVELOP OTHER MINERALS.**

Authorized by act of May 25, 1921, chapter 303 of the Statutes of 1921 (Statutes and Amendments, 1921, p. 404). Approved January 25, 1922.

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OFFICE OF THE SURVEYOR GENERAL OF THE
STATE OF CALIFORNIA,
SACRAMENTO, CALIFORNIA.

Under the authority of the act of the state legislature, approved May 26, 1921, entitled "An act to reserve all minerals in state lands; to provide for examination, classification and report on the mineral and other character of state lands; to provide for the granting of permits and leases to prospect for and take any such minerals; to provide for the rents and royalties to be paid, and granting certain preference rights; to provide for the making of rules, regulations and contracts necessary to carry out the purposes of this act; and repealing acts or parts of acts in conflict herewith; providing for an appropriation to defray the cost of administering this act," the following rules and regulations are prescribed for the administration of the provisions of such act.

DIVISION I.

General Provisions.

Section 1 of the act provides: That all coal, oil, oil shale, gas, phosphate, sodium, and other mineral deposits in lands belonging to the state, or which may become the property of the state, are reserved to the state, *except* such lands as were acquired by the state on a sale of delinquent taxes, unless the land is of the class, the deed for which is required to be filed in the office of the Surveyor General.

Article 1. Lands to Which the Act Applies.

- (a) All lands now owned by the state.
- (b) Lands which may become the property of the state, except as hereinafter described in subdivision (c) of this article.
- (c) The act *does not* apply to lands acquired by the state on a delinquent tax sale, the deed to which must be filed in the office of the State Controller.
- (d) All mineral deposits in such lands are reserved from sale except on a rental or royalty basis as herein provided for.

Article 2. Title to Deposits on State Lands.

(a) From the date upon which the act became effective (midnight July 28, 1921), no right, title, or interest can be acquired in or to the deposits as enumerated in section 1 of the act by any purchaser of lands belonging to the state, except as provided under the terms of the act as more specifically set out in sections 2 and 10 hereof.

Article 3. Rights of Purchasers of State Land.

(a) Rights of all purchasers of state lands shall be subject to the reservation of all deposits enumerated in section 1 of the act and to the conditions and limitations prescribed by law for the state and persons authorized by it to prospect for and remove such deposits, and to occupy and use so much of the surface of said lands, which in the opinion of the Surveyor General, is necessary for such mining operations.

Section 2 of the act provides: That all applications to purchase, and the sale of state lands after July 28, 1921, shall contain a reservation to the state of one-sixteenth ($\frac{1}{16}$) of all coal, oil, gas, and other mineral deposits, as enumerated in section 1 of the act, in all such state land and all certificates of purchase and patents issued therefor shall contain such reservation.

Section 3 of the act provides: For the classification of all state lands by Surveyor General as to its different values and uses and the assistance to be rendered by other state officers for such classification.

DIVISION II.**Oil and Gas Permits.**

Section 4 of the act authorizes the Surveyor General to grant to a qualified applicant the exclusive right to prospect for oil or gas for a period not exceeding two years, unless extended under certain conditions hereinafter enumerated.

Article 4. Classification of Applicants.

Pursuant to this section of the act prospecting permits may be issued upon the payment of fifty cents per acre for each acre embraced within the boundaries of such permit, within ten days from date of notice by the Surveyor General that a permit will be granted, to

(a) Persons who are citizens of the United States, or who have declared their intention to become such and are at the same time residents of the State of California.

(b) Associations of such persons as enumerated in subdivision (a) of this article.

(c) Corporations ninety per cent of whose stockholders are citizens of the United States.

Article 5. Lands to Which Permit Is Applicable.

(a) Permits thus issued may not include more than six hundred forty acres of land wherein such deposits of oil or gas belonging to the state **are not within any known geologic structure of a producing oil or gas field**, such field to consist of proved oil land. Proved oil land is that land which is determined, by the records of oil produced therefrom supported by geologic data, to be capable of yielding oil in paying quantities.

The proved oil and gas areas in the State of California are determined and mapped from year to year, as conditions of development and production change, by the engineering staff of the Department of Petroleum and Gas, of the State Mining Bureau, where such maps may be found.

(b) In the case of prospecting permits and leases to river beds, lake

beds, overflowed, tide, and submerged lands, the width, or length along the shore line shall not exceed one-fourth of a mile along a north and south or east and west line, and the side lines must be run at right angles to the shore line.

(c) The land applied for must be taken in a reasonably compact tract, rectangular in form, conforming to legal subdivisions if in surveyed territory, and in a compact square or rectangular tract if in unsurveyed territory, or in territory consisting of swamp and overflowed lands, and such rectangular tract shall be laid out according to the plan of the federal surveys, *i. e.*, boundaries being run north and south or east and west. The length of such tract must not exceed two and one-half times its width, except as provided for in subdivision (d) of this article.

(d) Incontiguous tracts within a limited radius may be included in a permit when conditions are such that because of prior disposals, a reasonable area in compact form of contiguous land can not be procured.

(e) Such permits shall not be granted covering tide, overflowed, or submerged land fronting on an incorporated city, or for a distance of one mile on either side thereof.

(f) If in unsurveyed territory, the Surveyor General may survey the land at the expense of the applicant, if deemed necessary.

Article 6. Extension of Life of Permit.

(a) If for any good reason the permittee is unable with the exercise of diligence to test the land in the time granted by the permit, the Surveyor General may extend such permit for such time, not exceeding two years and upon such conditions as he shall prescribe.

Article 7. Preference Rights and How Secured.

Preference right over other applicants to a permit may be obtained under this section for thirty days by:

(a) Erecting upon the land described, subsequent to the approval of the act, a monument not less than four feet high and four inches square, or four inches in diameter, at some conspicuous place thereon so as to be visible to any one who may be interested and post a notice in writing on or near said monument stating:

(1) That application for permit will be made within thirty days after the date of posting of said notice; (2) Name of applicant; (3) Date and hour of posting; (4) Such general description of the land to be covered by the permit by reference to courses and distances from said monument and such other natural objects and permanent monument as will reasonably identify the land; (5) Number of acres contained in said land.

(b) In case of simultaneous posting of notice, priority shall be decided by a method prescribed by the Surveyor General, unless an agreement shall be previously determined by the applicants.

(c) The littoral or riparian proprietor of tide, overflowed, or submerged lands shall have six months within which to file an application after service of notice of the filing of an application for a permit by some one other than such littoral or riparian owner, but if such riparian owner fails to comply with the requirements of the act within the said six months, his preference rights shall thereupon cease and forever be

terminated and the original applicant shall be permitted to proceed with his application. No particular wording is required in the notice.

(d) The service upon such littoral owner shall be a personal service of the notice when such owner is within the state, showing that the applicant has applied for a permit, together with a copy of the application. When such owner is not within the state, service shall be made by publication at least once a week for four successive weeks in a newspaper of general circulation published in the county in which the land is located, and such publication shall consist of the notice and application. A copy of said publication at the expiration of the four weeks of publication shall be placed in the United States post office with proper postage affixed and addressed to such owner at his last known address.

(e) When no newspaper is published in the county in which the property is located, as provided for in subdivision (d) of this article, then such notice may be published in a newspaper of wide circulation published in an adjoining county in which such property is located.

(f) The personal service, as required by subsection (d) of this article shall be made within ten days after the date of notice of acceptance by the Surveyor General of said application, and such aforesaid publication must be commenced in the first issue of said newspaper subsequent to ten days from date of acceptance by the Surveyor General of the application. The said ten days shall be computed by excluding the first day and including the last day, unless the last day be a holiday, then it is also excluded.

(g) Upon being granted the permit, said littoral owner is barred by section 12 of the act from obtaining any other permit, except as therein provided, regardless of the total acreage held by such littoral owner.

(h) When service is by publication the affidavit of the printer, or his foreman, annexed to a copy of the notice specifying the times when and the paper in which the publication was made, and an affidavit of deposit of such publication in the United States post office, or when by personal service, the affidavit of service must be filed with the Surveyor General within ten days after the last date of publication, or date of personal service.

Article 8. Form and Contents of Application.

(a) Application, together with the fee of \$5, must be filed with the State Surveyor General, who will suspend action upon said application for a period of thirty days to enable preference right claims to be presented.

(b) No specific form of application is required but such applications must cover in substance the following points:

1. If a person, applicant's name and address.
2. Proof of citizenship of the applicant, if native born, or a certified copy of certificate of naturalization, or notice of intention of becoming a citizen, together with proof of residence in the State of California.
3. If a corporation, by a certified copy of its articles of incorporation and proof of citizenship of ninety per cent of its stockholders.
4. A statement that the applicant is not the holder or in any way interested in any other permit to prospect for minerals on state lands, except as is more specifically set out in section 12, article 17, subdivision (c) of these rules and regulations.

5. Description of land for which the permit or lease is desired, described by legal subdivisions, if in surveyed territory, and by metes and bounds, if in unsurveyed territory. The beginning point of the description of the lands for which said permit or lease is desired must be connected with some record survey by courses and distances. The land may be surveyed by the Surveyor General at the expense of the applicant should the Surveyor General deem it necessary.

6. A statement that to the best of the applicant's knowledge and belief the land applied for is **not within any known geologic structure of a producing gas or oil field**. See article 5, subdivision (a).

7. Three references to applicant's reputation and business standing.

8. The applicant must furnish a bond with qualified corporate surety in the sum of one thousand dollars (\$1,000) conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation. This bond must be filed with the application, or within ten days after receipt of notice by the applicant that the permit will be granted upon filing of the bond. No particular form of bond is required beyond a good and sufficient surety.

9. A statement that within two days after posting the required notice, as set forth in article 7 of this section, the applicant had recorded a copy of same in the county recorder's office of the county in which said land is situated, substantiated by recorder's affidavit.

10. A statement giving the name and address of the principal place of business of all associations interested in oil lands in California of which the applicant is a member and all corporations interested in oil lands in California in which the applicant is a stockholder.

(c) An application made in good faith prior to the adoption of these rules and regulations not in conformity thereto may be amended to properly meet the requirements of such rules and regulations, but no such amendment shall embrace any material increase in area or change in boundaries, unless no preference right application for such increase has been filed.

Article 9. Form and Requirements of Permit.

(a) A permit will confer upon the recipient the exclusive right for a period not exceeding two years to prospect for oil and gas upon the lands embraced therein, provided he complies with the terms thereof, which permit will be on a form prepared by the Surveyor General.

(b) The permittee must begin drilling operations within six months from the date of the permit.

(c) The permittee shall within one year from such date drill one or more wells to a depth of one thousand feet each, unless valuable deposits of gas or oil shall have been sooner discovered.

(d) The permittee shall within two years from the date of the permit drill for oil or gas to an aggregate depth of not less than two thousand feet, each of the wells so commenced the first year, unless valuable deposits of gas or oil shall have been sooner discovered.

(e) The permittee shall within ninety days after receiving such permit, mark each corner of the tract described in the permit, except where corners are at inaccessible places.

(f) The permittee shall post a notice on a conspicuous place upon the lands stating that such permit has been granted and also containing a description of the land covered thereby.

(g) Where boundaries are wholly or partially in river or lake beds, overflowed, tide and submerged lands, the notice shall be posted in a conspicuous place on a monument as close to a corner of the land as possible, and shall describe the area by courses and distances so that the limits of the area can be easily determined.

(h) The permit issued under the terms of the act shall be on a form prepared by the Surveyor General and will include the provisions enumerated in the several sections of the act.

(i) No permit issued under the authority of the act shall be assigned or sublet.

DIVISION III.

Oil and Gas Leases.

Section 5 of the act provides: That the permittee shall be rewarded for the discovery of mineral.

Article 10. Reward for the Discovery of Mineral.

Upon establishing to the satisfaction of the Surveyor General that valuable deposits of oil or gas have been discovered within the limits of the lands embraced in the permit, within the period of the permit, or extension thereof, the permittee is entitled to:

(a) A lease for one-fourth of the land included in the permit, or for as much as one hundred sixty acres, if there be that area in the permit, for a term of twenty years upon a royalty of five per cent in amount or value of the product at the option of the Surveyor General, and the annual payment in advance of a rental of one dollar per acre to be credited against the royalties as they may accrue for that year with the right of renewal, as prescribed in section 8 of the act.

(b) Preference right to a lease for the remainder of the land covered by this prospecting permit at such royalties as may be determined by competitive bidding or fixed by such other methods as the Surveyor General may by regulations prescribe, but in no case less than twelve and one-half per cent in amount or value of the production. The Surveyor General shall reserve the right to reject any and all bids.

Section 6 of the act provides: That until the permittee shall apply for lease to the one-quarter of the permit area, he shall pay to the State of California a royalty of twenty per cent of the gross value of the oil or gas secured by him from the lands embraced within the permit.

Article 11. Continuity of Production.

(a) After discovery of oil or gas by permittee, all production operations must be continuous and at full capacity, unless permission be given by the Surveyor General for interruption or discontinuance of such operation.

(b) Until such time as permittee shall apply for a lease under the provisions of section 5, he shall pay to the state a royalty of twenty per cent of the gross value at the well of all oil or gas secured from the land embraced in his permit.

Section 7 of the act provides: For the conditions under which wells may be drilled.

Article 12. Drilling Restrictions.

(a) All permits and leases of lands containing oil or gas shall be subject to the conditions that no well shall be drilled within two hundred feet of the outer boundary of such lands, unless the adjacent lands have been patented or title otherwise vested in private owners.

(b) Permittee or lessee shall use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by him to the oil sands, or oil-bearing strata in accordance with existing statutes covering the protection of oil- and gas-bearing formations from damage from infiltrating water and other causes, and also existing statutes relating to the protection of fish and game.

(c) Operations by the permittee or lessee shall be at all times under the supervision of the State Oil and Gas Supervisor working under the direction of the Surveyor General.

(d) Violations of the provisions of this section shall constitute grounds for the forfeiture of the permit or lease.

(e) Upon being granted a lease, the lessee shall drill to production or to a depth of not less than two thousand feet at least one well the first four years of the life of the lease for each forty acres or fraction thereof in the tract so leased, up to and including one hundred sixty acres, and for acreage greater than one hundred sixty acres, additional wells must be drilled at such a rate that before the expiration of twelve years there shall be at least one well drilled to production or to a depth of not less than two thousand feet for each forty acres or fraction thereof in the tract so leased, unless permission shall be given in writing by the Surveyor General to drill a lesser number of wells or any well or wells to a depth less than two thousand feet.

(f) In the case of leases to river beds, lake beds, tide and submerged lands, the lessee shall drill to production or to a depth of not less than two thousand feet at least one well the first four years of the life of the lease for each ten acres or fraction thereof in the tract so leased, up to and including forty acres and for acreage greater than forty acres, additional wells must be drilled at such a rate that before the expiration of twelve years there shall be at least one well drilled to production or to a depth of not less than two thousand feet for each ten acres or fraction thereof in the tract so leased, unless permission shall be given in writing by the Surveyor General to drill a lesser number of wells or any well or wells to a depth less than two thousand feet.

(g) In the case of parties enumerated in section 17 of the act, no new wells will be required where the aggregate number of operating wells, or those in course of drilling shall equal the maximum number required by subdivisions (e) and (f) of this **article**, but the operation of wells equal in number to such required maximum number of wells must be contiguous.

(h) The lessee shall, within three months from the delivery of the executed lease, commence drilling at least one well and to continue such drilling with reasonable diligence to production or to a depth of at least two thousand feet.

(i) The applicant for a lease must furnish a bond conditioned upon compliance with the terms of the lease.

Section 8 of the act provides: For the leasing by the Surveyor General of all unappropriated deposits of oil and gas situated **within the known geologic structure of a producing oil or gas field** and the unentered lands containing the same not subject to preference lease, to the highest responsible bidder by competitive bidding. This section also authorizes the Surveyor General to reduce the royalty when the average daily production of any oil well does not exceed ten barrels per day.

Article 13. Conditions for Applications for and Restrictions in Leases.

(a) The area applied for shall not exceed six hundred forty acres and must be leased according to legal subdivisions, if surveyed lands, in tracts which shall not exceed in length two and one-half times its width.

(b) If unsurveyed lands, the tracts shall be of such form as the Surveyor General may deem to be to the best interest of the state and may be surveyed by him at the expense of the lessee.

(c) In the case of a lease to river beds, lake beds, overflowed, tide and submerged lands, the length along the shore line shall not exceed one-quarter of a mile, measured on a north and south or east and west line, the side lines to be at right angles to the shore line.

(d) The lessee shall pay such bonus (either cash or a percentage of the production in value or amount as determined by the Surveyor General) as may be accepted and such royalty as may be fixed in the lease, such royalty being decided by competitive bidding, but which shall not be less than twelve and one-half per cent in amount or value of the production and the payment in advance of a rental of one dollar per acre per annum during the continuance of the lease to be credited against royalties accrued for that year.

(e) All competitive bidding shall take place at such time and place as the Surveyor General may specify by advertising in a paper of general circulation published in the county in which the land is located, for a period of thirty days next preceding the date of sale.

(f) The lease shall be for a period of twenty years with a preference right to renew the same for successive periods of ten years upon such terms as the Surveyor General may prescribe.

(g) When the average daily production of any oil well shall not exceed ten barrels per day, then the lessee may apply for a reduction in royalty, and the Surveyor General is authorized to reduce the fixed royalty, if in his judgment the well can not be successfully operated at said fixed royalty.

(h) The applicant for a lease must furnish a bond conditioned upon compliance with the terms of the lease.

Section 9 of the act provides: For leasing state lands containing minerals other than oil and gas.

Article 14. Permits or Leases of Lands Containing Other Minerals.

(a) The right to prospect and lease land containing any other minerals besides oil and gas may be acquired in a similar manner as the right to prospect and develop oil and gas under such reasonable and proper rules and regulations as the Surveyor General may prescribe.

(b) The granting of a permit or lease for the development or produc-

tion of oil or gas will not preclude other permits or leases for the same land for the mining of other minerals under the act with suitable stipulation for such joint operations to the end that full development of the mineral resources may be secured.

Section 10 of the act provides: For permitting the sale of state land and development of its mineral resources by relinquishing to the purchaser fifteen-sixteenths of all oil and gas upon such lands.

Article 15. Aid in Developing Mineral Deposits.

(a) A purchaser of state lands, as agent of the state, is authorized under this act to sell or lease to any person or corporation the minerals upon such terms and conditions as such purchaser and owner may deem best, subject to the restrictions and reservations of the act.

(b) The purchaser, or lessee under the purchaser, in every case must pay to the state one-sixteenth of the value at the mine, as determined by the Surveyor General, of all minerals produced upon such lands.

(c) The state under the authority of the act, in order to promote the development of its mineral resources and as consideration of the purchaser acting as agent for the state, vests in the purchaser an undivided fifteen-sixteenths ($\frac{15}{16}$) of all oil and gas in or upon such land.

(d) Upon discovery of oil or gas in paying quantities upon adjacent lands, the purchaser shall within three months thereafter begin drilling a well upon his land, which drilling shall be continuous, as provided in these rules and regulations.

(e) There shall be incorporated in every certificate of purchase for state lands a reservation that said purchaser shall immediately upon entering into any leases or permits for the development of any minerals upon said land, file copies of such leases, permits, or agreements in the office of the Surveyor General within ten days after entering into any such permits, leases, or agreements.

Section 11 of the act provides: The penalty for the lack of due diligence and care in the prosecution of the prospecting and development work in accordance with the terms of the permit or lease.

Article 16. Cancellation of Permits and Leases for the Lack of Due Diligence.

(a) The Surveyor General shall reserve and exercise the authority to cancel any permit or lease upon the failure of the permittee or lessee to exercise due diligence and care in the prosecution of the prospecting and development work in accordance with the terms of the permit or lease and the Surveyor General shall be the sole judge of such diligence and care.

(b) The Surveyor General shall and will insert in every such permit and lease issued under the terms of the act appropriate provisions for such cancellation by him.

Section 12 of the act provides: For the restrictions placed upon various lessees as to the acreage they may lease.

Article 17. Restrictions as to Number of Leases.

(a) No person, association, or corporation shall take or hold under the terms of the act more than one oil or gas permit or lease at one time.

(b) No corporation as a stockholder in any other corporation shall hold any interest in more than one lease at the same time.

(c) No person or corporation shall take or hold any interest or interests as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease under the provisions hereof, which, together with the area embraced in any lease already directly held by him or it for any of the minerals enumerated under section 1 of the act, in the aggregate equal an amount equivalent to the maximum acreage obtainable under the act, *i. e.*, no acreage held under this subdivision can exceed six hundred forty acres.

(d) Any interest held in violation of the act shall be forfeited to the state by appropriate proceedings for that purpose in the superior court of the county in which the property or some part thereof is located.

(e) Interests forbidden by the act which may be acquired by descent, will, or judgment, may be held two years and not longer after the date of acquisition.

(f) Any number of lessees under the provisions of the act shall be permitted to combine their several interests for the purpose of carrying on the business of a refinery, or of establishing and constructing as a common carrier a pipe line or lines of railroads to be operated and used by them jointly in the transportation of oil or gas from their wells or from the wells of other lessees under the act.

(g) If any of the lands or deposits under the act shall be controlled by any combination, temporarily or permanently, as an unlawful trust, or any contract, or conspiracy in restraint of trade, the lease thereof shall be forfeited by appropriate proceedings in courts of competent jurisdiction.

DIVISION IV.

Rights of Way for Pipe Lines.

Section 13 of the act provides: For the granting of rights of way through state lands for pipe line purposes for the transportation of oil or gas to applicants having the qualifications provided in section 4 of the act.

Article 18. Rights of Way.

(a) Rights of way are granted under this section for pipe lines for the transportation of gas or oil as common carriers to any applicant qualifying under section 4 of the act to the extent of the ground occupied by said pipe line and twenty-five feet on each side of the same.

(b) The Surveyor General shall prescribe regulations as to survey, location, application and use for such grant.

(c) Every lease of oil land under the act shall provide that the lessee, assignee, or beneficiary, if the owner or operator, or owner of a controlling interest in any pipe line of a company operating the same, which may be operated accessible to the oil derived from the lands under such lease, shall at reasonable rates accept and convey the oil of the state, or of any citizen, or a company operating a lease or purchasing oil or gas under the act.

(d) No right of way shall hereafter be granted over said lands for the transportation of oil or gas except under and subject to the provisions, limitations and conditions of this section.

(e) Failure to comply with the provisions of this section or regulations of the Surveyor General shall be grounds for forfeiture of the grant by appropriate proceedings in courts of competent jurisdiction.

(f) All rights and privileges as are now or may hereafter be provided by law, by proceedings in eminent domain, are hereby given to the permittee or lessee in order that he may carry on the operations contemplated under the terms of the act.

Section 14 of the act provides: For joint and several use of certain easements in, upon, or through leased lands.

Article 19. Easements.

(a) All permits, leases, occupations, or uses permitted under the act shall contain reservations to the Surveyor General to permit, for joint or several use, such easements upon, through, or in the lands leased as may be necessary to the working of the same, or of other lands containing deposits enumerated in section 1 of the act and the treatment and shipment of the products thereof.

(b) The Surveyor General, in his discretion, may reserve in any lease under the act the right to lease, sell, or dispose of the surface of the lands embraced within such lease in so far as said surface is not necessary for the use of the lessee in removing the deposits therefrom.

(c) All such reservations must be determined upon before offering such lease.

(d) During the life of the lease, the Surveyor General is authorized to issue such permits for easements herein provided to be reserved.

DIVISION V.

Provisions of Leases and Permits.

Section 15 of the act provides: For the conditions under which leases may be assigned or sublet, and the various restrictions as to employment of workmen.

Article 20. Assignment of Leases.

(a) No lease issued under the authority of the act may be assigned without the consent of the Surveyor General, but the lessee may, in the discretion of the Surveyor General, be permitted to make a written relinquishment of all rights under such lease, or surrender any legal subdivision thereof, and upon acceptance of such relinquishment by the Surveyor General, be relieved from all future obligations under said act.

(b) Each lease shall contain provisions for:

1. Insuring the exercise of reasonable diligence, skill and care in the operation of the property.

2. For the safety and welfare of the miners and prevention of undue waste.

3. For a working day not exceeding eight hours in any one day for underground miners except in cases of emergency.

4. For prohibiting the employment of any boy under sixteen years of age or any girl or woman, without regard to age, in any mine below the surface.

