

PLACER COUNTY, By J. B. Hobson, B.M., Assistant in the Field.

Placer is one of the most prominent counties of the row that lies along the western slope of the Sierra in Central and Northern California. It was among the places first settled by the gold-seekers in 1849, and it has since been the scene of active development in the various branches of mining, farming, horticulture, quarrying, lumbering, and railroad building. The railroads have given its lands and their varied products a commercial value not possessed by some other districts of the State which are equally rich in the qualities of good soil and natural resources.

Placer has been fortunate in having the main line of the Central Pacific Railroad run through its entire length, thus affording easy communication and convenient shipping facilities for everything its inhabitants have to sell.

Its people have been enterprising and progressive, and it follows that the opportunities afforded have not been lost, as can be proved by noting the steady increase of population and assessable property.

Placer is over one hundred miles long, with an average width of twenty-five or thirty miles. At a point just above Auburn, the Bear and American Rivers, being respectively the northern and southern boundaries, converge to within about four miles of each other, and thus give the county the general shape of an hour-glass.

The county is bounded on the north by Nevada and Yuba Counties, on the west by Sutter County, on the south by Sacramento and El Dorado Counties, and on the east by the State of Nevada. Its irregular shape also makes Nevada County to some extent a western boundary, while El Dorado does the same duty on the east of the lower half of the county.

It contains one thousand four hundred and twenty-nine square miles, or nine hundred and fifteen thousand acres, and in size it ranks thirty-first among the fifty-three counties of the State. For purposes of comparison it is larger than Rhode Island, and it contains almost as much land surface as the State of Delaware. Its topography is as irregular as its shape. Imagine the whole Atlantic Coast from Labrador to Tallahassee incorporated into one county, and one will have a fair idea of what may be found in Placer, exaggerated as to size, but not as to the great variety of climate, elevations, soils, and resources.

In fact, as to resources, the whole Atlantic seaboard can hardly equal the endless variety to be found within the borders of this single county, which rivals Florida in the quality of its oranges, excels New Jersey in peaches, equals the New England States in its granite quarries, and compares favorably with Maine in the quality of its lumber.

The western part of Placer is blessed with perpetual summer, like the southern portion of our imaginary eastern county, but without the pests and miasma that infest the State of Florida.

From an elevation of about two thousand five hundred feet up to the summit of the mountains we have snow in the winter season, light at the lower edge of the line, and increasing in depth as we ascend the Sierra. Here is a strip of territory from the snow line up to an elevation of three thousand feet, where the snowfall is not greater than in New England, and where the winter temperature is much higher. It is particularly well adapted to the apple, the pear, and a great variety of vegetables.

At Auburn, the county seat, the average temperature for winter is 46.2 degrees; for spring it is 56.4 degrees; summer, 74.3 degrees; autumn, 61.7 degrees. The yearly mean of the maximum temperature at Auburn is 83.17 degrees; at Colfax, 85.42 degrees; at Rocklin, 84.33 degrees.

The average annual rainfall at Colfax is about forty-six inches, and at Auburn it is about twenty-six inches.

The soil of the western or valley portion of Placer County around Roseville, Lincoln, and Sheridan, is of the same general alluvial composition as all the soil in the great Sacramento Valley, and is well adapted to the growth of grain. Over thirty thousand acres are annually devoted to wheat, barley, oats, and hay. The low foothills back of Lincoln are excellent for the grape, and many new vineyards are springing up in that locality. They produce table grapes, wine, and raisins of superior quality.

The granitic belt from Rocklin to Newcastle is one of the foremost fruit districts of California. Its rolling lands are covered with orchards and vineyards. The chief fruits are the cherry, fig, nectarine, peach, olive, and orange, in all of which it excels. No other section produces earlier fruits, and it is estimated that for the last three or four years Placer County has shipped about one-seventh of all the green deciduous fruit sent East from California.

There are large shipping houses at Loomis, Penryn, Newcastle, Auburn, and Colfax. Newcastle does the heaviest forwarding business, and the total shipments from the county have increased from six million pounds in 1886 to seven million four hundred and fifty-nine thousand six hundred and eighty-eight pounds in 1887; twelve million pounds in 1888, and about the same proportionate increase for 1889 and 1890.

The decomposed granite soil of the fruit belt just mentioned requires plenty of irrigation for the best development of fruit and vegetables, and water is supplied in abundance by the Bear River Ditch, owned by the South Yuba Water Company. The main line of this ditch is sixty miles long, and its branches give the farmers of Placer a total of over one hundred miles of ditches for irrigating purposes. This service will be increased next year by the continuation of an old mining ditch, which now ends at Gold Run, to a point below Colfax, where the present Bear River Ditch comes out on the divide above Auburn. This new ditch will save a capacity of five thousand inches, and the same company will also build a new storage reservoir above Bear Valley, in Nevada County, to supply the increasing demand in Placer.