5. For securing workmen complete freedom of purchase.

6. For requiring the payment of wages at least twice a month in lawful money of the United States.

7. For proper rules and regulations to insure the fair and just weighing or measurement of the coal mined by each miner.

8. For such other provisions as he may deem necessary to insure the sale of the production of such leased lands to the public at reasonable prices.

9. For the protection of the interests of the state.

10. For the prevention of monopoly.

11. For safeguarding the public welfare.

DIVISION VI.

Forfeiture and Trespass.

Section 16 of the act provides: For the forfeiture and cancellation of permits and leases.

Article 21. Forfeiture of Leases and Permits.

(a) Any permit or lease issued under the provisions of the act may be forfeited and canceled whenever the permittee or lessee fails to comply with any of the provisions of the permit or lease or the general regulations promulgated under the act.

(b) Lease may provide for resort to appropriate methods for the settlement of disputes or for remedies for breach of specified conditions thereof.

Section 17 of the act provides: Methods of dealing with parties who were already producing oil or gas on state lands prior to the passage of the act.

Article 22. Trespass.

(a) Any person, or association of persons, corporate or otherwise, who has entered upon and is holding or developing the lands coming under the provisions of the act is guilty of trespass and any property placed upon said land is hereby declared forfeit to the state.

(b) The Surveyor General is authorized and empowered to issue prospectors' permits or leases on said land to any qualified claimants who shall comply with the provisions of the act.

(c) The Surveyor General is empowered and authorized to grant a lease on a royalty of twelve and one-half per cent of the production to any qualified applicant, who within three months after the passage of the act, and who at least six months prior to the passage of the act, was operating a producing well or who was actually drilling the same or actually mining for or otherwise developing the mineral products on said area of lands.

(d) In such a lease, the area shall be limited to that which, in the opinion of the Surveyor General, is necessary for the operation of the wells or mines, and will be so fixed in the lease.

(e) The Surveyor General shall have the right to call for competitive bids for the lease or leases upon the surrounding area of the land as hereinbefore provided for.

(f) Such leases as are granted under this section shall be for a term of twenty years upon a royalty of twelve and one-half per cent in amount or value of the production at the option of the Surveyor General, and an annual payment, in advance, of a rental of one dollar per acre, the rental paid in any one year to be credited against the royalties as

they accrued for that year with the right of renewal, as prescribed in section 8 of the act.

(g) The applicant for a lease must furnish a bond conditioned upon compliance with the terms of the lease.

DIVISION VII.

Enabling Acts.

Section 18 of the act authorizes: The Surveyor General to prescribe the necessary rules and regulations and do the things necessary to carry out the purposes of the act.

Article 23. Authority for These Rules and Regulations.

(a) Under the authority of this section, the Surveyor General has prescribed the foregoing rules and regulations as his interpretation of the various sections of the act, which rules and regulations will be amended from time to time in the administration of the act as occasion may arise.

Section 19 of the act provides: For the distribution of all moneys received by the Surveyor General under the act.

Section 20 of the act authorizes: The appropriation of money from the state treasury for the purposes of administering the act.

Section 21 of the act relates: To the effect upon the act of any part of the act that may be declared unconstitutional.

Section 22 of the act relates: To the repeal of any acts which may be inconsistent with the act.

Approved by

W. S. KINGSBURY,

Surveyor General and ex officio
Register of the State Land Office.

Compiled by
CURTIS B. LOCKLIN,
Assistant to the Surveyor General,
and in charge of leases.



FORM No. 1.

PERMIT TO PROSPECT FOR OIL OR GAS UPON STATE LANDS.

Know all men by these presents, That the Surveyor General, under and by virtue of chapter 303, Statutes of California, 1921, entitled "An act to reserve all minerals in state lands, etc.," approved May 26, 1921, for and in consideration of the sum of \$-----, being fifty cents per acre, for each acre in area embraced within the boundaries of the lands proposed to be prospected, has granted and does hereby grant a permit to-----granting-----the exclusive right for two years from date hereof to prospect for oil or gas, but for no other purpose, the following described lands:-----upon the express conditions following:

1. To mark each of the corners of the claim within ninety days from date hereof with substantial monuments so that the boundaries can be readily traced on the ground, and post in a conspicuous place, upon the lands covered hereby, a notice that such permit has been granted, and a description of the lands covered by this permit.

2. Within six months from date hereof to install upon some portion of the lands a substantial and adequate drilling outfit and to commence actual drilling operations.

3. Within one year from date hereof to drill one or more wells, not less than six inches in diameter to a depth of at least one thousand feet each, unless valuable deposits of oil or gas shall be sooner discovered.

4. Within two years from date hereof to drill one or more wells to a depth of at least two thousand feet, unless valuable deposits of oil or gas shall be sooner discovered.

5. Not to drill any well within two hundred feet of any of the outer boundaries of the lands covered by this permit unless the adjoining lands have been patented or the title thereto otherwise vested in private owners.

6. To carry on all operations hereunder in accordance with approved methods and practice; to use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by permittees to the oil sands or oil-bearing strata to the destruction or injury of the oil deposits, and to carry out, at the expense of the permittee, all reasonable orders of the Surveyor General relative to prevention of waste and preservation of property, and to comply with such regulations as may be issued by the Surveyor General as to methods of operation.

7. To furnish and maintain during the period of this permit a bond with qualified corporate surety in the sum of one thousand dollars (\$1,000), conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation.

8. That this permit is granted upon the express condition that the right is reserved to the Surveyor General to permit upon such terms as he may determine to be just, for joint or several use, such easements or rights of way, including easements in tunnels upon, through, or in the lands covered thereby, as may be necessary or appropriate to the working of the same, or of other lands containing the deposits described in the act under which this permit is granted.

9. The granting of this permit shall not preclude the sale of the surface of any of the lands included therein, where such sale of the surface is made with a reservation of the mineral deposits to the State of California.

10. That until this permittee shall apply for a lease of one-quarter of the area included herein, he shall pay to the State of California twenty per cent of the gross value of all oil or gas secured by him from the lands and sold or otherwise disposed of, or held by him for sale or other disposition.

11. The Surveyor General reserves the right and authority to cancel this instrument for failure of the permittee to comply with any of the conditions enumerated herein or to exercise due diligence in the work of development, as provided for in section 11 of the act.

12. Valid rights existing at the date of this permit will not be affected thereby.

13. This permit is nonassignable.

Dated this _____ day of _____, 19____.

Surveyor General of the State of California.



FORM No. 2.

LEASE OF OIL AND GAS LANDS UNDER THE ACT OF
MAY 26, 1921.

Date. Parties. This indenture of lease entered into, in triplicate, this _____ day of _____ A. D. 19____ by and between the State of California, acting in this behalf by the Surveyor General, party of the first part, hereinafter called the lessor, and _____ of _____, party of the second part, hereinafter called the lessee, pursuant, and subject to the terms and provisions of chapter 303, Statutes of California, 1921, approved May 26, 1921, entitled "An act to reserve all minerals in state lands, etc.," hereinafter referred to as the act, which is made a part hereof, witnesseth:

SECTION 1. Purposes. That the lessor in consideration of rents and royalties to be paid, and the covenants to be observed as herein set forth, does hereby grant and lease to the lessee the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following described tracts of land situated in the county of _____, State of California, and more particularly described as follows: _____

containing _____ acres, more or less, together with the right to construct and maintain thereupon all works, plants, waterways, roads, telegraph or telephone lines, pipe lines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment hereof, for a period of twenty years, with the preferential right in the lessee to renew this lease for successive periods of ten years, upon such reasonable terms and conditions as may be prescribed by the lessor, unless otherwise provided by law at the time of the expiration of such periods.

SECTION 2. In consideration of the foregoing, the lessee hereby agrees:

(a) *Bond.* To furnish a bond with approved corporate surety in the penal sum of \$1,000.00, conditioned upon compliance with the terms of the lease.

(b) *Commence drilling.* The lessee agrees, within three months from delivery of executed lease, to proceed with reasonable diligence to install on the leased ground a standard or other efficient outfit and equipment, and to commence drilling at least one well, and to continue such drilling with reasonable diligence to production or to a depth of at least two thousand feet, or to a point where the well is demonstrated unsuccessful, and thereafter to continue drilling with reasonable diligence at least one well the first four years of the life of this lease for each forty acres or fraction thereof in the tract so leased, up to and including one hundred sixty acres, and for acreage greater than one hundred sixty acres, additional wells must be drilled at such a rate that before the expiration of twelve years of the life of this lease there shall be at least one well drilled to production or to a depth of not less than two thousand feet for each forty acres or fraction thereof in the tract so leased, unless permission shall be given in writing by the Surveyor General to drill a lesser number of wells or any well or wells to a depth less than two thousand feet; in case the land embraced in this lease shall be river beds, lake beds, tide and submerged lands, the lessee shall

drill one well for each ten acres, up to and including forty acres, during the first four years of the life of this lease, and for acreage greater than forty acres, wells shall be drilled at such a rate that before the expiration of twelve years of the life of this lease there shall be at least one well drilled to production or to a depth of not less than two thousand feet for each ten acres or fraction thereof; *provided*, that in case there are at date of delivery of this lease a sufficient number of producing wells, or wells in course of drilling, already upon the land described, equal to the maximum number specified by this section, the lessee shall not be required to do any further drilling, but must at all times operate continuously such maximum number of producing wells.

(c) *Royalty and rents.* To pay the lessor in advance, beginning with the date of the execution of this lease, a rental of one dollar per acre per annum during the continuance hereof, the rental so paid for any one year to be credited on the royalty for that year, and, in addition to such rental, a royalty of-----per cent of the value of oil or gas produced from the land leased herein (except oil or gas used for production purposes on said lands or unavoidably lost), or, on demand of the lessor, -----per cent of the oil or gas produced (except oil or gas used for production purposes on said lands, or unavoidably lost), in which case credit for rent shall be on the basis of the current field price of oil, the royalty, when paid in value, to be due and payable monthly on the fifteenth of each month following the month in which produced, to the Surveyor General; and when paid in kind, to be delivered in the field where produced at such times, and in such manner as may be required by the lessor; whenever the average daily production of any oil well shall not exceed ten barrels per day, the lessee may apply to the Surveyor General for a reduction of the fixed royalty on future production of said well, which reduction may be granted, if, in the judgment of the Surveyor General the well can not be successfully operated upon the royalties fixed herein.

(d) *Sales contract.* To file with the Surveyor General copies of all sales contracts for the disposition of oil and gas produced hereunder, except for production purposes on the land leased, and, in the event the State of California shall elect to take its royalties in money instead of in oil or gas, not to sell or otherwise dispose of the products of the land, leased, except in accordance with a sales contract or other method first approved by the Surveyor General.

(e) *Monthly statement.* To furnish monthly statements in detail in such form as may be prescribed by the lessor, showing the amount, quality, and value of all oil and gas produced and saved during the preceding calendar month as the basis for computing the royalty due the lessor. The leased premises, and all wells, improvements, machinery, and fixtures thereon or connected therewith, and all books and accounts of the lessee shall be open at all times for the inspection of any person duly authorized by the Surveyor General.

(f) *Plats and reports.* To furnish annually and at such times as the Surveyor General shall require, in the manner and form prescribed by the Surveyor General, a plat showing all development work and improvements on the leased lands, and other related information, with a report as to all buildings, structures, or other works placed in or upon said

leased lands, accompanied by a report in detail as to the stockholders, investment, depreciation, and cost of operation, together with a statement as to the amount and grade of oil and gas produced and sold, and the amount received therefor, by operations hereunder.

(g) *Log of wells.* To keep a log in the form prescribed by the Surveyor General of all the wells drilled by the lessee, showing the strata and character of the ground passed through by the drill, which log, or copy thereof, shall be furnished to said lessor on demand.

(h) *Diligence. Prevention of waste. Health and safety of workmen.* To exercise reasonable diligence in drilling and operating wells for the oil and gas on the lands covered hereby while such products can be secured in paying quantities, unless consent to suspend operations temporarily is granted by the Surveyor General; to carry on all operations hereunder in a good and workmanlike manner, in accordance with approved methods and practice, having due regard for the prevention of waste of oil or gas developed on the land, or the entrance of water through wells drilled by the lessee to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits, the preservation and conservation of the property for future productive operations, and to the health and safety of workmen and employees; to plug securely any well before abandoning the same so as to effectually shut off all water from the oil- or gas-bearing strata; not to drill any well within 200 feet of any of the outer boundaries of the lands covered hereby unless the adjoining lands have been patented or the title thereto otherwise vested in private owners; to conduct all mining, drilling, and related productive operations subject to the inspection of the lessor; to carry out at the expense of the lessee all reasonable orders and requirements of lessor relative to prevention of waste and preservation of the property and the health and safety of workmen, and on failure so to do the lessor shall have the right to enter on the property to repair damage or prevent waste at lessee's cost; to abide by and conform to regulations in force at the time the lease is granted covering the matters referred to in this paragraph; *provided*, that lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(i) *Taxes and damages. Freedom of purchase.* To pay when due all taxes lawfully assessed and levied under the laws of the state upon improvements, oil, and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(j) *Reserved deposits.* To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under laws reserving to the state the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil and gas.

(k) *Excess holdings.* To observe faithfully the provisions of section 12 of the act defining the interest or interests that may be taken, held, or exercised under leases authorized by said act.

(l) *Assignment of lease.* Not to assign this lease or any interest

therein, nor sublet any portion of the leased premises, except with the consent in writing of the Surveyor General first had and obtained.

(m) *Deliver premises in case of forfeiture.* To deliver up the premises leased, with all permanent improvements thereon, in good order and condition, upon the termination of, or forfeiture of, this lease.

SECTION 3. The lessor expressly reserves:

(a) *Rights reserved. Easements and rights of way.* The right to permit for joint or several use such easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in the act, and the treatment and shipment of products thereof by or under authority of the state, its lessees, or permittees, and for other public purposes.

(b) *Disposition of surface.* The right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereinafter enacted in so far as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein.

(c) *Pipe lines to convey at reasonable rates.* The right to require the lessee, his assignee, or beneficiary, if owner, or operator of, or owner of a controlling interest in any pipe line, or any company operating the same which may be operated accessible to the oil derived from lands under such lease, to accept and convey at reasonable rates and without discriminating the oil of the state or of any citizen or company, not the owner of any pipe line, operating a lease or purchasing oil or gas under the provisions of the act.

(d) *Monopoly and fair prices.* Full power and authority to carry out and enforce all the provisions of section 15 of the act, to insure the sale of the production of such leased lands to the State of California and to the public at reasonable prices to prevent monopoly and to safeguard the public welfare.

SECTION 4. *Surrender and termination of lease.* The lessee may, on consent of the Surveyor General first had and obtained in writing, surrender and terminate this lease upon the payment of all rents, royalties, and other obligations due and payable to the lessor, and upon payment of all wages and moneys due and payable to the workmen employed by the lessee, and upon a satisfactory showing to the Surveyor General that the public interest will not be impaired; but in no case shall such termination be effective until the lessee shall have made full provision for conservation and protection of the property; upon like consent had and obtained the lessee may surrender any legal subdivisions of the area included herein.

SECTION 5. *In case of default.* If the lessee shall fail to comply with the provisions of the act or make default in the performance or observance of any of the terms, covenants and stipulations hereof, or of the general regulations promulgated, and such default shall continue after written notice thereof by the lessor, then the lessor may cancel this lease and enter the premises and take possession of the same, together with the improvements thereon; but this provision shall not be con-

strued to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. The waiver of or failure to act upon any particular cause of forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of forfeiture, or for the same cause occurring at any other time.

SECTION 6. *Heirs and successors in interest.* It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon and every benefit hereof shall inure to the heirs, executors, administrators, successors, or assigns of the respective parties thereto.

In witness whereof.

Witness.

STATE OF CALIFORNIA,

By

----- (L. S.)
----- (L. S.)



OIL AND GAS RIGHTS.

PART VII.

REFERENCE TO MISCELLANEOUS CALIFORNIAN LEGISLATION ON OIL AND GAS SUBJECTS.

An act prohibiting the unnecessary wasting of natural gas into the atmosphere; providing for the capping or otherwise closing of wells from which natural gas flows; and providing penalties for violating the provisions of this act. [Approved March 25, 1911.]

An act establishing and creating a Department of the State Mining Bureau for the protection of the natural resources of petroleum and gas from waste and destruction through improper operations in production; providing for the appointment of a State Oil and Gas Supervisor; prescribing his duties and powers; fixing his compensation; providing for the appointment of deputies and employees; providing for their duties and compensation; providing for the inspection of petroleum and gas wells; requiring all persons operating petroleum and gas wells to make certain reports; providing procedure for arbitration of departmental rulings; creating a fund for the purposes of the act; providing for assessment of charges to be paid by operators and providing for the collection thereof; and making an appropriation for the purposes of this act. [Approved June 16, 1915; amended 1917; amended 1919; amended 1921.]

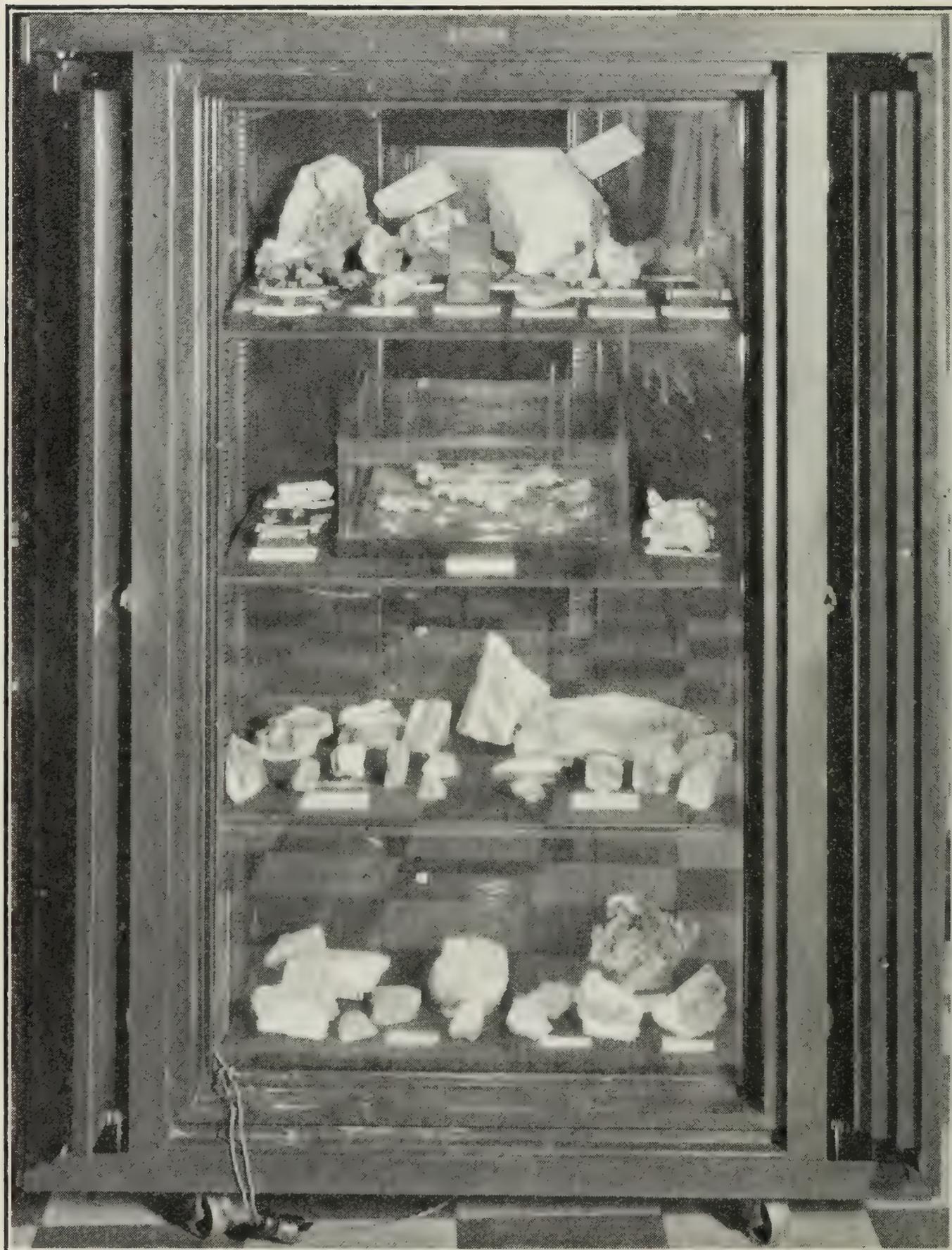
Assembly Concurrent Resolution No. 6—Relative to investigation of Norwalk State Hospital property for oil purposes. (Filed with Secretary of State, February 9, 1923.) [Statutes and Amendments, 1923, p. 1535.]

Assembly Concurrent Resolution No. 23, relating to an investigation by the Surveyor General of the prevalence of oil upon the beaches along the coast of California. (Filed with Secretary of State, May 21, 1923.) [Statutes and Amendments, 1923, p. 1687.]

An act authorizing the leasing of certain lands belonging to the State of California containing oil, gas, or other hydrocarbon deposits and providing for the disposition of the moneys received under said leases, and creating a commission to carry out the provisions of this act. [Approved May 25, 1923. Statutes and Amendments, 1923, p. 452.]

Gas companies, franchise tax for state purposes, provisions relating to: Political Code, §§ 3664, 3664*a*, 3665*a*, 3665*b*, 3666.

Oil car companies, franchise tax for state purposes, provisions relating to: *Id.*



Gold exhibit in electric-lighted safe, being one of four such displayed for Convention of American Mining Congress, at Sacramento, Cal.

MINERAL EXHIBIT AT AMERICAN MINING CONGRESS
CONVENTION, AT SACRAMENTO, CALIFORNIA.

WALTER W. BRADLEY, Deputy State Mineralogist.

In connection with the convention of the American Mining Congress at Sacramento, California, September 29–October 4, there was held an exposition of mining equipment and minerals. The main exhibit was held in a large tent (in the absence of a suitable hall of adequate dimensions) in the open space between the two new Capitol extension buildings, at Ninth, Tenth and M streets, across from the State Capitol. This was made possible through the courtesy and cooperation of the state officials, the Sacramento City authorities, and the Sacramento Chamber of Commerce. The convention sessions were held in the Assembly Chamber of the State Capitol.

The mineral specimens were allotted a prominent space in the center of the main tent, and to the California State Mining Bureau was delegated the general supervision of that portion of the display as well as the specific task of making a representative exhibit of California's resources.

Creditable displays of their economic ores and minerals were made by the states of Nevada and Oregon, and by the Vancouver Chamber of Mines for the province of British Columbia. Worthy of mention, among these, was a diagrammatic and panoramic representation in the Nevada exhibit of a shale oil reduction plant supplemented by samples of the material and products at the various stages. Colorado also had an oil shale exhibit, in charge of the Colorado School of Mines.

In addition to the general state display installed by the California State Mining Bureau, there were separate displays made by a number of the counties, including San Bernardino, Kern, San Diego, Shasta, Calaveras, Placer, Nevada, Amador, Tuolumne, Siskiyou, San Luis Obispo, Contra Costa, Napa, and San Mateo. The San Bernardino and Kern County exhibits, which included a special collection from the famous Rand District, was in charge of Mr. P. J. Osdick. The San Diego County exhibit, devoted largely to nonmetallies (for which that county is coming to the fore), including gem stones both in the rough and cut, was in charge of Mr. H. R. Jackson of the San Diego Chamber of Commerce. Calaveras County was in charge of Mr. Jarvis Lloyd; and Shasta and Siskiyou counties, of Mr. Louis Carrigan of the Northern California Counties Association. Materials for the other counties' displays were arranged by the staff of the State Mining Bureau, with assistance from the Sacramento Chamber of Commerce. One of the difficulties encountered in arranging a mineral exhibit of that sort is to obtain suitable display cases. Much credit is due the committee of the Department of Mines and Mining of the Sacramento Chamber of Commerce for their assistance in that regard, and to Mr. Charles Paine of the State Fair for the loan of glass show cases. A number of cases were shipped by the State Mining Bureau from our San Francisco headquarters.

The general arrangement of the State Mining Bureau's exhibit adhered to the economic grouping by ores of the various metals and the nonmetallic commercial minerals utilized for various industrial and structural purposes.

In the rotunda of the State Capitol, the gold display was placed in four electric-lighted safes with plate-glass fronts. These were loaned by courtesy of Mr. Ed Wahl of Sacramento. Gold bullion, sponge, placer nuggets, leaf and crystallized gold, and high-grade gold-bearing quartz, to a total value in excess of \$100,000, were gathered together there and displayed for the edification and education of the members of the congress and visitors. It is doubtful if as extensive and valuable a collection of gold specimens has ever before been attempted or gathered together for such an exhibit, and it attracted much interest and favorable comment. In addition to the Californian material, there were also gold specimens from Oregon and Alaska.

Siskiyou County's famous collection that has taken prizes and ribbons at a number of expositions and fairs occupied one entire safe. Notable among others were: Retorted sponge from a recent crushing, and chunks of ore that were more than half gold, from the Independence Mine, Hamburg Bar, Siskiyou County. Crystallized and leaf gold from the Red Ledge Mine, Washington, Nevada County; also from the Shore Mine, near Jamestown, Tuolumne County. A crystallized specimen (see front row, center, top shelf, in photo) from Yankee Jim's, Placer County, resembling a California Bear in outline.

In addition to the gold, a number of cut gem stones were shown, including diamonds from Cherokee Flat, Butte County; also kunzite and tourmalines (red, green, and pink) from Pala, San Diego County. One of the kunzites, known as the 'Pala Chief,' weighs 103 carats, stated to be the largest cut kunzite gem in existence, and is valued at \$2,000. There was also a beautiful ruby-red tourmaline of 53 carats weight called the 'Tourmaline Queen' and valued at \$1,000. Both of these stones are the property of the Pala Chief Gem Mining Company of San Diego.

We wish to here express the appreciation of the State Mining Bureau and the mining public as a whole to the several operators of properties and the owners of specimens, for their courtesy and interest in lending their valuable material for the purposes of this display which so strikingly illustrated this important resource for which the West, and California in particular, are justly famous.



COPPER RESOURCES OF SHASTA COUNTY.

By W. B. TUCKER, Mining Engineer.¹

DESCRIPTION AND LOCATION OF COPPER DISTRICTS.

The copper region of Shasta County is about 30 miles in length, and about 15 miles in width, extending nearly east and west across the Redding Quadrangle of the U. S. Geological Survey, and embraces three actively producing districts known as Iron Mountain, Bully Hill, and Ingot, which are separated by a dozen miles of country where as yet no large bodies of copper ore have been found.

The Iron Mountain district is the largest and by far the most important region. Iron Mountain lies just outside of the border of the Redding Quadrangle, northwest of the old town of Keswick, and from this locality the district extends nearly northeast for 25 miles to and beyond the Mammoth, and has a width of about two miles. It comprises the holdings of the Mountain Copper Company, Pittsburgh-Mount Shasta Mining Company, Balaklala (under lease to Mammoth Copper Company), Trinity Copper Company, Colma Copper Company, Golinsky Copper, and a number of other smaller mines.

The Bully Hill district comprises an area scarcely three miles north and south by two miles east and west, and includes the Bully Hill, Rising Star, Arps, and Copper City lodes, besides a number of prospected claims on the south and southwest slope of Horse Mountain. (Plate I.)

The Ingot district, which is on the east end of the copper region, has an area of scarcely two miles north and south by three miles east and west, and includes the Afterthought, Donkey and Woodrow Wilson mines.

Geology. (Excerpts taken from Redding Quadrangle on geology of district.)

The country rock of the copper deposits is practically the same throughout the region, but not all the same age. It is chiefly rhyolite and tuff, and here and there a trace of included sediments.

Character of Ore Deposits. The copper ore deposits are lenticular lenses or zones of disturbance in which the country rock is crushed and sheared, thus producing the channels for circulating waters, and greatly enhancing the possibilities of the mineral solution and deposition.

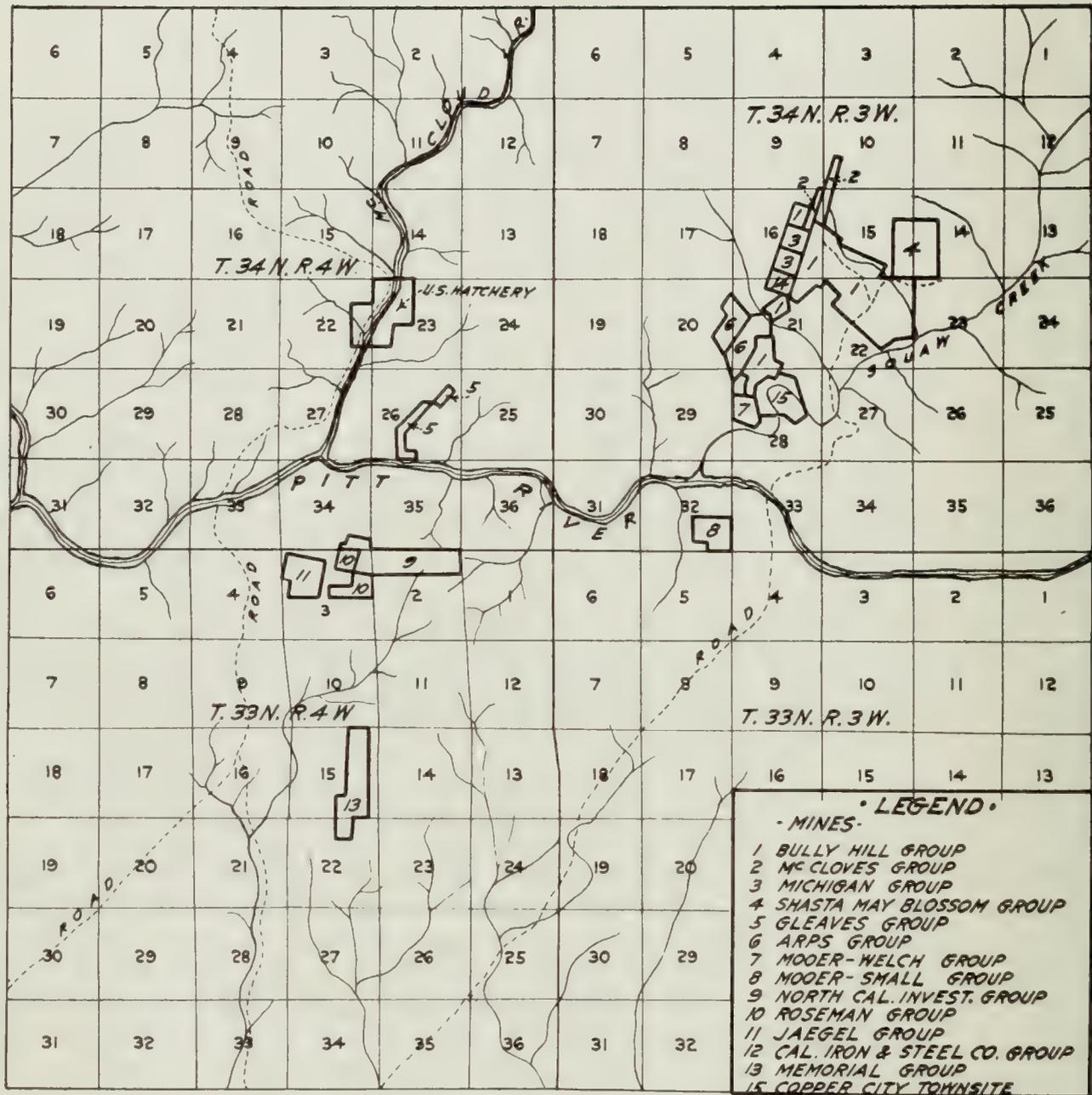
Fissure Systems. The rocks of the copper region have experienced disturbances at many periods extending over a wide range of time. The system of fissures is confined to three groups: (1) The early fissures filled at least in part by igneous rocks of the pre-Cretaceous eruption, (2) the fissures bearing ore deposits, and (3) the fissures of the late Cretaceous or post-Cretaceous age.

Ore-bearing Fissures. The fissures which gave access to mineral-bearing solutions and thus permitted the formation of deposits of copper and auriferous quartz, originated chiefly during the epoch of rock crushing and mountain making about the close of the Jurassic. This is indicated by the fact that the fissures bearing ore have been found in the Jurassic rocks, but not in the Cretaceous. The important

¹ACKNOWLEDGMENTS. The writer wishes to acknowledge the uniform courtesy extended him by owners and operators of mines throughout the Shasta Copper Belt.

ore-bearing fissures of the copper districts are irregular in trend. The greatest extension of the copper region is in a direction about N. 80° E., while that of the several districts range from N. 50° W. to N. 30° E.

PLATE I.



MAP OF A PORTION OF THE SHASTA COUNTY COPPER BELT EAST OF THE SACRAMENTO RIVER, INCLUDING THE BULLY HILL DISTRICT, SHOWING THE PRINCIPAL MINING PROPERTIES.

The general trend of the Iron Mountain district is N. 30° E., but the strike of its ore-bearing fissures rarely conforms to the general direction. The strike of the ore-bearing fissures about the head of Motion and Spring creeks varies, but the principal mineralized fissures usually have

a course of N. 70° W., whereas on the north slope of Balaklala Mountain and beyond Squaw Creek their general course is nearly N. 70° E., though locally diverted.

The rocks in this region are much sheared, and in all parts of the district the fissures containing the ore deposits are usually those that show the greatest amount of shearing.

In the Bully Hill district the principal ore-bearing fissures have a course of about N. 10° E., parallel with the greatest extent of the producing district, although there are local variations of minor importance.

In the Ingot district the principal ore-bearing fissures have a general strike of N. 50°-60° W. The dip of the ore-bearing fissures throughout the copper belt is usually vertical or at a high angle, but there are a number of prominent variations, as at Shasta King and Mammoth mines, where the dip westward flattens and locally may be reversed.

Distribution of Ores. The principal orebodies of economic value have been found only in the Balaklala and Bully Hill rhyolites. These orebodies occur in irregular fissures along which there has been much shearing, and the orebody is as a rule irregularly lenticular in the shear zone. These lenticular orebodies range from a mere seam to a hundred feet in diameter. They succeed one another in the same irregularity in a more or less continuous shear zone, or occur in adjacent parallel shear zones. The maximum width of ore bodies that have been worked is 300 feet, with a known length of 1000 feet.

Depths of Ore Deposits. The ore deposits have been developed throughout the district to a depth of 1500 feet below the surface.

Grade of Ore. The material mined in recent years does not average over 3 per cent copper.

Character of Ores and Gangue. The present ores of the copper region are almost exclusively sulphides, the metals contained being iron, copper, zinc, and small proportions of lead, arsenic, silver and gold. The minerals are pyrite, chalcocite, bornite, chalcocite, spalerite and galena. The upper portion of the ore bodies consists largely of limonite.

Production.

The exploitation for copper in Shasta County began in 1895 at Iron Mountain, and the total production from 1895 to 1923, inclusive, is 625,759,727 pounds valued at \$101,483,817.

Copper Production of Shasta Copper Belt, Shasta County, California, 1896 to 1923, Inclusive.

Copper output in pounds and value.

Year	Pounds	Value
1896	1,847,087	\$184,708
1897	13,592,610	1,535,966
1898	21,442,000	2,465,830
1899	21,835,863	3,565,023
1900	25,736,473	4,166,735
1901	30,990,781	4,881,048
1902	21,515,887	2,496,731
1903	16,453,409	2,171,497
1904	26,438,145	3,439,974
1905	10,830,865	1,688,614
1906	22,477,304	4,338,121

<i>Year</i>	<i>Pounds</i>	<i>Value</i>
1907	27,844,364	5,568,873
1908	34,878,677	4,642,976
1909	58,665,447	7,581,115
1910	44,947,950	5,725,469
1911	29,539,913	3,692,489
1912	25,249,892	4,166,232
1913	27,686,436	4,291,708
1914	25,122,766	3,341,328
1915	30,828,917	5,385,060
1916	39,437,196	9,701,550
1917	28,009,990	7,646,727
1918	25,294,590	6,247,764
1919	8,673,342	1,613,242
1920	810,843	149,195
1921	437,593	56,449
1922	1,733,424	234,012
1923	3,437,963	505,381
Totals	625,759,727	\$101,483,817

Approximately six million tons of ore have been extracted from the mines of the Shasta Copper Belt, containing over 300,000 tons of copper, and worth, with precious metals, more than \$100,000,000.

History.

Copper was discovered and mined in Shasta County at Copper City in 1862. It was not until 1895 that operations were started at the Iron Mountain Mine by the Mountain Copper Company, and this marked the discovery and development of the immense sulphide ore bodies of the copper belt of Shasta County.

The principal productive mines on the west end of the copper belt have been Balaklala, Golinsky, Iron Mountain, Mammoth, and Shasta King. On the east end of the belt are the Bully Hill and Rising Star mines at Bully Hill, and the Afterthought Mine at Ingot.

The copper mines of Shasta County have been under active operation from 1895 to 1919, and Shasta County led all other counties in California in the output of copper during these years. The history of the important districts in the copper belt is briefly described according to the importance of the mines.

Bully Hill and Copper City Districts.

In 1863 about 250 tons of ore were shipped to San Francisco. This ore is said to have contained 8 per cent copper, with values of \$40 in gold and \$20 in silver. From San Francisco the ore was shipped to Swansea, and gave a small margin of profit. The ground now covered by the Bully Hill Group of Mines was first located by Alexander Sanford. Jack Killinger and J. P. Williams formed a company and operated the Excelsior Mine, located near Copper City, until 1865. At the same time, the Baxter Mine was operated by the Baxter Mining Company.

At Bully Hill, O. R. Johnson & Co. acquired the claims located by Sanford, and began operations under the name of the Bully Hill Gold and Silver Copper Mining Company. In 1877, Alvin Potter & Company reopened the Bully Hill Mine. Then the property passed to the Extra

Mining Company, which built the first mill in Copper City in 1877. This company operated the property for three or four years, when operations were suspended on account of their inability to treat the base ores. About 1897, James Sallee obtained the Bully Hill Mine, and after three years of development work sold the property in 1899 to J. R. De La Mar for \$225,000. In 1901, the property was transferred to the Bully Hill Copper Mining and Smelting Company, of which J. R. De La Mar was president.

This company opened up the Bully Hill Mine, erected smelting works which then included a blast furnace with a daily capacity of about 150 tons, a converter plant of 150 tons, a battery of 60 roasting stalls, and two McDougall roasters. The first ores treated by this plant are reported to have carried as high as 15 per cent copper. During the operation of the plant by this company, the average ore treated is stated to have been around 5 per cent copper.

In 1905 the property was sold by the De La Mar interests to the General Electric Company. The General Electric Company opened up the Rising Star Mine, besides doing additional development work on the Bully Hill Mine. The smelting works were enlarged and smelting operations resumed.

The Sacramento Valley and Eastern Railroad was completed from Pit, a station on the Southern Pacific, to Bully Hill. The smelter was operated by the General Electric Company until 1910, after which only development work was done. The company built a small experimental plant to try out electric smelting and recovery of the zinc values. This plant was operated in 1915, producing 300 to 400 lbs. of metallic zinc per day, using direct electrolysis of zinc sulphate with regeneration of acid.

In October, 1917, the W. Arnstein interests, known as Bully Hill Mining Company, took over the property; the Rising Star shaft was repaired, and silver-gold-copper ore extracted from the lower levels was shipped to the Mammoth smelter at Kennett. The production in 1918 amounted to 27,000 tons of selected ore, averaging 6 per cent copper and \$1 in gold and silver per ton. The property was operated until 1920 by W. Arnstein, who built a 150-ton flotation plant, but this treatment was unsuccessful. In 1920 the property was sold to the Shasta Zinc and Copper Company, D. C. Jackling, president, and W. Arnstein, vice president.

The Shasta Zinc and Copper Company constructed a 150-ton reverberatory smelter and zinc oxide plant, and the plant was put in operation in June, 1922, and operated until December, 1922, when operations were suspended due to fall in the price of zinc oxide.

Iron Mountain District.

The Iron Mountain or Mountain Copper Mine was discovered in the early sixties, and located by William Magee and Charles Camden of San Francisco, as an iron mine. It was held as an iron deposit until 1879. In that year James Sallee and Alvin Potter acquired a one-third interest in the property, and operated the mine for its gold and silver values. In 1884, John O. Earl and Charles Ellsworth bonded the property, and placed a 20-stamp mill on the property. Before any production was made, the entire plant and mine was returned to the original owners. James Sallee, as part owner and superintendent,

operated the mine until 1888, when it was purchased by the Mountain Mines Syndicate, Ltd., of London, England. This company extended one of the prospect tunnels, encountered and developed a large body of copper-sulphide ore, and proceeded to operate the mine as a copper mine.

On January 1, 1897, the entire property of the Mountain Mines Syndicate was transferred for \$5,750,000 to the present Mountain Copper Company, Ltd., of London. The Iron Mountain Mine was operated continuously until 1920, when operations were suspended.

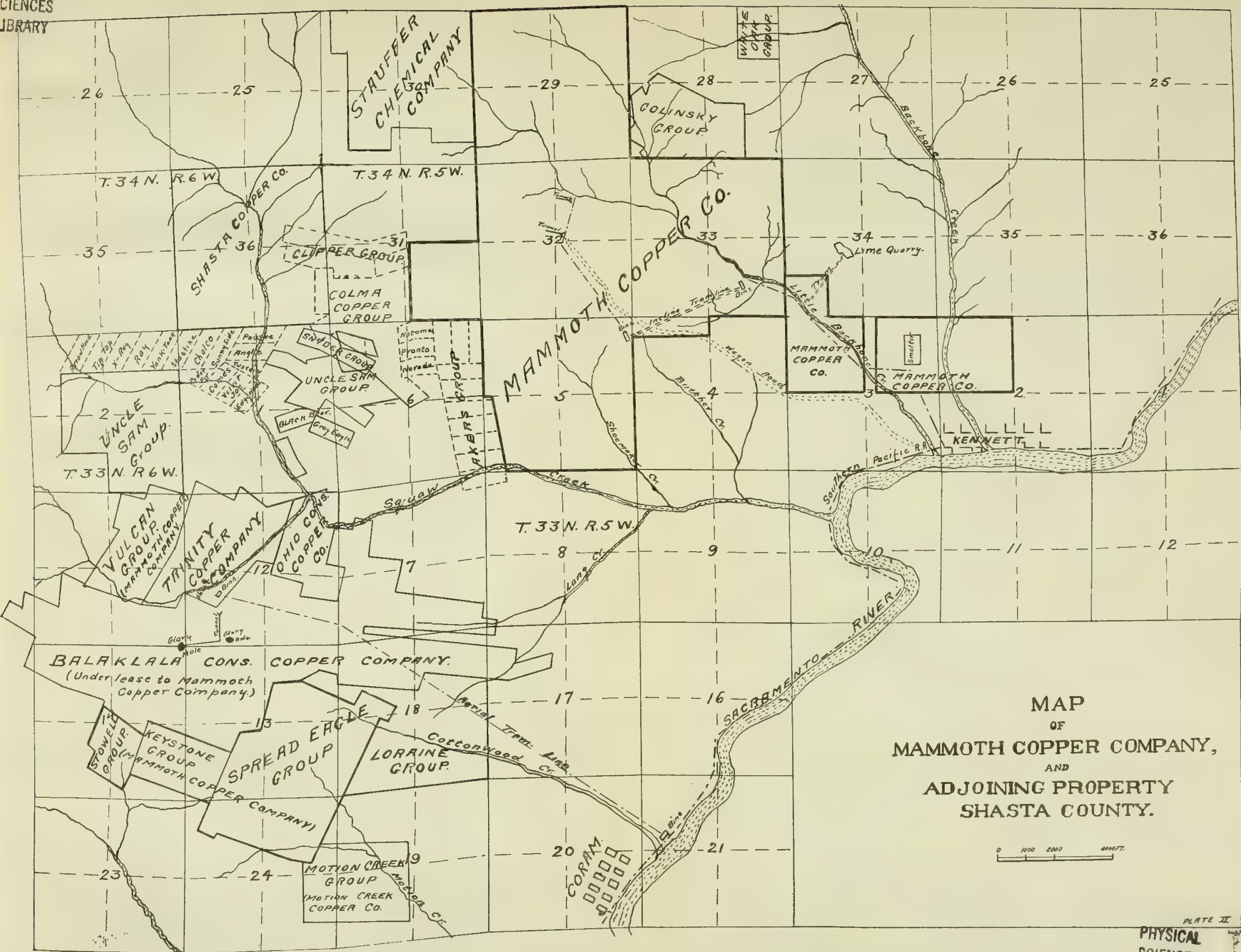
The Mountain Copper Company also owns and operates the Hornet Mine, lying to the north of the Iron Mountain Mine. On this property 5,000,000 tons of pyrite ore have been developed, averaging 0.7 per cent copper, and carrying 47 to 50 per cent sulphur. This mine has been under continuous operation, daily production being from 400 to 500 tons of pyrite ore.

The company also owns and operates a 350-ton smelter at Martinez, California, and a 150-ton leaching plant. At this plant the Hornet ores, low in copper but rich in sulphur, are burned and the sulphur fumes are collected in lead-lined chambers and transformed into sulphuric acid by the Meyer chamber process; the cinder remaining after roasting is leached for its copper content. The acid is sold crude, and is also used as the basis of commercial fertilizers. The fertilizer plant was operated to full capacity in 1920, and a gas purifier, bluestone and pigments made. At one time this company was among the largest copper producers of the world, but output has since greatly declined, the production having been:

29,727,040	pounds	fine	copper	in	1901
19,116,160	pounds	fine	copper	in	1903
6,814,000	pounds	fine	copper	in	1907
3,638,619	pounds	fine	copper	in	1908
2,775,197	pounds	fine	copper	in	1909
2,987,815	pounds	fine	copper	in	1910
5,400,000	pounds	fine	copper	in	1911
5,614,000	pounds	fine	copper	in	1912
6,890,000	pounds	fine	copper	in	1913
5,454,000	pounds	fine	copper	in	1914
7,280,712	pounds	fine	copper	in	1915
9,172,390	pounds	fine	copper	in	1916
8,122,325	pounds	fine	copper	in	1917
6,802,612	pounds	fine	copper	in	1918
2,250,468	pounds	fine	copper	in	1919

The Mammoth Mine, which is located in the Iron Mountain district, has been the largest producer of copper in the Shasta copper belt. This property, which originally consisted of twelve claims and a patented section, was owned by R. M. Saeltzer and associates of Redding. In 1904 it was purchased by the Mammoth Copper Mining Company, a subsidiary of the U. S. Smelting, Refining, and Mining Company, Boston, Massachusetts. The smelter located at Kennett was built in 1905, and in 1908 the plant was enlarged to its present capacity. The mine and smelter were under continuous operation until May, 1919.