On the Bear River Ditch are many sites with available and valuable water-power. In two or three places ten or twelve hundred horse-power could be developed without serious waste of water, which would flow back into the ditch to be taken up again for other uses.

At Auburn the South Yuba Company owns a valuable storage reservoir for city water, and from its site to the lower part of the town there is a fall of over three hundred feet. The power thus acquired is already used for electric lights, for the manufacture of artificial ice, and for running printing presses. It might be utilized for any number of manufactories, as it is cheap, efficient, and certain.

Up the Sierra—from a point midway between Auburn and Newcastle—the bedrock of the country is principally metamorphic slate. This belt is hardly as warm as the granite below, but requires less irrigation when cultivation is substituted, and the only practical difference to the fruit grower is, that his crops are about a week later than they are at Penryn or Loomis; however, they lose nothing in quality, and there is no soil in the State better adapted for the grape, the prune, the olive, and the fig.

An analysis of soil taken from a farm close by Auburn was made, resulting as follows:

Insoluble matter, silica: 69.52	Peroxide of iron: 12.42
Potash: .38	Alumina (clay) : 10.97
Soda: .07	Phosphoric acid: .16
Lime: .96	Sulphuric acid: .01
Magnesia: 1.09	Water and organic matter: 5.14
Peroxide of manganese: .39	

It will be observed that this soil excels in lime, iron, phosphoric acid, and in organic matter. The quality of the grapes and other fruits grown upon this soil is sufficient proof of its richness without the chemist's aid, and in the days to come when California shall be one vast garden, quality will be the one great desideratum.

Still farther up, the Colfax lands have become famous for their vineyards and pear orchards. An analysis of an average sample of Colfax soil gives the following result:

Insoluble matter, silica: 75.738	Peroxide of iron: 3.848
Potash: 492	Alumina (clay): 13.322
Soda: 137	Phosphoric acid: 062
Lime: 246	Sulphuric acid: 026
Magnesia: 530	Water and organic matter: 5.411
Peroxide of manganese: 181	

This analysis shows the soil to contain a good supply of potash, and in the surface soil proper an abundance of humus. The supply of lime and phosphoric acid is not high, and cereal culture would soon exhaust the latter; but the whole character of the soil is such as to insure a high quality of fruits adapted to the climate, and in view of the abundant supply of moisture and depth of soil overlying the pervious bedrock, the land would undoubtedly be very durable under such culture, when rationally conducted.

The iron is also a valuable constituent, and makes it known as "the red soil of the foothills."

These analyses will give a good idea of the general character of the Placer foothills with respect to their adaptability to fruit culture. No one place has a monopoly of good qualities, and there is an ever ready market, as there is hardly an orchard in the county distant ten miles from the railroad, and in the fruit belt there is a shipping house within easy reach of every farmer.

It does not require a prophetic mind to foretell the future of a district so favorably situated as this. The overland trains running through its entire length make its products a day nearer to the great eastern markets than those from other parts of the State, and if the "bugaboo" of "overproduction" should ever become anything like a reality, the fruits of Placer would still be first in demand because they are earliest and actually nearest to the great markets of the Northwest, and of Chicago and New York.

Placer, too, has the possibility of becoming a great manufacturing county. The discovery of clay at Lincoln a few years ago was the foundation of an immense pottery at that place, which is now annually turning out an amount of pottery, pipe, and terra cotta second to no other establishment in the West. The monthly wages paid to workmen in the Lincoln pottery amount to over \$8,000.

A quality of sand suitable for plate glass, not as yet found elsewhere in the State, was also discovered at Lincoln about a year ago, and it has been known for years that there are coal beds in the immediate vicinity. These form a combination that may cause glass works to spring up that will rival the pottery in volume and value of business. This deposit of sand is of considerable length, running south from Lincoln to Roseville and even beyond.

The granite quarries are another source of revenue to the people of Placer. The inexhaustible quarries at Lincoln, Rocklin, Loomis, and Penryn afford stone of all shades from the lightest gray to an almost jet black when polished. Great quantities of this stone are free from iron, and the convenient railroad offers shipping facilities which makes quarrying for distant markets profitable.

The street curbing and granite fronts of San Francisco are nearly all from the Placer quarries, while the State Capitol, the Stockton Court House, and the Crocker monument are examples of the value

and beauty of this foothill granite. The amount of business in this industry varies with the season, but it runs well up into the hundred thousands of dollars every year.