The Balaklala Mine was developed by the Balaklala Mining Company of San Francisco, in 1900. In 1902 the Western Exploration Company secured a bond on the property and carried on extensive development work until 1905, when it was acquired by the First National Copper



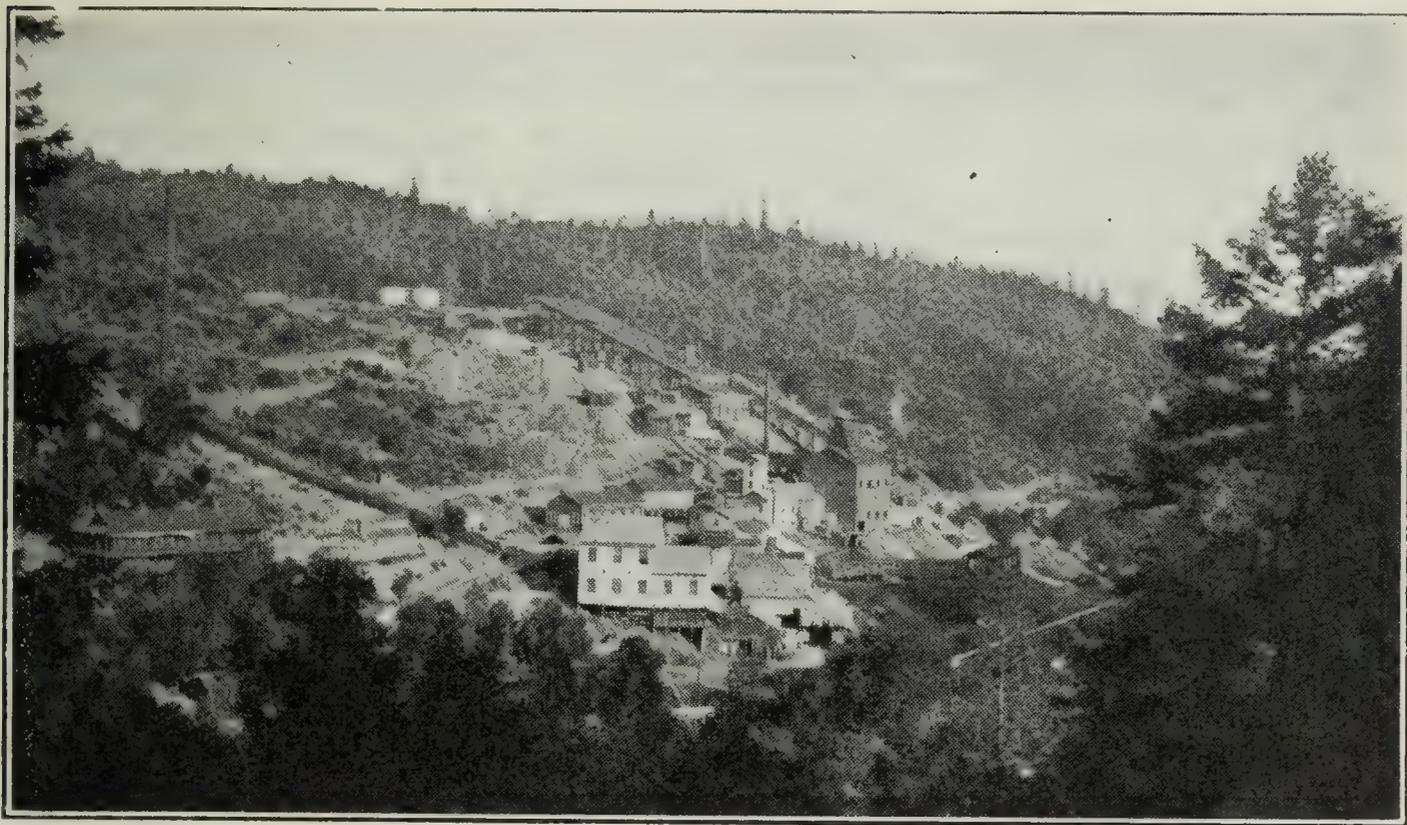
MAP
OF
MAMMOTH COPPER COMPANY,
AND
ADJOINING PROPERTY
SHASTA COUNTY.

0 1000 2000 4000 FT.

Company and operated under the name of the Balaklala Consolidated Copper Company, New York City, from 1906 until May, 1919, when operations were suspended. The mine was taken over under lease by the Mammoth Copper Company in 1923, and the mine reopened in November, 1923, the ore going to the Mammoth smelter.

Ingot District.

The history of the mines in the Cow Creek or Ingot district has been in many respects parallel to that of Iron Mountain and Bully Hill. The earliest attempts at operation were made for the extraction of gold and silver values from the oxidized surface ores. Later, effort was made to work the basic ores by a process of roasting and milling. C. M. Peck, in 1872, obtained for a nominal sum the property afterward known as the Peck Mine, and now included in the Afterthought Mine, and began its successful operation upon the oxidized surface ores. In



View of 300-ton Flotation Plant and Smelter, Afterthought Copper Company, Ingot, Shasta County.

1875 he erected a small reverberatory furnace, and later on a small water-jacket furnace was erected. Due to the refractory character of the ores treated, attempts to smelt the ore in these furnaces were unsuccessful. In 1903 the Great Western Gold Company acquired the property and installed a 42- by 150-inch water-jacket blast furnace having a capacity of 250 tons which was operated successfully. The smelter was blown in in 1905. In 1909 the property was acquired by the Afterthought Copper Company. This company installed a 300-ton reverberatory furnace, which was blown in in July, 1919; also a 300-ton differential oil flotation plant. The property was operated continuously until February, 1920, when operations were indefinitely suspended.

MINES.

Afterthought Mine. The property is located in Secs. 10, 11, 25 and 5, T. 33 N., R. 2 W., near the town of Ingot, which is 24 miles northeast of Redding. It is owned by the Afterthought Copper Company, George

L. Porter, president; C. A. Crowl, secretary; John Tait Milliken, general manager and consulting engineer. Offices 1321 Pierce Building, St. Louis, Missouri.

Since the Fourteenth Report of the State Mineralogist (1914) (pp. 760-761), a new reverberatory furnace and a 300-ton flotation plant were installed in 1918, and operated until 1919. The Harwood process was applied to the complex copper-zinc ores.

Holdings of the company consist of 1650 acres, of which 1550 acres are patented.

Ore deposits: The copper-zinc ore deposits are limited to zones of disturbance in which the country rock is crushed and sheared. The Copper Hill lode consists of two short, nearly vertical orebodies, approximately 350 feet apart. They lie close to the contact in rhyolite that encloses fragments of slate. The shear zone contains massive irregular lenticular orebodies. The two vein systems or lodes are known as the Afterthought and Copper Hill lodes, which strike northwest and dip 70° to the northeast. Approximately 300,000 tons of ore are reported to be developed, carrying 5.5 ozs. silver, 0.03 oz. gold, 16% zinc and 3% copper. The ore is a complex copper-zinc ore finely disseminated, composed largely of sphalerite, pyrite, chalcopyrite, and local traces of bornite. The gangue which forms less than 5% of the ore is barite, with some quartz and a trace of calcite.

Mine developments: No. 4 tunnel, the main working adit, is driven N. 85° E. 600 feet, then as a drift southeast 500 feet on the Afterthought lode and northwest 400 feet on the Copper Hill lode. About 350 feet southeast of the vertical shaft from the surface, a winze has been sunk to a depth of 400 feet. Levels have been driven every 100 feet in the winze below the adit. Total amount of underground workings is approximately 10,000 feet. The mill and smelter are described in detail in the Eighteenth Report of the State Mineralogist, pp. 596-598. (See Flow Sheet.)

Bibl: State Mineralogist Reports XIV, pp. 760-761; XVIII, pp. 596-598; Bulletin No. 50, pp. 102-105; A. H. Heller, Mining and Scientific Press, August 2, 1919.

Akers Group of Mines is located in Secs. 6 and 7, T. 33 N., R. 5 W., 5 miles west of Kennett, in the Backbone mining district. Elevation 1000 feet. J. W. Akers of Kennett, owner. Holdings comprise fourteen claims, totaling approximately 280 acres, located along Squaw Creek, between the Mammoth and Balaklala mines, and adjoining the Trinity Copper Company's property on the east. The development work on these claims is confined to five tunnels along an intrusion of quartz-augite-diorite, about 200 to 300 feet in width, with a general easterly trend which occurs in the Balaklala rhyolite. The gossan crop-pings are prominent and can be followed for about 1000 feet. The ore occurs in small irregular lenticular orebodies, along irregular fissures, one of which trends north and south, with a dip of 60° east, the other having a N. 40° W. trend. The ore is chiefly pyrite with more or less chalcopyrite and occasional traces of bornite, and carries \$2 per ton in gold and silver. The present work is confined to No. 3 tunnel, where a series of parallel north and south and a N. 40° W. fracture are being drifted on; and some small lenses of ore have been exposed along these fractures, varying in width from 2 inches to 2 feet, and from 10 to 15

feet in length. In this tunnel there is a drift 261 feet north on a north and south fracture, and one to the south 244 feet on a parallel fracture. In this south drift the main N. 40° W. fissure was cut. On the claims located on the south side of Squaw Creek are two tunnels which have lengths of 100 feet. In the lower tunnel, which is driven on a N. 40° W. fracture, a small lens of ore 40 feet in length and about 2 feet in width has been developed. Samples taken from this orebody are reported to carry from 2% to 6% copper. One man employed on development work.

Arps Group of Mines is located in Secs. 20, 21, 28 and 29, T. 34 N., R. 3 W., one and one-fourth miles north of Copper City, in the Pittsburgh mining district. It comprises fifteen patented claims, totaling 250 acres adjoining the Copper City claims of the Shasta Zinc and Copper Company. Owners are William Arps and R. M. Saeltzer of Redding. Elevation 900 to 1200 feet. The property is located on the Copper City lode, the shear zone in which the lode occurs traversing the Bully Hill rhyolite and having a general course of N. 30° W. The ore is pyrite, sphalerite and chalcopyrite, with barite as a gangue. Developments consist of six tunnels, two shafts and several crosscuts and winzes aggregating over 3000 feet. The most extensive workings are confined to the Globe, Hearst, and Kaiser Wilhelm claims. In these workings several small lenses of ore were developed, carrying values in copper, gold and silver. Several cars of ore have been shipped from the property to the Mammoth Smelter at Kennett, and are reported to have averaged \$20 per ton in gold and silver, with low copper content. Equipment consists of blacksmith shop and tools, compressor house, Chicago pneumatic compressor, air drills, cars and track. Idle.

Bibl: State Mineralogist Reports XIV, p. 761; XIX, pp. 89, 90; Bulletin No. 50, p. 110.

Balaklala Copper Mine consists of 72 patented claims, 1169 acres; also 800 acres of smelter and townsite land at Coram, in the Flat Creek mining district, in Secs. 10, 11, 12, 13, 14, 17, 20 and 21, T. 33 N., R. 6 W., about three miles northwest of Coram Station. Owned by First National Copper Company; office, 111 Broadway, New York. Officers, Thomas W. Lawson, president; W. A. Kerr, secretary, until May, 1919, when all operations were suspended. Under lease to the United States Smelting, Refining and Mining Company, Boston, Mass. The mines are located on the south side of Squaw Creek, at an elevation of 2400 feet. The country rock is rhyolite, ore occurring in lenticular masses as replacement of country rock in flat bodies, with slight dip to north, the greatest extension being to the east and west, with a series of north and south step faults, causing displacement from a few feet to more than 100 feet. The main ore-bearing fissure strikes N. 70° E., with a northwesterly dip somewhat steeper than the slope on which it occurs. The lode is well marked in places by heavy gossan, and has been traced more or less continuously for over a half mile. The main orebodies are developed for lengths of 900 and 1100 feet. The ore is cuperiferous pyrite, copper values being mainly in chalcopyrite, with a little chalcocite and covellite, all carrying gold and silver values and said to average about 2.7% copper, 0.9 oz. silver, 0.03 oz. gold, 21.4% silica, 31.5% iron, 4.3% lime, 3.4 % alumina, 2.2 % zinc and 35.2% sulphur.

Developments consist of 20 tunnels, of which the main haulage tunnel, known as the Wiel, is 6000 feet in length, and has a large glory hole.

Ore reserves are said to be about 3,000,000 tons of 2.7% copper ore with 0.95 oz. silver and 60¢ gold per ton.

Production June 30, 1918, to May 15, 1919, amounted to 82,271 tons of ore, the net recovered values being 2.7% copper and \$1.54 gold and silver, or a total of \$178,352, copper being sold at 19.59¢ per pound. For the year 1917-1918, the mine produced 82,876 tons of ore assaying 2.29% copper, \$1.57 in gold and silver, which compares with the previous year's production of 76,559 tons, netting \$174,656. Shipments were made to the Mammoth smelter at Kennett. The smelting plant which was located at Coram has been dismantled and the material sold to the Shasta Zinc and Copper Company at Winthrop.

Mine equipment consists of hoists, 5 air compressors, air drills, electric tramway, motors, cars and track, ore bunkers (capacity 1000 tons), and 16,500 feet of aerial tramway from the mine to Coram.

Buildings include an office, store, school, hospital, sawmill, and about 75 dwellings.

The Mammoth Copper Company resumed operations on the mine in November, 1923. The ore mined is transported over the aerial tramway to Coram, then by rail to the Mammoth smelter at Kennett.

Five to eight tons per month of copper precipitate, assaying 50% copper, is recovered from the mine water. Thirty men are employed.

Baxter-Winthrop Group, formerly known as Copper City Mine, owned by Shasta Zinc and Copper Company, comprises the Excelsior, Brown, Humboldt and Baxter claims, located in Secs. 21 and 28, T. 34 N., R. 3 W., 1 mile north of Copper City, in Pittsburgh mining district. Developments consist of 3000 feet of tunnels and 1000 feet of drifts. The lower tunnel, known as the Winthrop tunnel, was driven northeast 1000 feet, developing an orebody which was stoped to the surface. On the Baxter Claim, in Baxter Gulch, there is a shaft 150 feet deep, which is connected by drifts with the workings from the Winthrop tunnel. All workings caved. Idle.

Bibl: Bulletin No. 50, p. 107.

Black Diamond Group of Mines. This group, consisting of a half section of land and eighteen claims, is located in Secs. 2 and 3, T. 33 N., R. 4 W., in the Stillwater mining district. Formerly operated by Northern California Investment Company, George Bayha, vice president and agent, Redding, California.

The ore on these claims occurs on the contact of McCloud limestone and quartz-augite-diorite, and at a number of points small masses of ore have been found along this contact. The orebodies discovered are small and irregular. The ore consists of chalcopyrite, pyrrhotite and magnetite. A large amount of development work has been done on the property, consisting of a number of tunnels. Idle.

Bibl: Bulletin No. 50, p. 108.

Brushy Canyon consists of 160 acres in Sec. 34, T. 34 N., R. 3 W., about two miles south of Copper City, in Pittsburgh mining district.

Owners, W. Collins et al. Development consists of one tunnel 300 feet long. Idle.

Bibl: Bulletin No. 50, p. 102.

Bully Hill and Rising Star Mines. These properties are situated one and one-half miles north of Copper City, in Secs. 15, 16, 21 and 28, T. 34 N., R. 3 W., in the Pittsburgh mining district. Owned by Shasta Zinc and Copper Company, 1800 Hobart Building, San Francisco; D. C. Jackling, president; W. Arnstein, vice president; M. W. Enrich, secretary; G. T. Jackson, general manager; Louis Monohan, mine superintendent.

At Bully Hill, there are two lodes that have been extensively worked, the Eastern or Delamar lode in the Bully Hill Mine, and the Western or Anchor lode in the Rising Star Mine. The general course of the lodes is N. 10° E.; dip, approximately vertical. They are almost parallel and are about two hundred yards apart. The shear zones in the rhyolite are more or less distinct throughout, and contain irregularly lenticular overlapping orebodies. These orebodies vary in extent and size from lenticular or sheet-like nodules a few inches wide, up to bodies of ore 100 feet in length and 12 to 30 feet thick. The greatest extent of the orebodies appears to be in a nearly vertical direction, pitching steeply north. The ore is composed of pyrite, chalcopyrite, chalcocite, bornite, sphalerite, and galena in varying proportions. The ore mined in the Rising Star Mine is principally sphalerite and some pyrite and chalcopyrite. Quartz is scarce in the gangue, and barite is more common, particularly in ore that is rich in copper. The average content of ore mined from the Rising Star Mine is about 22% zinc, 2% copper, 2 ounces silver, and 60¢ in gold. Since 1917 all development work has been confined to the Rising Star Mine. A series of lenticular orebodies have been opened up on the 5th, 6th, 7th, 8th and 9th levels.

Developments: The Bully Hill Mine has been opened by a number of tunnels with extensive drifts, crosscuts and raises, comprising several thousand feet. There are nine levels 100 feet apart, eight raises from 50 to 560 feet in height, and an 1100-foot crosscut tunnel on the Bully Hill Claim, about 600 feet below the gossan outcrop. At 1100 feet from portal of the tunnel, where the vein was cut, a 3-compartment shaft was sunk to a depth of 950 feet. No. 3 or main tunnel level is connected by chutes and raises with the upper workings, of which some of the drifts run along the lode 800 to 1000 feet.

Rising Star Mine. The underground workings were unwatered in 1917, the shaft repaired, and a large amount of development was done from 1917 to 1922, opening up a series of lenticular orebodies on the 5th, 6th, 7th, 8th and 9th levels. It is reported that 300,000 tons of ore have been blocked out. During 1918 and 1919, silver-gold-copper ore was shipped from the lower levels to the Mammoth smelter at Kennett.

Developments: There is a 3-compartment shaft 800 feet deep. The main adit tunnel (No. 5 level) intersects the shaft 219 feet below the collar, with six levels below No. 5 level, 100 feet apart, with drifts on the 6th, 7th, 8th and 9th levels. Ore is trammed through No. 5 level to

storage bins, then hauled in cars by horses one-half mile to bins at the smelter at Winthrop.

Mine equipment: Electric hoist, 10-drill Ingersoll-Rand compressor, driven by 60-h.p. motor, blacksmith shop, and timber-framing shop. Mine water is handled by two 5- by 9-inch Aldrich quinquplex pumps, each driven by 100-h.p. motor; one pump on 9th level, the other on 11th level. Electric power is secured from the Pacific Gas and Electric Company.

Smelter: The 400-ton smelter, idle since 1910, has been dismantled and moved to Winthrop. Some parts of it were salvaged and used in the construction of the zinc oxide plant. During 1920 to 1922, a reverberatory and zinc oxide plant having a capacity of 150 tons per day was constructed on this property. The plant was put in operation during the early part of June, 1922, and operated until December, 1922, when the plant was closed down due to fall in price of zinc oxide.



General View of Bully Hill Smelter, Shasta Zinc and Copper Company, Winthrop, Shasta County.

In August, 1924, the California Zinc Company was organized to take over the Bully Hill mine and smelter from the Shasta Zinc and Copper Company. A. D. Bryant, general manager.

The method of treating the ore from the Rising Star Mine, which runs about 22% zinc, 2% copper, 2 ounces silver, and about 60¢ in gold, consists in charging a mixture of fine roasted ore and coal dust in a copper reverberatory smelter. The heating of the mixture to the temperature of the reverberatory furnace reduces the zinc oxide to zinc and volatilizes it. The volatilized zinc oxidizes in the furnace gases and passes with them to be recovered in the flues. The residual ore mixture is smelted in the usual way for the recovery of copper matte with gold and silver values.

Description of plant: From the crude ore bins, a belt conveyor carries the ore to a 10 x 20-inch Blake crusher, where it is reduced to 2-inch size. A 20-inch belt feeder draws the ore from small surge hoppers and discharges it into a 37½ x 15-inch set of rolls, where it is

crushed to $\frac{5}{8}$ -inch size. The discharge from rolls is conveyed by a 16-inch bucket elevator to a Mitchell electric vibrating screen, the over-size going to a second set of rolls and being returned to the elevator. The screen under-size is automatically sampled and delivered to a conveyor which is equipped with a weightometer. The under-sized ore is finally conveyed to any one of eight storage bins of a set of 16 bins, each having a capacity of 2200 cubic feet. The remaining eight bins are used for furnace charge, consisting of calcines, flux and coal. Under each of the fine ore bins is a belt feeder, which permits a predetermined flow to conveyors, leading to McDougall roasters. The roasted ore is discharged to steel-flight conveyors and conveyed back to the opposite side of storage bins, cooling en route. A bucket elevator elevates and assists in mixing the charge before it goes to the hoppers of the reverberatory furnace. The reverberatory furnace is fired by fuel oil. The slag from the reverberatory furnace is handled in 5-ton hand-operated



View of Crushing Plant, Reverberatory Furnace, No. 1 Bag-House, and Storage House, Shasta Zinc and Copper Company, Bully Hill, Shasta County.

pots and hauled to the dump by electric locomotives. The matte is handled in matte cars, and hauled to bins after cooling, where it is loaded in railroad cars for shipment. The waste gases are drawn into cooling flues. Exhaust fans are used to draw gases through the flue system. All gases are filtered through bags.

Bag-house No. 1 is a steel structure containing four fireproof compartments, each compartment having four transverse hoppers which connect with 88 bags. The bags are 18 inches in diameter and 25 feet long. A mechanical shaking apparatus is used. From No. 1 bag-house, the zinc oxide, which contains 3 per cent soluble sulphates and is not the grade required, is loaded in cars from the hoppers and trammed to the refining plant. The cars are hauled up an incline and dumped into hoppers over the refining furnace, which has a capacity of 30 tons per day. Here crude zinc oxide is reheated at a temperature of 1200° . The gases from this furnace are drawn through a flue (trail) to No. 2 bag-house, containing 500 bags, 18 inches in diameter by 25 feet long.

The zinc oxide is here collected in canvas sacks 4 feet long by 20 inches in diameter, which are attached to hoppers below the bags. These sacks are then transported to the storage building, which is of steel construction throughout, 92 by 141 feet. This storage building contains a number of bins in which the zinc oxide can be distributed according to analysis. The capacity of the bins is one month's run. A bolting machine, mixer and two packing machines complete the equipment in the storage house. Here the zinc oxide is packed in barrels which are paper lined, and it is then ready for shipment. Capacity of the plant is 30 tons of zinc oxide per day, with 15 to 20 tons of copper matte. Sixty men were employed at the mine and 140 men around the smelter.

Bibl: State Mining Bureau Bulletin No. 50; State Mineralogist Reports XII and XIV; U. S. Geological Survey Redding Folio.

Colma Copper Group of Mines is located in Secs. 6 and 31, T. 33 and 34 N., R. 5 W., 6 miles west of Kennett, in the Backbone mining district. It lies between the Uncle Sam and Mammoth holdings, at an elevation of 2400 feet. Owners are M. E. Dittmar of San Francisco and Louis Monahan of Winthrop, California. The property is under bond to the American Zinc, Lead and Smelting Company, 1012 Pierce Building, St. Louis, Missouri. C. B. Nichols, superintendent.

This group of claims is being developed through No. 5 tunnel level of the Uncle Sam Mine, with the hope of picking up the direct extensions of the Mammoth Mine ore trends along the so-called 'California Fissure' or shear zone. The trend of the tabular ore deposition has been developed in the Mammoth Mine from the point of original exposure for a distance of approximately 5000 feet through the Mammoth property towards the Colma copper boundaries. The course of the No. 5 tunnel level of the Uncle Sam Mine is N. 40° E., and it intersects the Uncle Sam vein 1200 feet from the portal. About 350 feet beyond this vein, a vein of quartz 3 feet in width was cut, which is heavily mineralized with chalcopyrite and pyrite. The crosscut tunnel has been driven ahead 1800 feet beyond the Uncle Sam vein, and the company plans to continue driving the crosscut to intersect the Mammoth ore fissure. The formation cut by this tunnel is quartz-porphyrty and rhyolite.

Equipment: A 10 x 12-inch Ingersoll-Rand compressor driven by a 50-h.p. motor, air drills, cars, blacksmith shop, and dwellings. Electric power is secured from the Pacific Gas and Electric Company. Eight men are employed.

Donkey Mine consists of two patented claims comprising 40 acres in Sec. 11, T. 33 N., R. 2 W., in the north Cow Creek mining district, about two miles northeast of Ingot, and in the Shasta Forest Reserve. Owner, Afterthought Copper Company. Idle.

Bibl: Bull. No. 50, pp. 105-106; State Mineralogist Report XIV, p. 765.

Golinsky Group, formerly known as Little Backbone, is located in Sec. 28, T. 34 N., R. 5 W., about four miles from Kennett, in the Backbone mining district. Owner, Mrs. B. Golinsky of San Francisco, California.

Holdings consist of 300 acres, patented, adjoining the Mammoth Mine on the east. The orebody developed extended 150 feet N. 70° E.,

dipping southeast, and to a depth of not over 100 feet. This orebody is approximately parallel to the Mammoth orebody. Formation Balaklala rhyolite.

Workings consist of several tunnels, one being 800 feet in length, 400 feet of drifts, and one stope. Ore bins and dwellings on the property. Produced \$70,000. Idle.

Bibl: Bull. No. 50, p. 100; State Mineralogist Report XIV, p. 766.

Greenhorn Mine. Owners, *Atascadero Mining Company*, 1014 Hobart Building, San Francisco, California; E. G. Lewis, president; C. E. Gilman, secretary; Albert Hanford, consulting engineer. The property is located in French Gulch mining district, in Sec. 6, T. 32 N., R. 7 W., 22 miles northwest of Redding. Elevation 2000 feet. Holdings consist of 15 patented mining claims and 120 acres of patented land. Total area of 420 acres.

The country rock is quartz-porphry. The ore occurs as lenticular orebodies in a shear zone in altered rhyolite which strikes N. 60° W., with dip of 40° W., and is mainly chalcopyrite or pyrrhotite with some suprite in the upper workings, as well as malachite and azurite. Principal ore mined is chalcopyrite associated with pyrrhotite and pyrite. Some beautiful specimens of native copper were discovered in the upper workings of the mine. Orebodies developed varied from thin seams to 10 feet in thickness. Management claims 250,000 tons of 3% ore blocked out.

Development consists of six tunnels totaling over 3000 feet, the greatest depth of workings below the outcrop being 480 feet.

Equipment: Ingersoll-Rand 10 x 12-inch compressor, air drills, cars, blacksmith shop, and bunk houses. Compressor was driven by electric motor. Electric power secured from the Pacific Gas and Electric Company. Idle.

Bibl: State Mineralogist Report XVII, p. 518.

Kosh Creek Mine consists of 12 claims in Sec. 23, T. 37 N., R. 1 W., on Kosh Creek, near the 'big bend' of Pit River, at 2000 feet elevation and several miles north of the copper belt. Owners, W. Murray et al. Idle.

Bibl: State Mineralogist Report XIII, p. 63; Bull. No. 50, p. 108.

Little Nellie Mine is located southeast of the Iron Mountain and Hornet mines of the Mountain Copper Company, eight miles northwest of Keswick. Holdings consist of the Alleghany and Bennington groups, 30 patented claims. Area 575 acres in Secs. 27 and 35, T. 33 N., R. 6 W., in the Flat Creek mining district. Elevation 2400 feet. Owners, Pittsburgh and Mount Shasta Gold Mining and Milling Company; J. J. Schneider, president; T. V. Scott, secretary and managing director. Offices, 516 Federal St., Pittsburgh, Pa.

The mine was opened and worked for gold in the early days; however, all the later development has been in prospecting for orebodies carrying copper. Three parallel quartz veins, known as the Little Nellie, Yorktown and Yorktown No. 2, occur in quartz-diorite. These veins strike N. 60° E. and dip 70° N. Width is 2 to 4 feet. The principal development has been confined to the Little Nellie and Yorktown veins. Stated production is \$160,000 in gold.

Developments: Upper tunnel driven on the Little Nellie vein a distance of 1125 feet; lower tunnel driven on the Yorktown vein a distance of 3888 feet, with crosscuts driven to the Little Nellie vein. The upper and lower workings are connected by a shaft which is located 1600 feet from the portal of the tunnel. From this point a crosscut has been driven north 2260 feet, at which point a vertical winze has been sunk 522 feet deep. This winze cut some small lenses of ore, showing chalcopyrite associated with pyrite. No extensive orebodies were encountered in crosscut or winze.

Equipment consists of 25-h.p. hoist (14 x 9 x 10-inch), Sullivan compressor driven by 50-h.p. motor, carpenter and blacksmith shops, and dwellings, and 15-stamp mill. Two men are employed.

Mammoth Copper Mining Company is a subsidiary of the U. S. Smelting, Refining and Mining Company, 55 Congress St., Boston, Mass. Mine office at Kennett, Shasta County, Cal. A. P. Anderson, general manager; O. J. Eggleston, manager; R. E. Hanley, superintendent. The Mammoth Copper Company is one of the largest producers of copper metal in California, and owns the most productive mines in the Shasta copper belt. The properties owned by the company are located in Secs. 2, 3, 29, 31, 32 and 33, T. 33 and 34 N., R. 5 W., about 4 miles northwest of Kennett. Elevation 3000 feet.

Properties: The Mammoth Group, which is the principal property, comprises 1117 acres, patented, and 434 acres, unpatented. The company also owns and operates the following properties (Plate II):

Anderson Group, consisting of 15 claims, 260 acres unpatented; Butters section, comprising 2719 acres; Crystal Group, 24 claims, 480 acres; Friday-Lowden Group, 150 acres patented, 188 acres unpatented; Keystone, 8 claims patented, 160 acres; Little Mammoth, 57 acres patented; Sheridan Group, 45.7 acres patented; Spread Eagle Group, 22 claims, 163 acres patented; Stowell Group, 10 claims, 188 acres of which 128 acres are patented; Vulcan Group, 10 claims, 200 acres patented. The company also owns a 195-acre patented smelter site one-half mile north of Kennett; 184-acre patented town site, and 657 acres in additional tracts.

Mines.

Crystal Group consists of 23 unpatented claims and is located in Sec. 11, T. 33 N., R. 6 W., in the Flat Creek mining district, adjoining the Balaklala on the north, the Vulcan on the west, and about $3\frac{1}{2}$ miles northwest of Coram. Owners, Mammoth Copper Company. Development by tunnels aggregates 200 feet. Idle.

Bibl: State Mineralogist Report XIV, p. 764.

Friday-Lowden Mine is located one mile southwest of the Mammoth Mine. Development on the property has revealed one orebody 60 feet above the main crosscut tunnel, the strike of this body being N. 40° W., with a dip of 35° NE. The orebody extends up to the 670-foot level of the Mammoth workings. A winze has been sunk on this orebody from the 670-foot level to the Friday-Lowden tunnel level. The ore is chalcopyrite and pyrite, with quartz and barite as gangue.

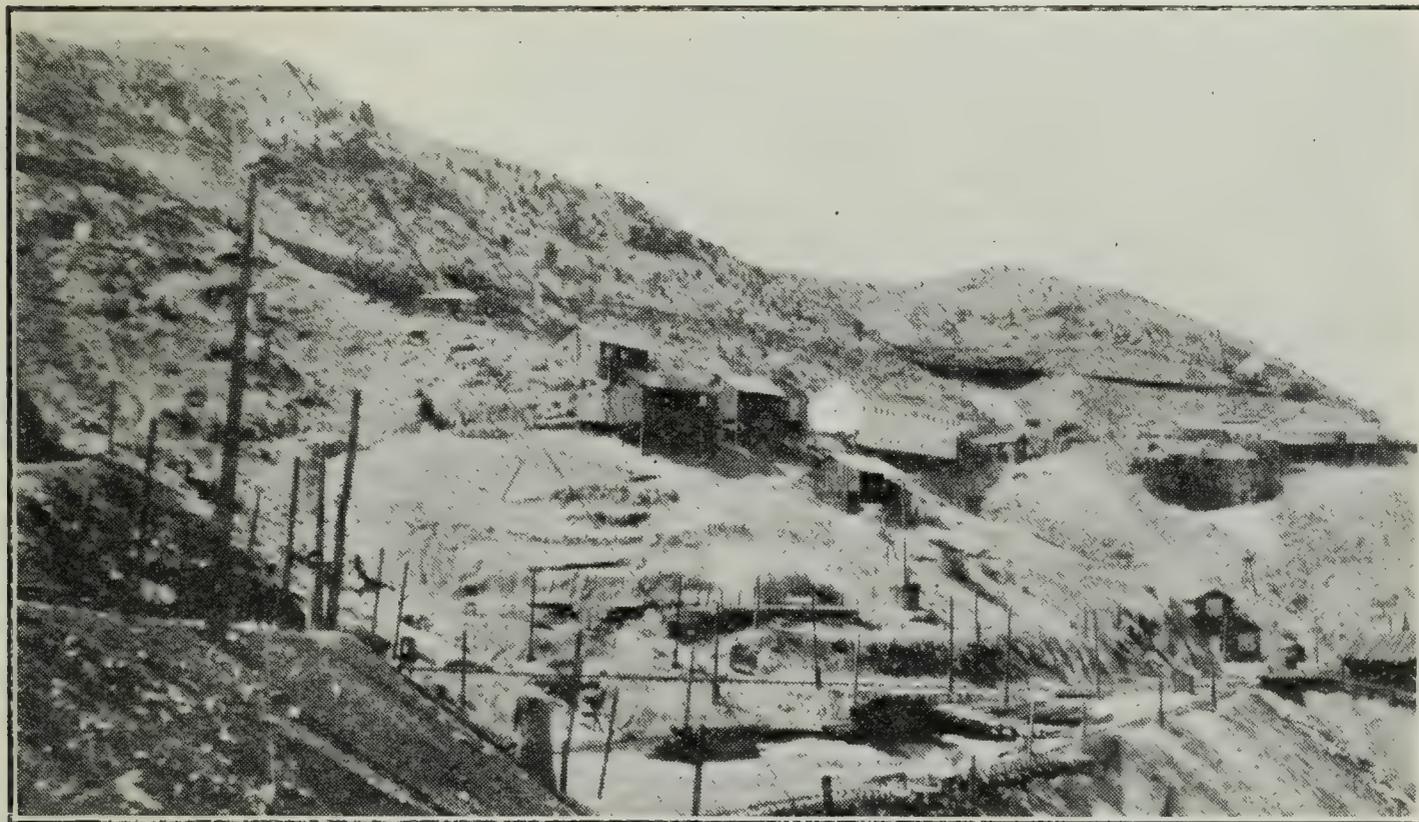
Developments consist of a crosscut tunnel 4000 feet in length, with 1000 feet of crosscuts and drifts.

Keystone Mine is located in Sec. 14, T. 33 N., R. 6 W., adjoining the Balaklala Mine on the south and the Stowell on the east. Elevation 3000 feet.

Developments consist of two tunnels, the upper tunnel being driven S. 30° W., 300 feet, and the lower tunnel being driven S. 30° W., 2000 feet, with 2000 feet of drifts and crosscuts, the most extensive orebody being found 50 feet above the lower tunnel. The orebody is 100 feet in length, 50 feet thick, and strikes north with a dip to the east. It was developed during 1918. The ore is chalcopyrite associated with pyrite. It is stated that there are 20,000 tons of ore carrying 3% copper on the dump.

Equipment: 4-drill Laidlaw-Dunn compressor driven by 50-h.p. motor, air drills, ore cars, blacksmith shop, and dwellings.

Mammoth Mine. The Mammoth lode exposed in the Mammoth Mine has a course of N. 80° E., and has been followed for about 5000 feet.



View of Mammoth Mine, Mammoth Copper Company, Kennett, Shasta County.

The principal orebody developed had a length of 800 feet and a depth of 200 feet from the upper gossan croppings. This orebody dips 30° NW. The orebodies consist of a series of long, flat-lying lenses, occurring irregularly in shear zones in the rhyolite. The ore is composed chiefly of pyrite, chalcopyrite, and sphalerite. Quartz is the gangue mineral, although much of the ore is a heavy sulphide only showing a trace of quartz. Ore as mined in recent years is said to average 3% copper with \$2 in gold and silver.

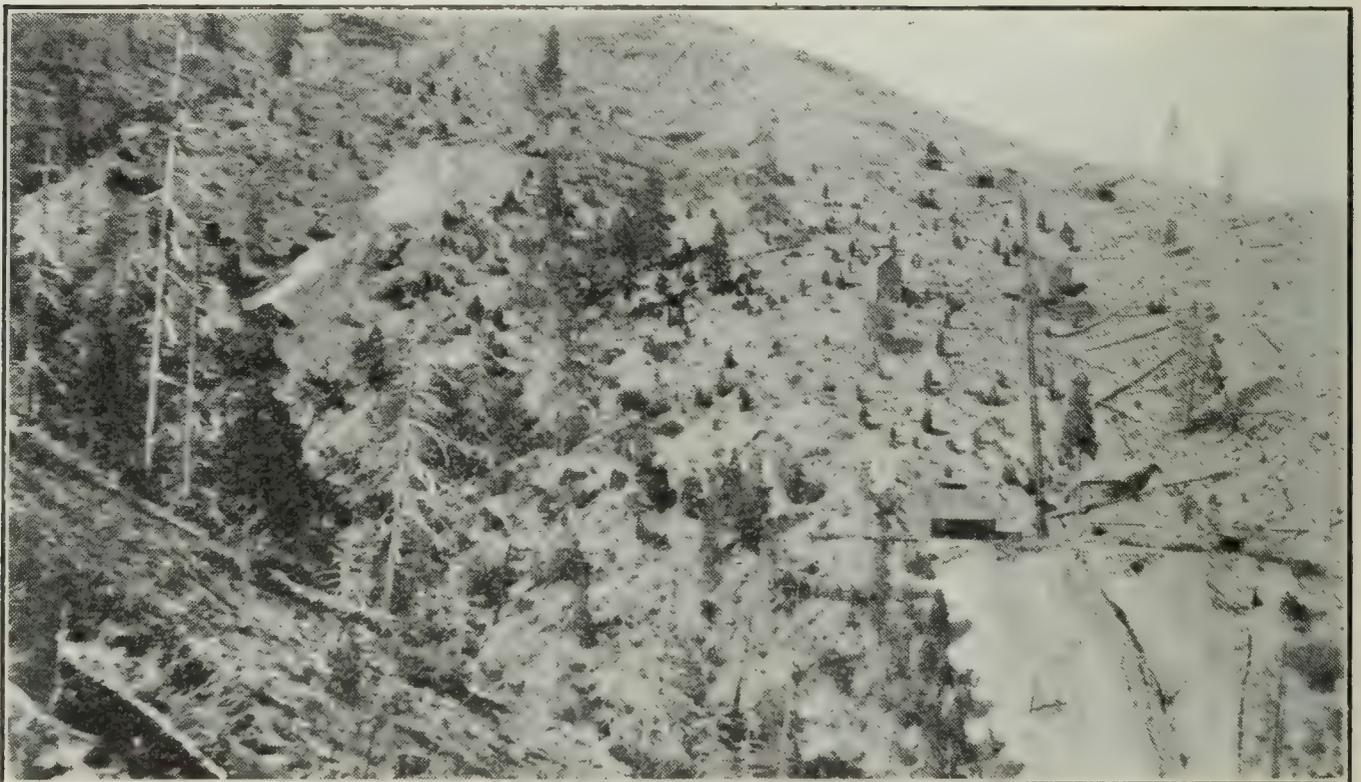
Developments consist of 5 tunnels, No. 5, the main haulage tunnel, being 2500 feet long. It is known as the 500-foot level. The tunnel is 8 by 10 feet and contains a 3-foot gauge track, 56-lb. rail with electric haulage. No. 3 tunnel (300-foot level) is driven west 5000 feet to the shaft which from this level has a depth of 500 feet, with levels at 540, 670 and 780 feet. On the 540-foot level an orebody has been developed which strikes northeast. It is 30 feet thick by 250 feet in length. Total amount of underground workings amount to 60,000 feet. It is

stated that there are probably 25,000 tons of ore developed above the 500-foot level.

Spread Eagle Mine is located in Sec. 13, T. 33 N., R. 6 W., and adjoins the Balaklala and Keystone mines on the east. The general trend of the ore fissures developed on this property is N. 70° W., and dip 75° SW. The ore is capped by a large mass of gossan on the steep slopes at the head of Motion Creek. The ore developed beneath the capping is pyrite with occasional small masses of chalcopyrite.

Development work consists of eight tunnels, aggregating about 3000 feet.

Stowell Mine is located in Sec. 14, T. 33 N., R. 6 W., one-half mile west of the Spread Eagle Group, and adjoins the Keystone Mine on the west. Elevation 3100 feet. On the slope of the ridge north of Spring Creek, there is a large mass of gossan which has a general course of northeast. Crosscut tunnels driven into the ridge below the gossan



View of the Sutro Mine, Mammoth Copper Company, Kennett, Shasta County.

coppings have exposed a massive body of pyrite ore. This orebody has apparently a course of N. 40°–60° W. The main tunnel is approximately 2000 feet in length. Other tunnels on the property aggregate about 800 feet. It is reported that ore reserves developed amount to 40,000 tons of 3% copper ore carrying \$1.50 in gold and silver per ton.

Equipment: Aerial tram from the mine to the bunkers at the Balaklala Mine.

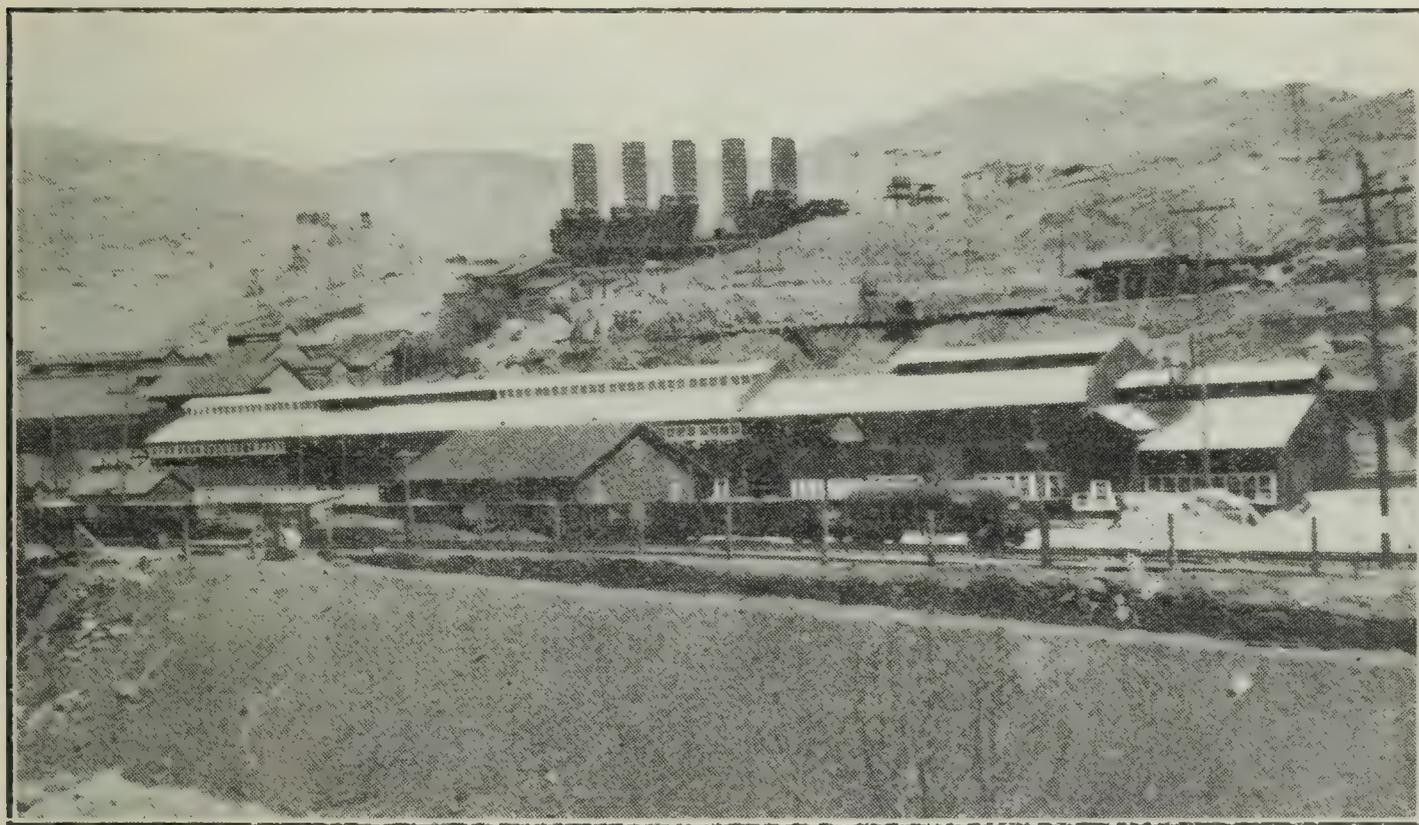
Sutro Mine is located in Sec. 29, T. 34 N., R. 5 W., one mile north of the Mammoth Mine and adjoining the Summit Mine on the east. It is situated on the eastern slope of Bohematosh Mountain, at an elevation of 3000 feet. The tabular orebody developed occurs along a shear zone with a course of N. 70° E., and a dip to the southeast. The orebody is 25 to 50 feet thick and about 200 feet in length. The main working tunnel is driven north 2000 feet. No ore was found on this level, but

the ore zone was encountered in an upraise from this level. On the northeast slope of the mountain there is a tunnel driven southwest about 1500 feet, at an elevation about 200 feet above the main tunnel. This tunnel intersected the orebody. There is another tunnel about 150 feet above this latter tunnel which was driven south 500 feet, developing some chalcopyrite associated with pyrite. Ore reserves are reported to be 40,000 tons, carrying 3% copper with \$2 in gold and silver per ton. The workings are connected with the Mammoth Mine by a tram line $1\frac{1}{2}$ miles in length.

Equipment: 20-h.p. electric hoist, Ingersoll-Rand compressor driven by 100-h.p. motor, blacksmith shop, and camp buildings.

Vulcan Mine is located in Secs. 11 and 12, T. 33 N., R. 6 W., and adjoins the Shasta King Mine on the west. Holdings consist of 12 claims.

Developments consist of a crosscut tunnel driven north 1500 feet from the south fork of Squaw Creek. There are three other tunnels



General View of Mammoth Smelter, Mammoth Copper Company, Kennett, Shasta County.

at a higher elevation. Some massive pyrite ore was developed in the upper tunnels but no ore was developed in the main crosscut tunnel. Idle.

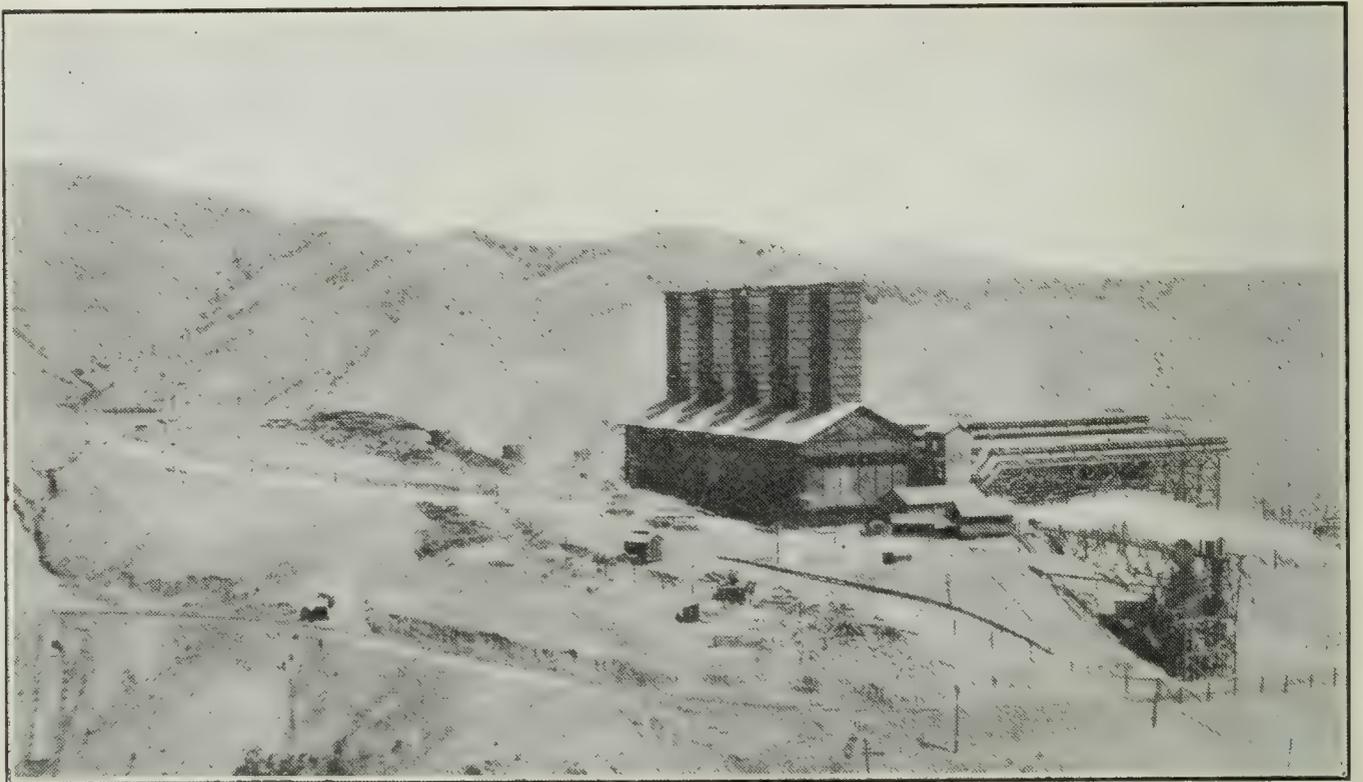
Ore Transportation System.