The lumber business is by no means the smallest of Placer's resources. A single firm has cut about two hundred and fifty million feet in Placer and Nevada Counties since it has been in business, while several smaller firms on the Forest Hill and Iowa Hill divides annually contribute their quota to the output. A new mill at Emigrant Gap is turning out about twenty thousand feet a day, and the recent organization of the Sierra Land and Lumber Company, which owns large tracts in the "French Meadows," above Michigan Bluff, will be the cause of soon opening up one of the finest timber belts now remaining in Central California. It is not unlikely that a narrow gauge railroad will be built from Soda Springs Station to this property in 1891. The wood-pulp mill at Towles is also an important feature of Placer's industries. The output is used at the paper mill in Stockton.

Besides the immense deposits of gold in both the quartz and gravel deposits, there are found within the limits of the county ores of copper, iron, manganese, chromite, and silver (in the Ophir Mining District), and other minerals such as limestone, marble, steatite (soapstone) magnesite, and baryta spar (sulphate of baryta), kaolin and quartz sand, suitable for making glass.

Large quantities of lime and chromite are shipped from the county, and the value of the pottery clay has already been mentioned.

Mining for gold has been the leading industry and source of wealth of the county in the past since the discovery of gold in 1849, and will certainly continue to be one of the principal industries and sources of wealth in the future. The shallow placers were extensive, extending from the lower plains almost to the summit of the Sierra, and were among the richest in the State.

Quartz mining has also been carried on to a greater or less extent since the erection of the Croesus Mill—one of the first stamp mills in the State—on the Croesus Mine, in Baltimore Ravine, near Auburn, in 1851.

As the shallow placers and river bars were exhausted miners turned their attention to drift and hydraulic mining in the deep auriferous gravels of the ancient river channels on the hills; and whenever the beds of the ancient rivers were accessible for working by shafts and tunnels they were worked by the drifting process, and yielded large profits.

Hydraulic mining began in 1854, and was carried on successfully at Yankee Jim's, Forest Hill, Bath, Michigan Bluff, Iowa Hill, Wisconsin Hill, Gold Run, Dutch Flat, and other places throughout the county, and as an industry increased in importance and nourished until the debris litigation resulted in stopping, by injunction, all the hydraulic mines in the county. Since hydraulic mining ceased in 1886, miners and capitalists have turned their attention to the development and working of quartz mines, and the opening of the deep, lava-capped auriferous gravel channels for mining by the drifting process. This work is not objectionable, as it can be conducted without doing damage either to the navigable streams or valley lands.

Taking into consideration the fact that there are within the county limits about two hundred miles of unworked auriferous gravel channels and an immense area of auriferous metamorphic rock, in which are great numbers of veins of auriferous quartz, and basing an estimate of the amount of gold yet remaining in the unworked channels on the result obtained from channel workings at Forest Hill, Iowa Hill, Deadwood, Last Chance, Canada Hill, Dutch Flat, and some deep channel workings between Rocklin and the American River, varying from about \$100 to \$1,000 per linear foot of channel worked, and equal to a product varying from about \$500,000 to \$5,000,000 per mile, it is evident that the amount

of gold already extracted is but a trifle compared with the amount remaining in the ancient river channels and quartz lodes.

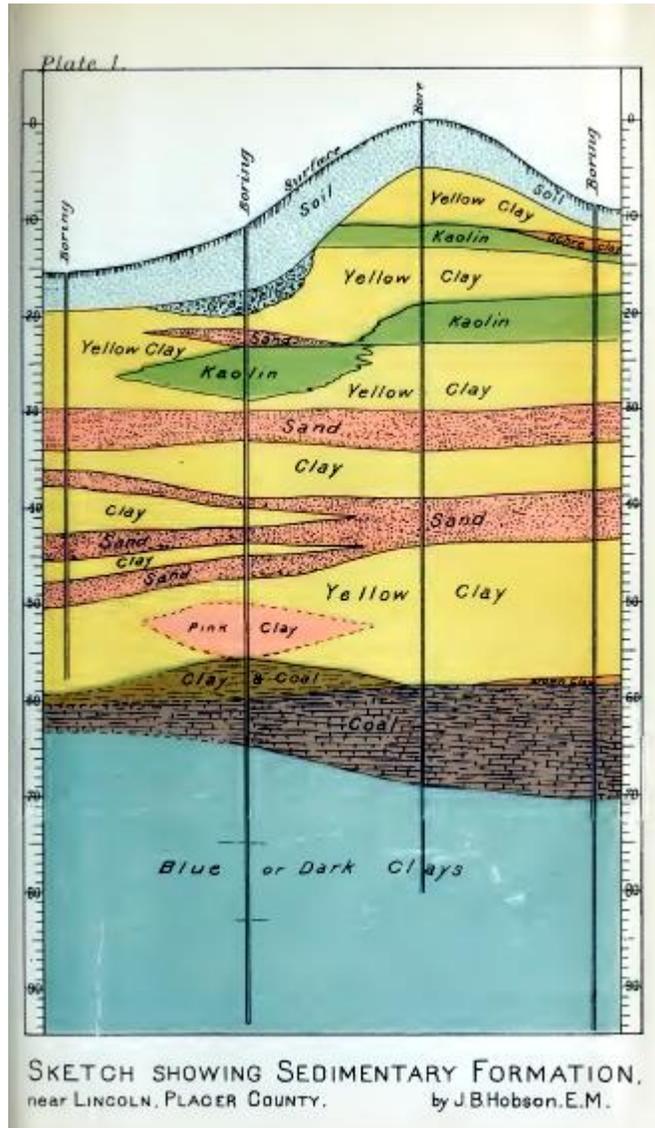
GEOLOGICAL FEATURES.