The ore from the Keystone and Stowell mines is transported by aerial tram to bunkers at the Balaklala Mine, then by aerial tram to Coram, from which point it is hauled by train over the Southern Pacific tracks to the smelter at Kennett. Ore from the Sutro Mine is trammed by mules to bunkers at the Mammoth Mine. The ore from the Mammoth Mine is drawn from mine chutes on the 500-foot level, into narrow-gauge railroad cars, and taken over a 2-mile electric railroad equipped with two 25-ton electric locomotives, six 25-ton steel gondola cars, and nine 10-ton flat cars to ore bins with a capacity of 1000 tons. From these bins the ore is taken over an incline gravity railroad in skips to another

set of bins. The gravity railroad has a length of 4000 feet and a drop in this distance of 1700 feet. The skips have a capacity of 20 tons of ore and travel at a speed of 2000 feet a minute. From these lower bins the ore is taken to the smelter over a steam railroad operated with three 40-ton locomotives and 22 standard steel railroad cars. The capacity of the transportation system is about 1500 tons of ore per day.

Smelter.

The smelter at Kennett has a capacity of 2200 tons. The semi-pyritic process of smelting is used, the ore being treated with a low percentage of coke. The smelting process consists in eliminating the excess of iron in the ore by adding an excess of silica and lime so as to obtain a thin slag. The charge is one car of coke to three of ore and silica. This charge is automatically conveyed from the weighing platform to the five blast furnaces by means of electric trains. The matte from the furnaces is taken by means of a 50-ton crane to five 96 x 150-



Mammoth Smelter, Mammoth Copper Company, Kennett, Shasta County.

inch Allis-Chalmers converters. The blister copper from the converter plant is shipped to the refinery of the U. S. Metals Refining Company at Chrome, New Jersey. Two of the blast furnaces are under operation at the present writing. The smelter is supplied with a large bag-house which is divided into five sections, each section containing 592 bags, or a total of 2960 bags. The residue collected in the bags from the fumes is in the form of white powder containing arsenic, sulphur and gold. The residue from the bag-house is stored near the smelter.

The smelter and mines, after being shut down since May, 1919, resumed operations in November, 1923. The principal tonnage mined is from the Balaklala, Friday-Lowden, Keystone, Mammoth, and Sutro mines. About 250 men are employed.

McClure or Pioneer Group of Mines. The property is situated in Secs. 9 and 16, T. 34 N., R. 3 W., $1\frac{1}{2}$ miles north of Copper City, in the Pittsburgh mining district, and adjoins the Bully Hill Mine on the

northeast. Holdings consist of the following claims: McClure, Andrews, Banner, Everett, Hope, and Poverty, totaling 160 acres; patented.

Development consists of a crosscut tunnel 500 feet in length. Owners, Mount Shasta Gold Mines Corporation.

Bibl: State Mineralogist Report XIV, p. 769; Bull. No. 50, p. 110.

Minnie Haley Group of Mines is located on the west slope of Horse Mountain, in Sec. 24, T. 34 N., R. 4 W., $1\frac{1}{2}$ miles northeast of Heroult. Elevation is 1800–2000 feet. Owners are James Doyle and George G. Dean of Redding. Holdings consist of 8 claims.

The ore is found along epidote dikes which occur in the Dekkas andesite on the western slope of Horse Mountain. The ore is chalcopyrite associated with iron pyrite in quartz gangue, and carries values in gold and silver.

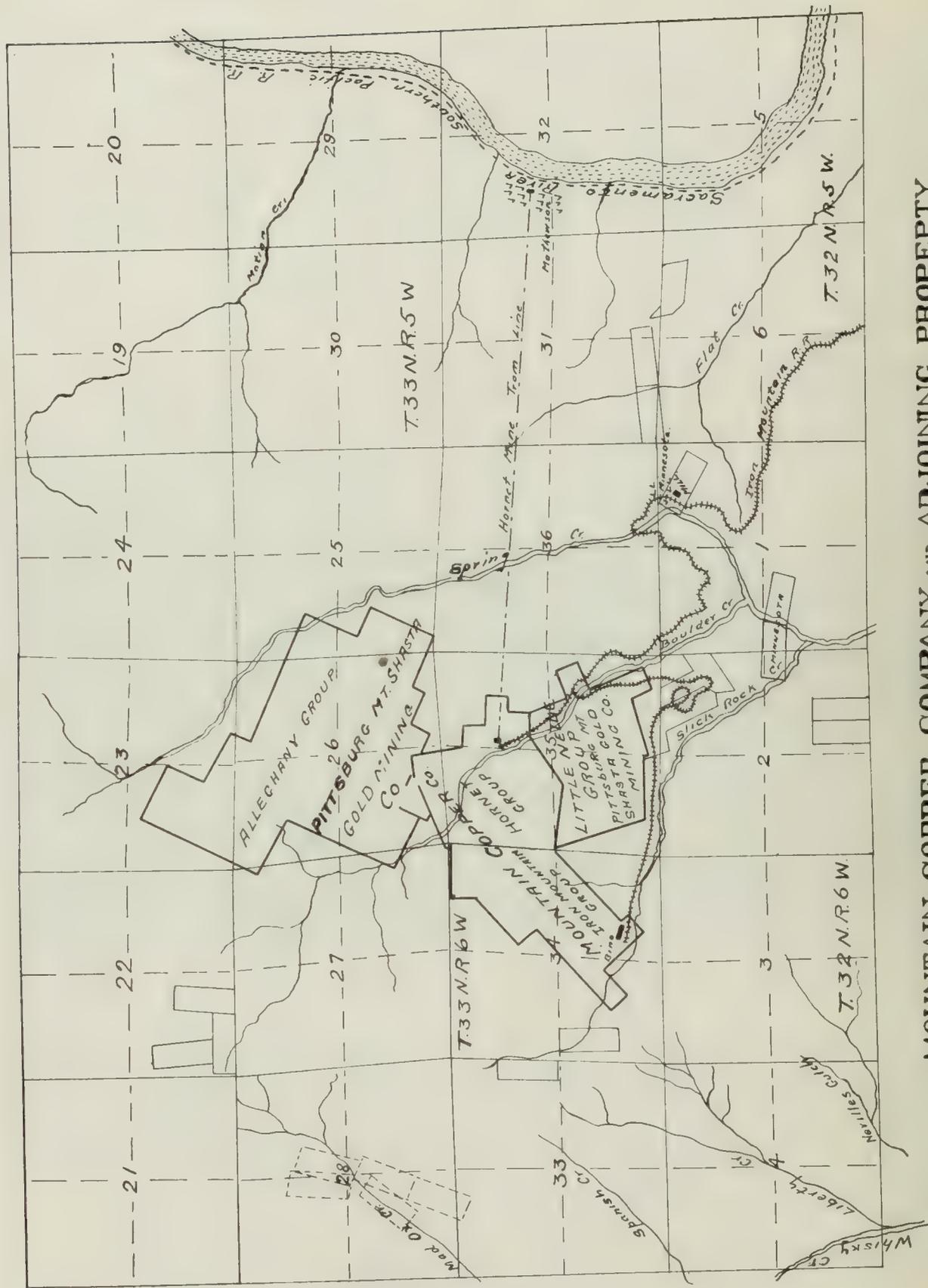
Developments consist of four tunnels from 20 to 150 feet in length. Two men employed on development work.

Bibl: State Mineralogist Report XIX, p. 92.

Mountain Copper Company's property includes the Iron Mountain and Hornet mines, comprising several hundred acres of patented land located in Secs. 34 and 35, T. 33 N., R. 6 W., 11 miles by railroad northwest of Keswick. Owners, Mountain Copper Company, 3 Lombard St., London, England. Sir Charles Fielding, president; A. N. Frewer, secretary. Pacific coast office, 332 Pine St., San Francisco. W. F. Kett, general manager; M. F. Murphy, superintendent. Mine offices are at Mathewson, California.

Since the Fourteenth Report of the State Mineralogist, 1914, the Iron Mountain Mine operated until the early part of 1921, when operations were suspended, due principally to the low price of copper. In 1915, a 500-ton flotation plant was built at Minnesota Station on the Iron Mountain Railroad for the purpose of treating the low-grade ores from the Iron Mountain Mine. The Hornet Mine has been under continuous operation, producing from 400 to 500 tons of pyrite ore per day. A new crushing and sizing plant, with a capacity of 600 tons per day, was constructed and put in operation in October, 1920. In February, 1922, an aerial tramway from the Hornet Mine to Mathewson, a station on the Southern Pacific Railroad, was put in operation. It is $2\frac{1}{2}$ miles in length and has a capacity of 100 tons per hour, and replaces the old Iron Mountain Railroad, used by the company for ore shipments for many years. The company ships 500 tons of pyrite ore daily to chemical plants near San Francisco. The Keswick smelter has been dismantled and the shops removed to Mathewson.

Hornet Mine. This mine lies to the north of the Iron Mountain Mine, on Boulder Creek, where a gossan capping, with a general strike of N. 30° E. is exposed, indicating the position of an immense orebody of pyrite which has been developed by a number of tunnels. One tunnel 300 feet above Boulder Creek is 500 feet in length on the eastern edge of the orebody. A lower tunnel, a short distance above the creek, follows the greater part of its length of 1600 feet along the western border. The main haulage tunnel is 10 by 10 feet, 3000 feet in length and is 180 feet below the old adit.



**MOUNTAIN COPPER COMPANY AND ADJOINING PROPERTY
SHASTA COUNTY.**

The ore occurs in a large fissure along a shear zone in the rhyolite. The lens of ore developed is several hundred feet in length; width and depth are undetermined. The general strike of the orebody is N. 30° E., with a dip almost vertical. The ore is nearly pure iron pyrite with not over 1% to 2% silica, the average copper content being 0.7% and the sulphur content 45% to 48%. The ore is mined by combination of shrinkage and caving method. Estimated tonnage of ore developed is about 5,000,000 tons. Ore is hauled from the mine by electric motor in trains of ten 7-ton cars to a bin at the crushing plant which has a capacity of 700 tons. From the bin the ore passes through a No. 6 Gates gyratory breaker, and is conveyed to a 4-foot trommel over the railroad bins, where it is screened into three sizes, namely: minus $\frac{3}{8}$ -inch; plus $\frac{3}{8}$ -inch; minus 1 $\frac{1}{2}$ -inch; plus 1 $\frac{1}{2}$ -inch, which includes pieces up to 4-inch maximum. About 10% to 20% of ore coming from the mine, containing waste, is classed as second-class ore and is dumped into separate bins.



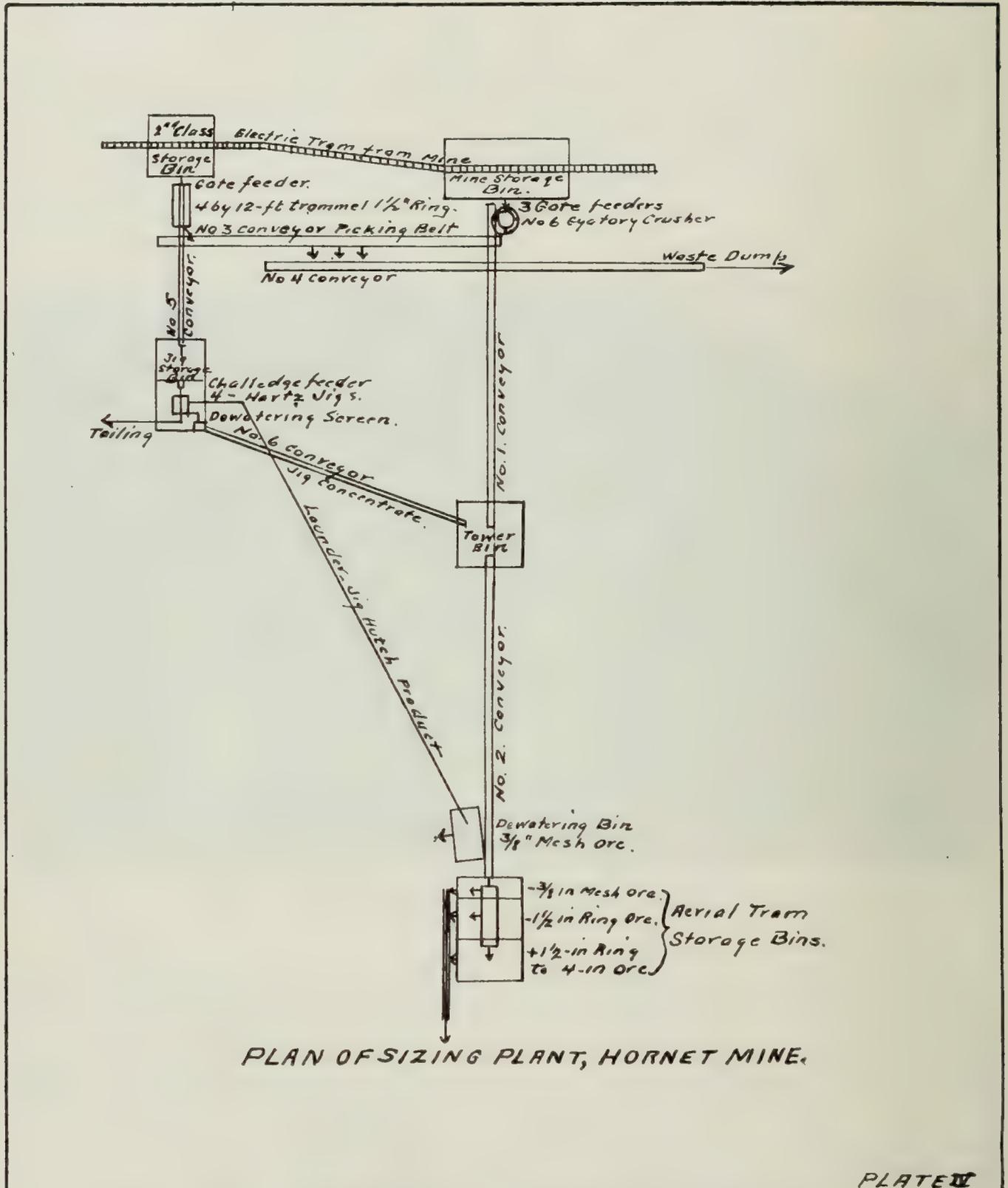
Crushing and Sizing Plant, Hornet Mine, Mountain Copper Company, Keswick, Shasta County.

This ore is fed to a 4 x 12-foot trommel having screens with 1 $\frac{1}{2}$ -inch openings. The oversize from the trommel goes to the picking belt conveyor, where the waste is sorted out. This waste is conveyed to the waste dump, while the clean ore goes to a No. 6 Gates gyratory crusher. The undersize from this trommel goes to the jig storage bin. From these bins the ore is fed by means of a Challenge disc-feeder to four one-compartment Harz jigs. The concentrates from these jigs flow to a special dewatering bin at the railroad. The 1 $\frac{1}{2}$ - to 4-inch size material is shipped to the Standard Oil Company, at San Francisco, and the mine's $\frac{3}{8}$ -inch material to the General Chemical Company, at San Francisco. The Standard Oil Company returns the pyrite cinder to the company's smelter at Martinez, where it is leached and the copper extracted. The Hornet Mine is the only property owned by the company that is under production. However, it is the company's plan to resume operations at

Iron Mountain Mine when the price of copper will warrant reopening it. Two hundred men are employed.

Bibl: State Mineralogist Report XIV, pp. 769-770; Bulletin No. 50, pp. 70-78.

Iron Mountain Mine. This mine has been operated since 1880, it being the pioneer copper mine of the Shasta copper belt. The company

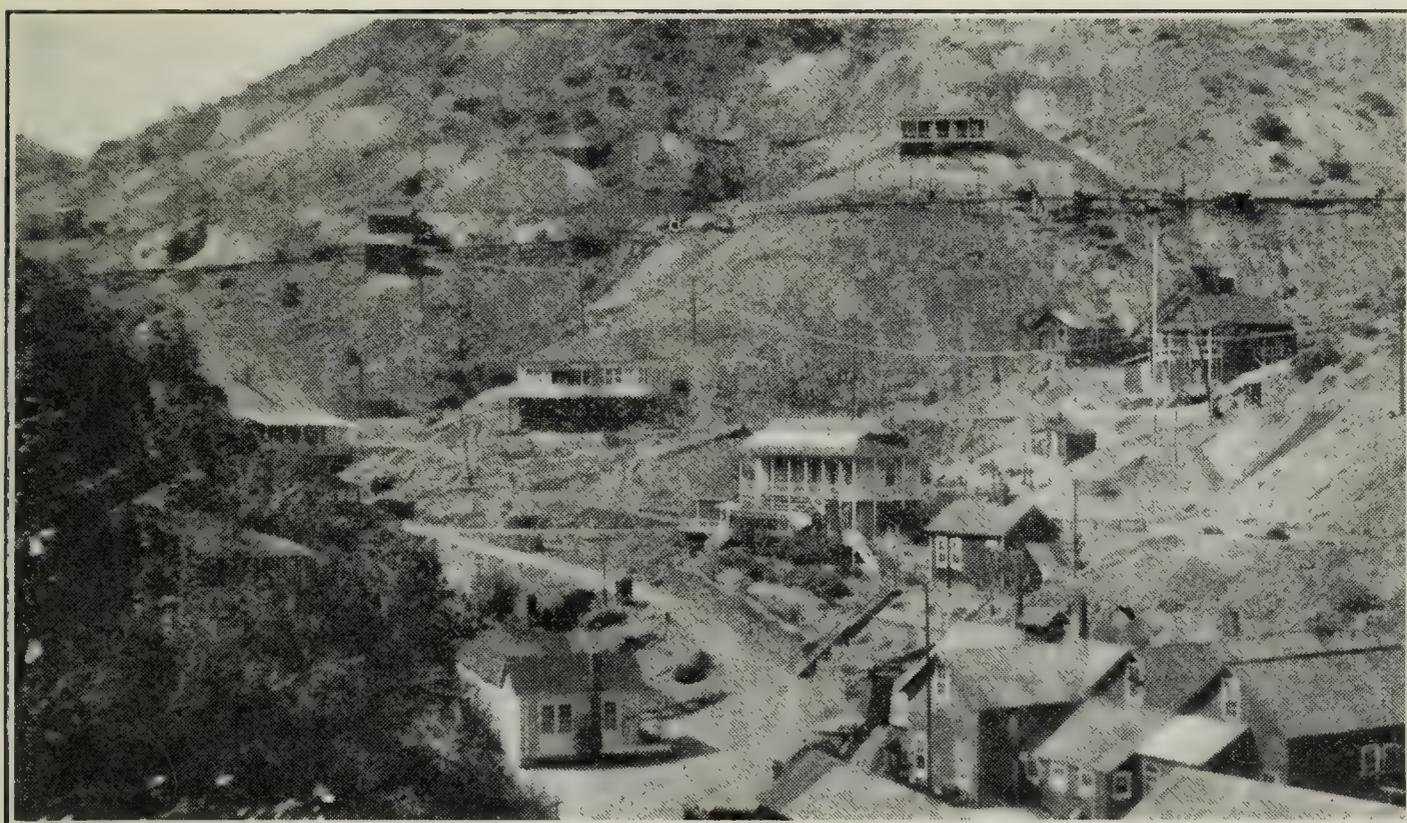


controls a large acreage on Iron Mountain, between Slick Rock and Boulder creeks. Elevation varies from 2400 to 3200 feet. The Iron Mountain fissure occurs in the rhyolite and has a course of N. 70° E., and dips 75° W.

The ore deposits of Iron Mountain consist of immense masses of sulphides, mainly underlying a gossan capping 300 feet in width, but in places the ore occurs in and under rhyolite. The principal ore mass developed lies on the southern slope of Iron Mountain above Slick Rock

Creek. This orebody was 800 feet long, from 100 to 400 feet wide, and 600 feet in depth below the gossan outcrop. It contained about 2,000,000 tons of ore of all grades. The ores are chalcopyrite associated with massive pyrite carrying from 2.5% to 5% copper, with \$2 in gold and silver per ton. The pyrite orebody has been worked out, but it is reported the present ore reserves amount to 300,000 tons of siliceous copper ore carrying 3% copper. (Plate III.)

Developments consist of thousands of feet of tunnels, the principal tunnels through which the ore was mined being No. 8 mine tunnel, driven N. 10° W. 3000 feet, and at a higher elevation, the Confidence tunnel, driven N. 40° W. several thousand feet. The Complex Mine, which is located east of Confidence tunnel at an elevation of 3150 feet, has been driven north 3000 feet, intersecting the Iron Mountain fissure. An incline tram connects this mine with bunkers on the Iron Mountain Railroad, a distance of 1500 feet.



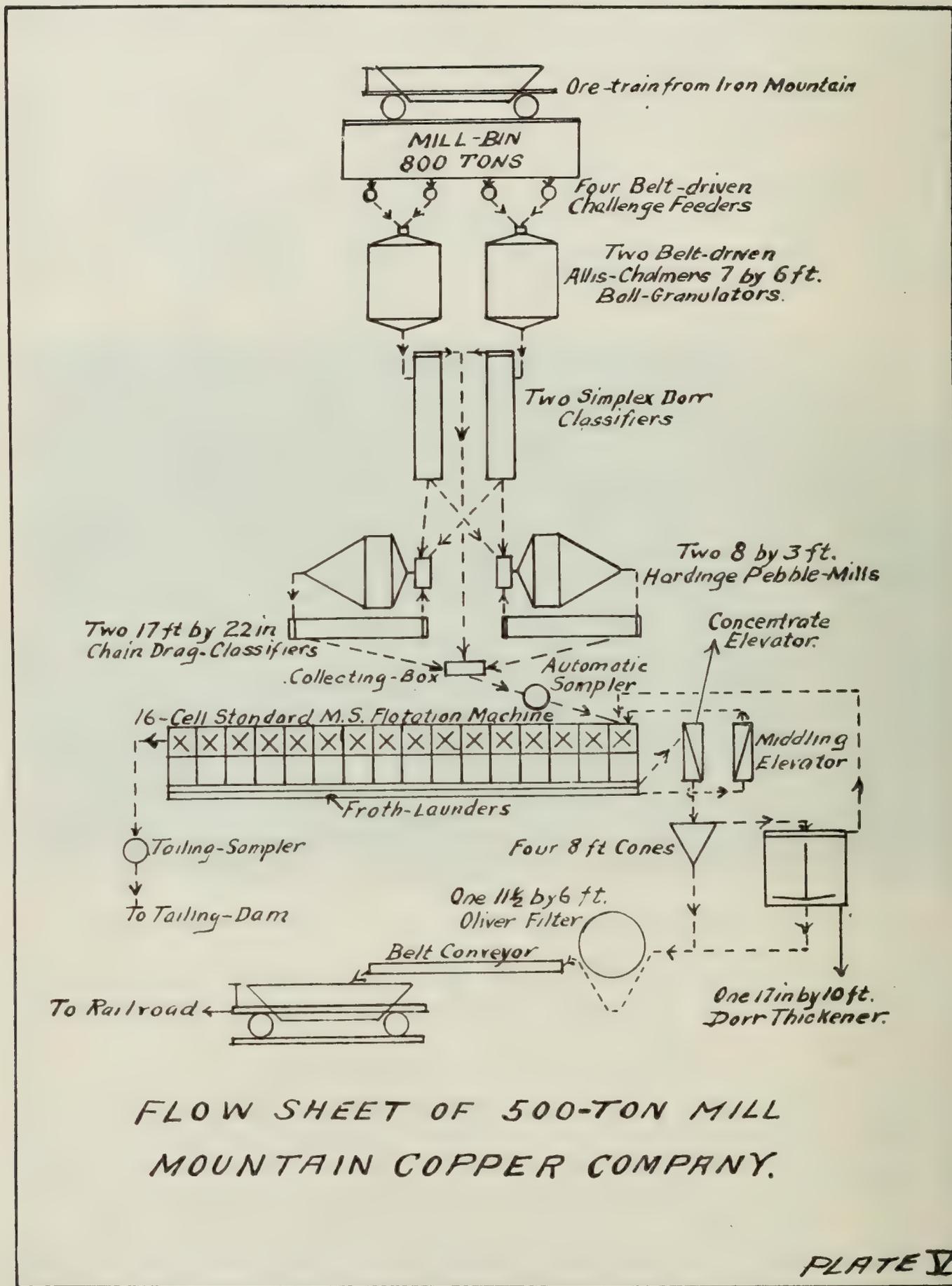
View of the Iron Mountain Mine, Mountain Copper Company, Shasta County.

From 1915 to 1921, the principal production from the mine has been siliceous ore running 2%, which was treated in a 500-ton flotation plant.

Flotation Plant.

The crushing plant is at Iron Mountain Mine. The ore is delivered by electric haulage from No. 8 tunnel to the mine storage bin, which has a capacity of 1200 tons. The bin is covered with 30-lb. rails, spaced 10 inches apart. Oversized pieces are broken by sledge hammer. Ore from the bin is fed on a conveyor by six feed-gates, then to a 48-inch trommel, where it is screened to pass a 2½-inch ring, the oversize going to a No. 6 Gates gyratory crusher, and through-size being conveyed to the railroad storage bin which has a capacity of 700 tons. Through-size from the gyratory crusher goes to a 42-inch trommel, the oversize going to a picking belt, where high-grade chalcopyrite is sorted out for shipment direct to the company's smelter at Martinez. Through-size is elevated to a distributing conveyor, which carries the ore to the railroad

storage bin. The capacity of the crushing plant is 600 tons in eight hours. A 100-h.p. motor drives the plant. The ore is hauled five miles over the Iron Mountain Railroad to the concentrator at Minnesota Station. The narrow-gauge ore train consists of a Shay engine and seven cars, each having a capacity of 800 tons. The ore from the bin is



fed by four belt-driven Challenge ore feeders to two belt-driven Allis-Chalmers 7- by 6-foot ball granulators, then to two simplex Dorr classifiers. From the Dorr classifiers, oversize goes to two 3- by 8-foot Hardinge mills, in closed circuit with two 17-foot by 22-inch chain drag classifiers. Slimes from the Dorr classifiers go to a collecting box joining

slimes from chain drag classifiers. The ore is ground to pass a 60-mesh screen. From the collecting box, the material goes to a 16- by 24-inch standard minerals separation flotation machine. Froth from the flotation machine is elevated to four 8-foot cones. Overflow from the cones passes to one 17-inch by 10-foot Dorr thickener. The chief object in the use of cones is to collect the coarser part of the concentrates amounting to about 75% of the whole. The coarse concentrate goes to one 1½- by 6-foot Oliver filter. The colloidal part of the concentrate which is drawn from the Dorr thickener is filtered separately. The concentrate averages something over 10% moisture. The ore milled averages about 2% copper, with 8% iron, and the concentrate runs about 15% copper. The average recovery is 92%. Ratio of concentration is about 7:1. The production from 500 tons of ore milled is about 70 tons of concentrate. Rated horsepower of plant is 590. (See Flow Sheet.) (Plate V.)

Mountain Monarch consists of 120 acres in Secs. 28 and 33, T. 32 N., R. 6 W., two miles south of Stella, in the Shasta mining district. Owners, Mountain Monarch Mining Company, of Redding. The ore, principally malachite, occurs in meta-andesite, and is five feet wide on the surface. A crosscut tunnel has been driven 700 feet, exposing some ore, but the main orebody has not been reached. Idle.

Bibl: State Mineralogist Report XIV, p. 770.

Ohio consists of 120 acres, patented, in Sec. 12, T. 33 N., R. 6 W., five miles west of Coram, in the Flat Creek mining district. Owners, Bliss Estate of New York. Several tunnels have developed some pyrite ore. Idle.

Bibl: State Mineralogist Report XIV, p. 770.

Shasta Belmont Mine consists of 7 claims located in Sec. 24, T. 34 N., R. 4 W., on Horse Mountain, west of the Bully Hill district, and 1½ miles northeast of Heroult. Elevation 1850 feet. Owner, Shasta-Belmont Mining Company; W. E. Carson, president; J. T. Davis, secretary. Offices, Carson City, Nevada.

Developments consist of two tunnels driven east along an east fracture. The lower tunnel is 350 feet in length. Fifty feet above this tunnel there is another tunnel 225 feet long. Lower and upper tunnels are connected with a raise, also with a shaft 75 feet deep from the surface. The orebody occurs along an east fracture in Dekkas andesite, and where developed was from six inches to two feet wide, showing streaks and bunches of high-grade copper ore, mainly chalcocite and chalcocite, with pyrite in a quartz gangue. It is stated that three cars of ore which had an average value of 7% copper and about 4 ozs. silver, were shipped to the Mammoth smelter at Kennett. Idle.

Shasta King Mine consists of 16 patented claims known as the Shasta King Group, located in Secs. 11 and 12, T. 33 N., R. 6 W., 7 miles west of Kennett, on the south fork of Squaw Creek, and adjoining the Balaklala Mine on the north. Elevation 1650 feet. Owner, Trinity Copper Corporation; T. W. Lawson, president; John N. Reynolds, secretary; Allan Arnold, treasurer. Offices, 85 Devonshire St., Boston, Mass. The company also owns the King Copper and Lost Desert groups, located between Spring and Motion creeks, in Secs. 23, 24, 25

and 26, T. 33 N., R. 6 W., their total holdings comprising 1200 acres of mineral land.

The Shasta King orebody lies on the west slope of south fork of Squaw Creek, nearly opposite the Balaklala orebody, but at a lower level. The Shasta King orebody is somewhat irregularly basin-shaped. It is several hundred feet in width, with the longer axis running nearly north and south. It is limited for the most part by fissures, along which there has been decided shearing. These fissures have a general northerly strike. The gossan croppings are very prominent and can be followed for several hundred feet. The ore is chalcopyrite associated with iron pyrite, averaging 2% copper and 1 oz. silver, with small gold values.

Developments consist of crosscut tunnels driven from the side of the mountain at different elevations, which connect with drifts on the orebody. The main haulage tunnel is 1145 feet in length; another tunnel, 175 feet vertically lower, is 1100 feet in length. The orebody developed in these workings is a lens of massive pyritic ore 200 feet wide and 1000 feet long, but it does not extend down to the lower tunnel level. The different levels were known as 830-, 850-, 860-, 870-, 900- and 1045-foot levels.

Total underground workings are over 15,000 feet in length. It is stated the ore reserves amount to 400,000 tons. The ore was hauled from the main haulage tunnel by electric motor to 500-ton capacity bins. A double track incline 900 feet long transports ore from the bins to the Balaklala aerial tram.

Equipment consists of Laidlaw-Dunn compressor driven by 200-h.p. motor, cars, track, blacksmith shop, ore bins, laboratory, warehouse, shops, hospital, and about 25 houses for employees.

Shasta May Blossom Mine is located in Sec. 14, T. 34 N., R. 3 W., one mile north of Winthrop, in the Pittsburgh mining district, and comprises 26 unpatented claims known as the Keith Group. Elevation is 1250 feet. Owner, Shasta May Blossom Mining and Smelting Company; C. M. Bradley, president; E. Seaburg, secretary. Offices, 604 Mills Building, San Francisco.

The workings are located along the contact of Bully Hill rhyolite and black and gray shales, the latter being the footwall. The top of the mountain is capped with rhyolite, and on the east slope of the ridge are gossan croppings.

Development consists of two tunnels, the lower being 720 feet long. One hundred feet vertically from this tunnel is the upper tunnel 600 feet in length, with a raise to the surface. Only small lenses of ore were developed, the ore being principally iron pyrite with small amount of chalcopyrite.

Equipment consists of Rix compressor driven by a 50-h.p. motor, also blacksmith shop, compressor house, and bunk house. Idle.

Bibl: Bulletin No. 50, p. 100; State Mineralogist Report XIX, p. 91.

Shasta National Copper Company's property consists of 38 unpatented claims located in Secs. 18, 19 and 20, T. 34 N., R. 5 W., on the ridge southeast of Backbone Creek, six miles northwest of Kennett. Officers of the company are: W. H. McEwen, president; M. P. Fries,

vice president; Horatio Allen, secretary. Offices, M. P. Fries & Company, 1635 Broadway, New York. The property adjoins the Mammoth Copper Company's holdings. Development consists of a number of tunnels. Idle.

Summit Group of Mines is located in Sec. 30, T. 34 N., R. 5 W., four miles northwest of Kennett, in the Backbone mining district.

The principal workings are on the eastern slope of Bohematosh Mountain, and the claims adjoin the Mammoth Company's holdings on the west. Elevation 3100 feet. Owner, *Stauffer Chemical Company* of San Francisco.

The country rock is rhyolite which is heavily mineralized with pyrite and chalcopyrite.

Development consists of three tunnels, one 400 feet long, with a 350-foot raise.

A 4-drill Sullivan compressor, shop, are bins, and dwellings constitute the surface equipment.

The ore was transported to the Mammoth Mine over the tram line from the Sutro Mine. Idle.

Bibl: Bulletin No. 50, p. 97; State Mineralogist Report XIV, p. 773.

The King Copper Group consists of 23 claims about $2\frac{1}{2}$ miles south of the Shasta King. The general trend of the orebody developed on this property is N. 70° W., dip 80° SW. The mine has about 1000 feet of development work. Idle.

Bibl: Bulletin No. 50, p. 84.

Woodrow Wilson Mine is located in Sec. 4, T. 33 N., R. 2 W., $1\frac{3}{4}$ miles southwest of Ingot, in the North Cow Creek mining district. Elevation 1800 feet. Owner, Triumvate Mining Company of Ingot; H. M. Swift, president; J. H. Jones, secretary. Holdings consist of six claims, approximately 120 acres, located on the east copper belt, and adjoining the Afterthought Copper Company's property on the west. Two systems of veins have been developed, known as the Homestead and Woodrow Wilson lodes. The former occurs in a shear zone in the rhyolite, which lies south of the contact of the rhyolite and shales of the Pit formation to the north. Two shafts have been sunk on this vein to depths of 35 feet, developing 6 to 8 feet of quartz in which occur irregular lenses of ore. The ore is of a different character from that developed in the other mines of this district, in that it carries high values in lead. The quartz is mineralized with galena, chalcopyrite, pyrite and sphalerite.

The Woodrow Wilson lode lies close to the contact of rhyolite with black and gray shales, and strikes northeast, with a dip of 50 degrees to the northwest. The ore is similar to that of the Afterthought Mine, being composed largely of pyrite, sphalerite, chalcopyrite and galena, with local traces of bornite.

Developments consist of three tunnels: No. 1 tunnel, 260 feet, and 70 feet below it No. 2 tunnel, 600 feet. No. 3 tunnel is 100 feet below No. 2, and is a crosscut tunnel driven S. 70° E., 200 feet in the slate hanging wall towards the contact.

Equipment consists of cars, track, air drills, blacksmith shop, and dwellings. Idle.

ADMINISTRATIVE DIVISION.

WALTER W. BRADLEY, Deputy State Mineralogist.

Personnel.

During the period, July 15–October 15, the following changes in personnel have taken place:

Mr. L. L. Stewart has been appointed Librarian of the Bureau, being in charge of the library and the general information desk at the main office in San Francisco.

IN THE OIL DIVISION:

Mr. F. D. Gore, Deputy Supervisor at Santa Maria since March, 1921, resigned to engage in commercial practice.

Mr. R. E. McCabe, Petroleum Engineer in the Department of Petroleum and Gas, has been promoted to the position of Deputy Supervisor for District No. 3, with headquarters at Santa Maria, vice F. D. Gore, resigned.

New Publications.

During the quarterly period covered by this issue, the following Bureau publications have been made available for distribution:

Mining in California (quarterly), July, 1924, being Chapter No. 3 of State Mineralogist's Report XX. Price 25 cents (or \$1.00 for the year).

Summary of Operations—California Oil Fields, Vol. 9, Nos. 11 and 12, May and June, 1924, respectively.

Commercial Mineral Notes: Nos. 16, 17, 18, July–September, inc.

These 'notes' carry the lists of 'mineral deposits wanted' and 'minerals for sale,' issued in the form of a mimeographed sheet, monthly. It is mailed free of charge to those on the mailing list for 'Mining in California.'

Mails and Files.

The Bureau maintains, in addition to its correspondence file, a mine report file which includes reports on some 7500 mines and mineral properties in California. Also there is available to the public a file of the permits granted to mining and oil corporations by the State Commissioner of Corporations.

During the period from July 16, 1924, to October 15, 1924, there were 1746 letters received and answered at the San Francisco office alone, covering almost every conceivable phase of prospecting, mining and developing mineral deposits, reduction problems, and marketing of refined products.

DIVISION OF MINERALS AND STATISTICS.

Statistics, Museum, Laboratory.

WALTER W. BRADLEY, Deputy State Mineralogist.

STATISTICS.

MINERAL PRODUCTION IN CALIFORNIA IN 1923.

Compilation of the production figures for California for the calendar year 1923 has been completed, being at this writing in the hands of the printer, and will be published as Bulletin No. 94.

Direct returns to the State Mining Bureau from the various operators throughout the state show the total aggregate value of the mineral output of California for the year 1923 to have been \$344,024,678, being an increase of \$98,840,852 over the 1922 total of \$245,183,826. There were fifty-four different mineral substances, exclusive of a segregation of the various stones grouped under gems; and all but one of the fifty-eight counties of the state contributed to the list.

As revealed by the data following herein, the salient features of 1923, compared with the preceding year, were: The continued increase in petroleum yield, although of lower prices per barrel; increases in cement, copper, lead, natural gas, brick and tile, and crushed rock; and decreases in gold and silver values. The net result was an increase in the grand total of all groups of nearly one hundred million dollars, as stated above. Petroleum accounted for an increase of \$69,350,044 in total value accompanying an increase in quantity of over 124,000,000 barrels.

Of the metals, copper increased from 22,883,987 pounds worth \$3,090,582 to 28,346,860 pounds worth \$4,166,989; lead, from 6,511,280 pounds and \$358,120 to 9,934,522 pounds and \$695,416; quicksilver, from 3466 flasks and \$191,851 to 5458 flasks and \$332,851. Gold decreased from \$14,670,346 to \$13,379,013, in spite of which, as in 1922, California continued to account for approximately 30% of the gold output of the United States.

Of the structural group, cement advanced from 8,962,135 barrels valued at \$16,524,056 to 10,825,405 barrels and \$25,999,203; miscellaneous stone (comprising crushed rock, sand and gravel, paving blocks, and grinding-mill pebbles), from a total valuation of \$10,377,783 to \$15,395,652; brick and hollow building blocks or tile, from \$7,994,991 to \$9,738,082; magnesite, from 55,637 tons and \$594,665 to 73,963 tons and \$946,643; with granite and lime also registering gains.

In the 'Industrial' group, there were a number of fluctuations, the more important increases being shown by diatomaceous earth, limestone, mineral water, pottery clay, gypsum and talc. One new item, sulphur, was added in 1923 to this list, which has not been produced commercially in California for many years. In the saline group, all items increased, but particularly borates, salt and potash, the gain for the group amounting to a total of \$1,479,570 more than the previous year's figures.

By Substances.

The following table shows the comparative yield of mineral substances of California for 1922 and 1923, as compiled from the returns received at the State Mining Bureau, San Francisco, in answer to inquiries sent to producers:

Substance	1922		1923		Increase+ Decrease- Value
	Amount	Value	Amount	Value	
Asbestos.....	50 tons	\$1,800	20 tons	\$200	\$1,600-
Barytes.....	3,370 tons	18,925	2,925 tons	16,058	2,867-
Bituminous rock.....	4,624 tons	13,570	2,945 tons	11,780	1,790-
Borates.....	(a) 39,087 tons	1,068,025	(a) 62,667 tons	1,893,798	825,773+
Calcium chloride.....	b	b	c	c	c +
Brick and tile.....		7,994,991		9,738,082	1,743,091+
Cement.....	8,962,135 bbls.	16,524,056	10,825,405 bbls.	25,999,203	9,475,147+
Chromite.....	379 tons	6,334	84 tons	1,658	4,676-
Clay (pottery).....	277,232 tons	473,184	376,863 tons	697,841	224,657+
Coal.....	27,020 tons	135,100	1,010 tons	5,090	130,010-
Copper.....	22,883,987 lbs.	3,090,582	28,346,860 lbs.	4,166,989	1,076,407+
Dolomite.....	52,409 tons	114,911	69,519 tons	142,615	27,704+
Feldspar.....	4,587 tons	37,109	11,100 tons	81,800	44,691+
Fuller's earth.....	6,606 tons	48,756	3,650 tons	55,125	6,369+
Gems.....		1,312		13,220	11,908+
Gold.....		14,670,346		13,379,013	1,291,333-
Granite.....		676,643		760,081	83,438+
Graphite.....	b	b			b -
Gypsum.....	47,084 tons	188,336	86,410 tons	289,136	100,800+
Infusorial and diatoma- ceous earths.....	b	b	c	c	c +
Iron ore.....	3,588 tons	18,868	3,102 tons	18,665	203-
Lead.....	6,511,280 lbs.	358,120	9,934,522 lbs.	695,416	337,296+
Lime.....	57,875 tons	671,747	70,894 tons	788,834	117,087+
Limestone.....	84,382 tons	282,181	143,266 tons	348,464	66,283+
Lithia.....	b	b			-
Magnesite.....	55,637 tons	594,665	73,963 tons	946,643	351,978+
Magnesium salts.....	3,036 tons	89,788	3,662 tons	116,031	26,243+
Manganese ore.....	540 tons	7,650	690 tons	10,620	2,970+
Marble.....	38,321 cu. ft.	127,792	28,015 cu. ft.	124,919	2,873-
Mineral paint.....	1,620 tons	13,277	1,049 tons	11,773	1,504-
Mineral water.....	4,276,346 gals.	486,424	5,487,276 gals.	616,919	130,495+
Natural gas.....	103,628,024 M. cu. ft.	6,990,030	240,405,397 M. cu. ft.	15,661,433	8,671,403+
Onyx and travertine....	10,950 cu. ft.	3,320	14,220 cu. ft.	2,510	810-
Petroleum.....	138,468,222 bbls.	173,381,265	262,875,690 bbls.	242,731,309	69,350,044+
Platinum.....	795 fine oz.	90,288	602 fine oz.	78,546	11,742-
Potash.....	17,776 tons	584,388	29,597 tons	709,836	125,448+
Pumice and volcanic ash	613 tons	4,248	2,936 tons	16,309	12,061+
Pyrites.....	151,381 tons	570,425	148,004 tons	555,308	15,117-
Quicksilver.....	3,466 flasks	191,851	5,458 flasks	332,851	141,000+
Salt.....	223,238 tons	819,187	275,979 tons	1,130,670	311,483+
Sandstone.....	900 cu. ft.	1,100	7,000 cu. ft.	13,000	11,900+
Shale oil.....	b	b	c	c	c -
Silica (sand and quartz).	9,874 tons	31,016	7,964 tons	30,420	596-
Sillimanite and andal- usite.....	b	b	c	c	c +
Silver.....	3,100,065 fine oz	3,100,065	3,559,443 fine oz.	2,918,743	181,322-
Slate.....	b	b			-
Soapstone and talc.....	13,378 tons	197,186	17,439 tons	252,661	55,475+
Soda.....	20,084 tons	573,661	34,885 tons	764,284	190,623+
Stone, miscellaneous(d)		10,377,783		15,395,652	5,017,869+
Sulphur.....			a	a	a +
Tungsten concentrates.			34 tons	19,126	19,126+
Zinc.....	3,034,430 lbs.	172,963			172,963-
Unapportioned.....		b380,558		c2,482,047	2,101,489-
Total values.....		\$245,183,826		\$344,024,678	
Net increase.....					\$98,840,852+

(a) Recalculated to 40% 'anhydrous boric acid' equivalent.

(b) Unapportioned—includes calcium chloride, graphite, diatomaceous earth, lithia, shale oil, sillimanite-andalusite and slate.

(c) Unapportioned—Includes diatomaceous earth, calcium chloride, shale oil, sillimanite-andalusite, and sulphur

(d) Includes macadam, ballast, rubble, riprap, paving blocks, sand, gravel, and grinding-mill pebbles

By Counties.

The following table shows the comparative value of the mineral production of the various counties in the state, for the years 1922 and 1923:

County	1922	1923
Alameda.....	\$2,041,454	\$2,487,035
Alpine.....	2,800
Amador.....	2,479,063	1,955,874
Butte.....	720,625	841,948
Calaveras.....	1,502,883	1,498,119
Colusa.....	75,934	75,000
Contra Costa.....	2,397,312	2,672,944
Del Norte.....	6,261	34,027
El Dorado.....	184,525	216,065
Fresno.....	10,853,433	4,883,331
Glenn.....	91,250	113,282
Humboldt.....	125,613	434,706
Imperial.....	188,739	264,733
Inyo.....	2,137,681	2,845,581
Kern.....	68,551,002	41,812,415
Kings.....	6,806	1,555
Lake.....	48,289	101,038
Lassen.....	27,327	7,840
Los Angeles.....	62,751,671	174,367,459
Madera.....	476,264	518,035
Marin.....	403,099	688,881
Mariposa.....	226,832	170,911
Mendocino.....	20,526	53,410
Merced.....	157,579	235,630
Modoc.....	16,018	8,397
Mono.....	86,863	92,791
Monterey.....	255,319	222,022
Napa.....	312,270	351,592
Nevada.....	2,966,005	2,370,770
Orange.....	38,926,087	45,468,989
Placer.....	405,975	494,513
Plumas.....	3,314,498	3,784,262
Riverside.....	3,243,917	7,093,853
Sacramento.....	2,189,562	2,436,015
San Benito.....	1,794,248	2,277,903
San Bernardino.....	8,547,900	13,777,253
San Diego.....	656,807	821,796
San Francisco.....	65,409	117,341
San Joaquin.....	473,395	811,229
San Luis Obispo.....	141,470	145,249
San Mateo.....	243,984	329,816
Santa Barbara.....	4,613,358	5,005,872
Santa Clara.....	894,036	1,320,393
Santa Cruz.....	3,608,805	4,225,905
Shasta.....	1,513,591	1,563,387
Sierra.....	1,770,626	886,610
Siskiyou.....	101,463	181,011
Solano.....	3,108,114	3,376,885
Sonoma.....	221,941	227,312
Stanislaus.....	452,167	445,515
Sutter.....	97	97
Tehama.....	9,388	6,216
Trinity.....	197,937	677,174
Tulare.....	371,845	466,559
Tuolumne.....	764,938	670,362
Ventura.....	5,837,078	4,679,684
Yolo.....	13,431	16,957
Yuba.....	2,588,316	3,391,129
Total values.....	\$245,183,826	\$344,024,678

Total Mineral Production of California, by Years.

The following tabulation gives the total value of mineral production of California by years since 1887, in which year compilation of such data by the State Mining Bureau began. At the side of these figures the writer has placed the values of the most important metal and non-metal items—gold and petroleum.

In the same period copper made an important growth beginning with 1897 following the entry of the Shasta County mines, and more recently Plumas County. Cement increased rapidly from 1902, while crushed rock, sand and gravel as a group parallels the cement increase. Quicksilver has been up and down. Mineral water and salt have always been important items, but the values fluctuate. Borax has increased materially since 1896. War-time increases, 1915–1918, were shown by chromite, copper, lead, magnesite, manganese, silver, tungsten and zinc. Most of these, except silver, have since declined; with structural materials and copper increasing in 1920–1923, also lead and magnesite in 1923.

Total Mineral Production of California by Years, Since 1887.

Year	Total value of all minerals	Gold, value	Petroleum, value
1887	\$19,785,868	\$13,588,614	\$1,357,144
1888	19,469,320	12,750,000	1,380,666
1889	16,681,731	11,212,913	368,048
1890	18,039,666	12,309,793	384,200
1891	18,872,413	12,728,869	401,264
1892	18,300,168	12,571,900	561,333
1893	18,811,261	12,422,811	608,092
1894	20,203,294	13,923,281	1,064,521
1895	22,844,663	15,334,317	1,000,235
1896	24,291,398	17,181,562	1,180,793
1897	25,142,441	15,871,401	1,918,269
1898	27,289,079	15,906,478	2,376,420
1899	29,313,460	15,336,031	2,660,793
1900	32,622,945	15,863,355	4,152,928
1901	34,355,981	16,989,044	2,961,102
1902	35,069,105	16,910,320	4,692,189
1903	37,759,040	16,471,264	7,313,271
1904	43,778,348	19,109,600	8,317,809
1905	43,069,227	19,197,043	9,007,820
1906	46,776,085	18,732,452	9,238,020
1907	55,697,949	16,727,928	16,783,943
1908	66,363,198	18,761,559	26,566,181
1909	82,972,209	20,237,870	32,398,187
1910	88,419,079	19,715,440	37,689,542
1911	87,497,879	19,738,908	40,552,088
1912	88,972,385	19,713,478	41,868,344
1913	98,644,639	20,406,958	48,578,014
1914	93,314,773	20,653,496	47,487,109
1915	96,663,369	22,442,296	43,503,837
1916	127,901,610	21,410,741	57,421,334
1917	161,202,962	20,087,504	86,976,209
1918	199,753,837	16,529,162	127,459,221
1919	195,830,002	16,695,955	142,610,563
1920	242,099,667	14,311,043	178,394,937
1921	268,157,472	15,704,822	203,138,225
1922	245,183,826	14,670,346	173,381,265
1923	344,024,678	13,379,013	242,731,309
Totals	\$3,095,775,027	\$615,597,567	\$1,608,485,225

MUSEUM.

The Museum of the State Mining Bureau possesses an exceptionally fine collection of rocks and minerals of both economic and academic value. It ranks among the first five of such collections in North America; and contains not only specimens of most of the known minerals found in California, but much valuable and interesting material from other states and foreign countries as well.

Mineral specimens suitable for exhibit purposes are solicited, and their donation will be appreciated by the State Mining Bureau as well as by those who utilize the facilities of the collection.

The exhibit is daily visited by engineers, students, business men, and prospectors, as well as tourists and mere sightseers. Besides its practical use in the economic development of California's mineral resources, the collection is a most valuable educational asset to the state and to San Francisco.

LABORATORY.

FRANK L. SANBORN, Mineral Technologist.

Clay is an important industrial mineral of California and its value as a mineral substance is growing steadily. During the year 1922, 277,232 tons of clay were utilized in the ceramic industries of this state not including clays used in the manufacture of bricks and hollow building blocks; and in 1923, 376,863 tons were used. Considering the fact that the use of clay products is steadily increasing, it is reasonable to suppose that the demand for clays will grow from year to year.

In addition to clays, feldspar and quartz are utilized in the ceramic industries. Quartzite and flint are the most desirable sources of silica for refractory bricks.

The price paid per ton for ordinary clays, other aluminum silicates, feldspar, and quartz is not great, therefore, in prospecting for these minerals, deposits convenient to rail transportation should be sought. The white-burning clays and silicates having a high alumina content demand a higher price and can consequently be transported some distance.

Kaolin, or china clay, is generally very pure and practically free from iron, possessing a fine white color which it keeps after heating. Inferior qualities burn to a yellowish or reddish color, and some discoloration is usually present in the raw state. Some of the impurities can often be removed by washing with water.

Impure clays are used for making common building material, such as brick, tiles, sewer pipes, etc. Some grades of white clay are important in the manufacture of paper, cotton goods and chemicals. Clays of the montmorillonite group are being successfully used in the making of some soaps.

During the four-month period covered by this report, 1332 samples were received and determined at the laboratory of the State Mining Bureau. Material was received from practically every county in the state.

LIBRARY.

L. L. STEWART, Librarian.

In addition to the numerous standard works, authoritative information on many phases of the mining and mineral industry is constantly being issued in the form of reports and bulletins by various government agencies.

The library of the State Mining Bureau contains some five thousand selected volumes on mines, mining and allied subjects, and it is also a repository for reports and bulletins of the technical departments of federal and state governments and of educational institutions, both domestic and foreign.

It is not the dearth of the latter publications, but rather a lack of knowledge of just what has been published and where the reports may be consulted or obtained, that embarrasses the ordinary person seeking specific information.

To assist in making the public acquainted with this valuable source of current technical information, 'Mining in California' contains under this heading a list of all books and official reports and bulletins received, with names of publishers or issuing departments.

Files of all the leading technical journals will be found in the library, and county and state maps, topographical sheets and geological folios. Current copies of local newspapers published in the mining centers of the State are available for reference.

The library and reading room are open to the public during the usual office hours, when the librarian may be freely called upon for all necessary assistance.

OFFICIAL PUBLICATIONS RECEIVED.

Governmental.

U. S. Geological Survey:

Prof. Paper No. 127—The Composition of the Earth's Crust. By Frank W. Clarke and Henry S. Washington.

Bulletin No. 755-C—Geology and Mineral Resources of the Region Traversed by the Alaska Railroad. By Stephen R. Capps.

Bulletin No. 755-D—The Cold Bay-Chignik District, Alaska. By W. R. Smith and A. A. Baker.

Bulletin No. 758—Bibliography of North American Geology for 1921-1922. By John M. Nickles.

Bulletin No. 760-A—Pedestal Rocks in the Arid Southwest. By Kirk Bryan.

Water-Supply Paper No. 503—Surface Water Supply of the United States, 1919-1920, Part III. Ohio River Basin. By Nathan C. Grover and others.

Water-Supply Paper No. 516—Surface Water Supply of Hawaii. By Nathan C. Grover and Jas. E. Stewart.

Water-Supply Paper No. 518—Ground Water in Musselshell and Golden Valley Counties, Montana. By A. J. Ellis and O. E. Meinzer.

Water-Supply Paper No. 520-B—Additional Ground-Water Supplies for the City of Enid, Oklahoma. By B. Coleman Renick.

Water-Supply Paper No. 520-C—Power Resources of Snake River, Between Huntington, Oregon, and Lewiston, Idaho. By Wm. G. Hoyt.

Water-Supply Paper No. 535—Surface Water Supply of Hawaii. By Nathan C. Grover and Jas. E. Stewart.

Mineral Resources of the United States:

Part I. Metals, 1921. By G. F. Loughlin.

Part II. Nonmetals, 1921. By F. J. Katz.

Gold and Silver in 1922. By J. P. Dunlop.

Petroleum in 1922. By G. B. Richardson.

- Platinum and Allied Metals in 1923. By James M. Hill.
- Bauxite and Aluminum in 1923. By James M. Hill.
- Fluorspar and Cryolite in 1923. By Hubert W. Davis.
- Magnesium and Its Compounds in 1923. By J. M. Hill and G. F. Loughlin.
- Strontium in 1923. By Geo. W. Stose.
- Gold, Silver, Copper, Lead, and Zinc in the Eastern States in 1923. By J. P. Dunlop.
- Mineral Resources of the United States in 1923 (Preliminary Summary).
Introduction by F. J. Katz, statistics by Martha B. Clark.
- Smithsonian Institution, United States National Museum:
- Bulletin No. 99—East African Mammals in the United States National Museum, Part III. By N. Hollister.
- Bulletin No. 128—List of North American Recent Mammals, 1923. By Gerrit S. Miller, Jr.
- U. S. National Herbarium, Vol. 20, Part 13. Revision of the American Species of *Rinorea*, New Plants from Venezuela. By S. F. Blake.
- U. S. Bureau of Mines:
- Bulletin No. 210—Oil Shale, Historical, Technical and Economic Study. By Martin J. Gavin.
- Technical Paper No. 358—Production of Explosives in the United States, 1923. By Wm. W. Adams.
- Technical Paper No. 364—Permissible Explosives, Mining Equipment, and Apparatus Approved Prior to January 1, 1924. By J. E. Crawshaw and others.
- Reports of Investigations:
- Serial No. 2611—Fatalities in the California Oil Fields. By H. C. Miller.
- Serial No. 2612—Effects of Extraneous Gas on the Production of Oil Wells. By M. J. Kirwan.
- Serial No. 2613—Microchemical Analysis and Its Application in the Determination of Low-Grade Ores. By Ernest E. Fairbanks.
- Serial No. 2614—Explosives Used in April, 1924. By W. W. Adams.
- Serial No. 2615—Sand Blast Sand. By W. M. Weigel.
- Serial No. 2616—Saving Gasoline and Increasing Mileage by Proper Carburetor Adjustment. By G. W. Jones and A. A. Straub.
- Serial No. 2617—The Safety Bonus in Metal Mining. By F. C. Gregory.
- Serial No. 2618—Hindered Settling Classification in Relation to Table Concentration of Idaho Lead-Zinc Ores. By A. W. Fahrenwald.
- Serial No. 2619—The Effect of the Temperatures of Liquid Oxygen Explosives on Cordeau-Bickford. By D. B. Gawthrop.
- Serial No. 2620—Coal-Mine Fatalities in May, 1924. By W. W. Adams.
- Recent Articles on Petroleum and Allied Substances, May, June, July, 1924. Compiled by H. Britton.
- Serial No. 2621—The Resistance of Coal-Mine Entries to the Flow of Air. By J. W. Paul and others.
- Serial No. 2622—Filter Sand for Municipal Water Supply. By W. M. Weigel.
- Serial No. 2623—Explosives Used in May, 1924. By W. W. Adams.
- Serial No. 2624—Temperatures in Cabs of Freight Locomotives Passing Through Tunnels of the Chesapeake & Ohio R. R. By S. H. Katz and E. G. Meiter.
- Serial No. 2625—The Cost of Accidents in Metal Mines as Measured by Compensation Insurance Premiums. By Byron O. Pickard.
- Serial No. 2626—Hazards of Electric Sparks and Arcs in Coal Mines. By L. C. Iisley.
- Serial No. 2627—The Utilization of Dolomite for Refractories. By G. A. Bole.
- Serial No. 2628—Coal-Mine Fatalities in June, 1924. By W. W. Adams.
- U. S. Department of Commerce:
- Monthly Summary of Foreign Commerce of the United States, May, Parts I, II; June, Parts I, II; July, Parts I, II, 1924.
- Bulletin No. 2. National Rivers and Harbors Congress, 1924. By Wm. G. Bruce and others.
- Serial No. 258. Effect of Variations in the Assumed Figure of the Earth on the Mapping of a Large Area. By Walter D. Lambert.
- Trade and Economic Review for 1923. No. 5, Czechoslovakia; No. 6, Canada;

- No. 7, Switzerland; No. 8, Sweden; No. 9, British Guiana; No. 10, United Kingdom.
- Comparison of Tariff Acts of 1909, 1913, and 1922.
- State of Colorado, Bureau of Mines, Annual Report, 1923.
- State of Indiana, Department of Conservation, Laws and Regulations Affecting Oil Development Operations.
- Geological Conditions in the Oil Fields of Southwestern Indiana. By W. N. Logan.
- Iowa Geological Survey, Vol. XXIX, Annual Reports, 1919 and 1920.
- State Geological Survey of Kansas. Bulletin 9. Geology and Invertebrate Paleontology of the Comanchean and "Dakota" Formations of Kansas. By W. H. Twenhofel.
- State of Michigan, Department of Conservation, Geological Survey Division. Mineral Resources of Michigan. By R. A. Smith, State Geologist.
- North Carolina Geological and Economic Survey. Bulletin No. 32, Magnetic Iron Ores of East Tennessee and Western North Carolina. By W. S. Bayley, Geologist.
- Natural Resources. A bi-weekly publication.
- North Dakota Geological Survey. Bulletin No. 3, Artesian Water Conservation Fund. By Howard E. Simpson, Geologist in Charge.
- South Dakota Geological and Natural History Survey. Circular 15, Sand and Gravel Deposits in Eastern South Dakota. By E. P. Rothrock.
- Circular 16—The Natural Resources of South Dakota. By Freeman Ward and others.
- Circular 17—Field Conditions in Southern Haakon County. By Freeman Ward and Gail F. Moulton.
- Division of Geology, Tennessee, Bulletin No. 28—Marble Deposits of East Tennessee. By C. H. Gordon and others.
- Bulletin No. 29—The Magnetic Iron Ores of East Tennessee and Western North Carolina. By W. S. Bayley.
- Bulletin No. 31—Zinc Deposits of East Tennessee. By Mark H. Secrist.
- Scientific and Industrial Research Council of Alberta, 1923. Fourth Annual Report.
- Department of Colonization, Mines and Fisheries, Quebec, Canada. Report on Mining Operations in Province of Quebec, 1923.
- Department of Mines, Canada—The Mineral Industries of Canada. By A. H. A. Robinson.
- Bulletin No. 38—Contributions to Vertebrate Paleontology. By Chas. W. Gilmore.
- Memoir 137—Paleontology of the Silurian Rocks of Arisaig, Nova Scotia. By F. H. McLearn.
- Memoir 136—Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec. By M. E. Wilson.
- Department of Mines, South Australia. Mining Review No. 39, for the half year ended December 31, 1923.
- Department of Mines, New South Wales. Geology, No. 8 Supplement—The Geology of the Broken Hill District. By E. C. Andrews, Geologist.
- Departamento de la Estadística Nacional. El Progreso de Mexico—Estudio Económico, Estadístico.
- Departamento de Minas, Secretaría de Industria, Comercio y Trabajo. Anuario de Estadística Minera correspondiente al. Año de 1922. Mexico.
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- Instituto Geológico de Mexico, Boletín Numero 41, Catálogo Geográfico de las Especies Minerales de Mexico.

Societies and Educational Institutions.

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- Journal of the Western Society of Engineers. May, June, July and August, 1924.
- Bulletin of the Institution of Mining and Metallurgy. June, July and August, 1924.

- Mining and Metallurgical Society of America. Bulletin No. 170, Explorations in the Gobi Desert.
Officers, Members and Committees, July, 1924.
Index to Vol. XVI, Bulletins Nos. 158-165.
- Monthly Bulletin of Canadian Institute of Mining and Metallurgy, Montreal. July, August, September, 1924.
- Journal of the American Peat Society, Inc. July, 1924, Vol. XVII, No. 3.
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- Colorado College Publication. General Series No. 126, Social Science Series, Vol. II, No. 18. Honor Men and Women of Colorado College. September, 1924.
- Alumni Magazine of the Colorado School of Mines. Vol. XIV. Modern Anthracite Stripping; 1924 Alumni Directory; Geological Distribution of Mines Alumni.
- Louisiana State University—The Arkadelphia Formation, June, 1924. By Henry V. Howe.
- School of Mines and Metallurgy, University of Missouri. Bulletin, November, 1923. Subterranean Stream Piracy in the Ozarks. Ebb and Flow Springs in the Ozarks. By C. L. Dake and Josiah Bridge.
Technical Bulletin, February, 1924. Meridian Determination. By C. E. Bardsley.
- Bulletin of the University of Minnesota. Mining Directory of Minnesota for 1924. Vol. XXVII, No. 25.
- The Science Reports of the Tohoku Imperial University, Third Series. Mineralogy, Petrology, Economic Geology. Vol. II, Nos. 1 and 2.
- The John Crerar Library, Twenty-ninth Annual Report for 1923.
- Proceedings of the American Philosophical Society, Philadelphia. Vol. LXIII, No. 1, 1924.
- Proceedings of the California Academy of Science. Fourth Series—
Vol. XII, No. 27, pp. 529-560. XXVII. Expedition of the California Academy of Sciences to the Gulf of California in 1921. The Bees. By T. D. A. Cockerell.
No. 28, pp. 561-694. XXVIII. The Spider Fauna of the Shores and Islands of the Gulf of California. By Ralph V. Chamberlin.
No. 29, pp. 695-949. XXIX. New Marine Algae from the Gulf of California. By Wm. A. Setchell and N. L. Gardner.
No. 30, pp. 951-1218. XXX. The Botany (The Vascular Plants). By Ivan M. Johnston.
- Vol. XIII, No. 7, pp. 131-136. VII. Freshwater Mollusks of Eagle Lake, California. By G. Dallas Hanna.
No. 8, pp. 137-145. VIII. Notes on some Echinoids from the San Rafael and Tuxpam Beds of the Tampico Region, Mexico. By Merle C. Israelsky.
No. 9, pp. 147-149. IX. New Genus and Species of Freshwater Gastropod Mollusk. By G. D. Hanna and E. G. Gaylord.
No. 10, pp. 151-186. X. Rectifications of Nomenclature. By G. Dallas Hanna.
No. 11, pp. 187-188. XI. Vogdesella, a New Genus-Name for a Paleozoic Crustacean. By Fred Baker.
No. 12, pp. 189-230. XII. Notes on Herpetology of New Mexico. By J. V. Denburgh.
No. 13, pp. 231-236. XIII. The Genus Erythroneura in California. By E. P. Van Duzee.
No. 14, pp. 237-241. XIV. New Species of Whale from Type Locality of Monterey Group. By G. Dallas Hanna and Mary E. McLellan.
- New York Academy of Sciences, Vol. XXIX, pp. 141-143. Two New Lizards from Peru. By G. K. Noble. Pp. 145-180. On Families of Spiders. By Alex. Petrunkevitch. Pp. 181-283. Apparently Nonselective Characters and Combinations of Characters. By Frank E. Lutz.
- Records of Australian Museum. Vol. XIV, No. 3. By Charles Anderson, Director.
- Royal Society of South Australia. Vol. XLVII. Transactions and Proceedings. Bibliotheca National do Rio de Janeiro. Catalogo Exposicao Permanente dos Cimelios. By Joan de Saldanha da Gama.

Real Academia de Ciencias y Artes, Barcelona. Año Academico de 1923 a 1924.
Memorias. Vol. XVIII, Num. 7, 8, 9.
Sumario. Vol. V, Num. 1.

Current Magazines on File.

For the convenience of persons wishing to consult the technical magazines in the reading room, a list of those on file is appended:

American Petroleum Institute, New York.
Architect and Engineer, San Francisco.
Arizona Mining Journal, Phoenix, Arizona.
Asbestos, Philadelphia, Pennsylvania.
Brick and Clay Record, Chicago.
Bulletin, Union Oil Co., Los Angeles.
California Journal of Development, San Francisco.
Cement, Mill and Quarry, Chicago, Illinois.
Chemical Engineering and Mining Review, London, England.
Engineering and Mining Journal-Press, New York.
Explosives Engineer, Wilmington, Del.
Financial Insurance News, Los Angeles, California.
Graphite, Jersey City.
Journal of Electricity and Western Industry, San Francisco.
Metallurgical and Chemical Engineering, New York.
Mine and Quarry, Chicago.
Mining and Engineering Record, Vancouver, B. C.
Mining and Oil Bulletin, Los Angeles.
Oil Age, Los Angeles.
Oil and Gas Journal, Tulsa, Oklahoma.
Oil and Gas News, Kansas City.
Oil News, Galesburg, Illinois.
Oildom, New York.
Oil, Paint and Drug Reporter, New York.
Oil Trade Journal, New York.
Oil Weekly, Houston, Texas.
Petroleum Age, New York.
Petroleum Record, Los Angeles.
Petroleum World, Los Angeles.
Queensland Government Mining Journal, Brisbane, Australia.
Rock Products, Chicago, Illinois.
Safety News, Industrial Accident Commission, San Francisco.
Salt Lake Mining Review, Salt Lake City, Utah.
Southwest Builder and Contractor, Los Angeles.
Standard Oil Bulletin, San Francisco.
Stone, New York.
The Record, Associated Oil Company, San Francisco.
Through the Ages, Baltimore.

Newspapers.

The following papers are received and kept on file in the library:

Amador Dispatch, Jackson, Cal.
Arkansas Oil and Mineral News, Hot Springs National Park (Arkansas).
Barstow Printer, Barstow, Cal.
Blythe Herald, Blythe, Cal.
Bridgeport-Chronicle-Union, Bridgeport, Mono Co., Cal.
Calaveras Prospect, San Andreas, Cal.
California Oil World, Los Angeles, Cal.
Cloverdale Reveille, Cloverdale, Cal.
Colusa Daily Sun, Colusa, Cal.
Daily Commercial News, San Francisco, Cal.
Daily Midway Driller, Taft, Cal.
Del Norte Triplicate, Crescent City, Cal.

Exeter Sun, Exeter, Cal.
 Gateway Gazette, Beaumont, Cal.
 Goldfield News, Goldfield, Nevada.
 Guerneville Times, Guerneville, Cal.
 Healdsburg Enterprise, Healdsburg, Cal.
 Humboldt Standard, Eureka, Cal.
 Inyo Independent, Independence, Cal.
 Inyo Register, Bishop, Cal.
 Ione Valley Echo, Ione, Cal.
 Lake County Bee, Lakeport, Cal.
 Mining and Financial Record, Denver, Colo.
 Mining Topics, Sacramento, Cal., and Unionville, Nev.
 Mountain Democrat, Placerville, Cal.
 Mountain Messenger, Downieville, Cal.
 Nevada Mining Press, Reno, Nevada.
 Oatman Mining News, Oatman, Arizona.
 Oregon Observer, Grants Pass, Oregon.
 Oroville Daily Register, Oroville, Cal.
 Petroleum Reporter, Taft, Cal.
 Placer Herald, Auburn, Cal.
 Plumas Independent, Quincy, Cal.
 Plumas National Bulletin, Quincy, Cal.
 Randsburg Times, Randsburg, Cal.
 San Diego News, San Diego, Cal.
 Shasta Courier, Redding, Cal.
 Siskiyou News, Yreka, Cal.
 Stockton Record, Stockton, Cal.
 Tuolumne Prospector, Tuolumne, Cal.
 Ventura Daily Post, Ventura, Cal.
 Weekly Trinity Journal, Weaverville, Cal.
 Western Sentinel, Etna Mills, Cal.

PRODUCERS AND CONSUMERS.

The producer and consumer of mineral products are mutually dependent upon each other for their prosperity, and one of the most direct aids rendered by the Bureau to the mining industry in the past has been that of bringing producers and consumers into direct touch with each other.

This work has been carried on largely by correspondence, supplemented by personal consultation. Lists of buyers of all the commercial minerals produced in California have been made available to producers upon request, and likewise the owners of undeveloped deposits of various minerals, and producers of them, have been made known to those looking for raw mineral products.

When the publication of MINING IN CALIFORNIA was on a monthly basis, current inquiries from buyers and sellers were summarized and lists of mineral products or deposits 'wanted' or 'for sale' included in each issue.

It is important that inquiries of this nature reach the mining public as soon as possible and in order to avoid the delay incident to the present quarterly publication of MINING IN CALIFORNIA, these lists are now issued monthly in the form of a mimeographed sheet under the title of 'Commercial Mineral Notes.'

EMPLOYMENT SERVICE.

Following the establishment of the Mining Division branch offices in 1919, a free technical employment service was offered as a mutual aid to mine operators and technical men for the general benefit of the mineral industry.

Briefly summarized, men desiring positions are registered, the cards containing an outline of the applicant's qualifications, position wanted, salary desired, etc., and as notices of 'positions open' are received, the names and addresses of all applicants deemed qualified are sent to the prospective employer for direct negotiations.

Telephone and telegraphic communications are also given immediate attention.

The Bureau registers technical men, or those qualified for supervisory positions, and vacancies of like nature, only, as no attempt will be made to supply common mine and mill labor.

A list of current applications for positions and 'positions open' is carried in each issue. Notices are designated by a key number, and the name and address corresponding to any number will be supplied upon request, without delay or charge of any kind. If desired, recommendations may be filed with an application, but copies only should be sent to the Bureau, to avoid possible loss. Registration cards for the use of both prospective employers and employees may be obtained at any office of the Bureau upon request, and a cordial invitation is extended to the industry to make free use of the facilities afforded.

POSITIONS WANTED.

- 21-39 Mill Foreman. Ten years' experience, gold and copper mills. Age 49. Married. References. Salary wanted, \$200.
- 21-40 Mining Engineer. Graduate, Petrograd University. Ten years' experience. Age 37. Single. References. Salary open.
- 21-41 Mining or Metallurgical. Extensive experience at home and abroad. Age 45. Married. References. Salary open.
- 21-42 Mechanical Engineer. Design and supervision of construction of industrial plants: smelting, concentrating, cement, sugar, steel and reinforced concrete. 1893-1923.
- 21-43 Mining Engineer. One and one-half years' experience. Age 24. Single. References. Salary not important.
- 21-44 Metallurgical Engineer or Mill Superintendent. Experience covers design and construction of various plants up to 500-ton capacity. Age 52. Married. References. Salary open.
- 21-45 Chemical Engineer. Plant management and production. Nine years' experience. Age 33. Married. References. Salary open.
- 21-46 Chemist, Metallurgist, or Mill Superintendent. Fifteen years' experience. Age 48. Married. References. Salary open.
- 21-47 Assayer. Service man; has completed course in assaying. Age 37. Married. References. Salary open.
- 21-48 Mining Accountant. Eight years' experience as auditor for mining companies. Age 44. Married. References. Salary wanted, \$200.
- 21-49 Millman, cyanide or flotation. Six years' experience. Age 30. Single. Salary wanted, \$150.
- 21-50 Superintendent or Foreman. Thirteen years' experience as foreman and superintendent at large Mother Lode mines. Age 58. Married. References. Salary open.

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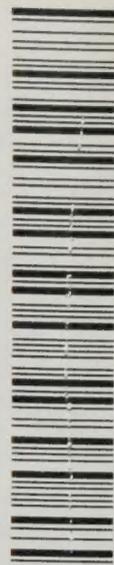
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