The reader will be assisted by reference to the Geological Map and accompanying profiles and sections through Placer County.

No. 1 showing cross-section beginning at the Sacramento County line and running along the line of the Central Pacific Railroad to Summit, thence east to the State line; and No. 2 from Colfax, running east along the township line between Townships Nos. 14 and 15 north, to the west boundary of range 11 east; thence northeasterly to the summit of Bald Mountain; thence easterly through Tahoe City and Lake Bigler to the State line; also a sketch illustrating the formation developed by borings southeast of Roseville on the N.W. $\frac{1}{4}$ of Sec. 9, T. 10 N., R. 7 E., M. D. M.

By reference to the accompanying sketch (Plate 1) it will be observed that the borings passed through about ten feet of surface soil, thence through alternate strata of clay, kaolin, auriferous gravel and sand, to a depth of about fifty feet; thence through yellow, pink, and brown clay, overlying a stratum of lignite, varying from four to twelve feet in thickness, underlying which is a bed of dark blue clay of unknown depth. The borings were sunk to a depth of ninety-six feet.

The formation is similar to that found in the vicinity of Lone, in Amador County, and probably belongs to the Tertiary. The above formation probably underlies that portion of the plains and rolling hills immediately west of the granitic rock. East of the sedimentary formation just described, the granite comes in and continues about six miles, following the line of the Central Pacific Railroad to a point about one mile west of Penryn. This belt crosses the county from the El Dorado County line going northwesterly, narrowing gradually as it approaches the Yuba County line. The surface overlying this rock forms low rounded hills, little valleys, and depressions, which are covered with a deep soil, composed of decomposed granite and detritus which is very productive when properly cultivated and irrigated. The granite weathers out in large masses near Rocklin, Loomis, Penryn, and Lincoln, where extensive quarries have been opened for supplying stone for building purposes in San Francisco and other places.



A few veins of quartz have been discovered in this body of granite, but none of them have proved to be gold or silver-bearing. This body of granite, in many places, is overlaid with patches of rich auriferous gravel and volcanic capping. The gulches, ravines, and shallow placers were rich, and worked extensively by the early miners. The source of the gold was from the Tertiary gravels of the ancient rivers, and not from the detritus of the underlying granite rock.

Adjoining the granite below Penryn is a highly auriferous belt, composed principally of syenitic granite and syenite, divided by narrow belts of hard metamorphic siliceous slate, hornblende schist, talc schist, chlorite schist, ferruginous slates, and dikes of diorite and porphyry. Between the contacts are veins of auriferous quartz, many of which carry a large percentage of argentiferous galena. The strike of this auriferous belt varies from north 20 degrees to north 75 degrees west. Some of the veins cross the strike at nearly right angles. This belt is about six miles wide, on line of railroad, narrowing in the shape of a wedge going northwest, including the well known Newcastle and Ophir Mining Districts, widening southeasterly towards El Dorado County, and joining the metamorphic slates about two miles below Auburn.

North and east from the syenitic granite the slates continue, following the line of railroad about six miles, to a point at the head of the west branch of Dry Creek, known as Nealsburg.

Large masses of serpentine and metamorphic limestone occur among the metamorphic rocks. Strong fissure veins of auriferous quartz are found in places throughout the entire belt; also, veins of auriferous talc, which are usually found in contact with the serpentine.

Dikes of diorite are usually found walling the auriferous veins, and wherever a belt or seam of ferruginous slate comes in contact with the quartz rich bodies of ore are found.

The belt of country lying between the Auburn gold belt and a point about three fourths of a mile west of New England Mills, is composed of metamorphic rocks similar to those forming the Auburn belt, but no shallow placers or veins of auriferous quartz have been discovered.

Copper, chromite, manganese, iron, limestone, and heavy spar (sulphate of baryta) occur where marked on Geological Map.

At New England Mills is a narrow belt of auriferous slate resembling that of the Mother Lode, and I believe it is a continuation of the same. Located on it are the Meda and other claims, whose walls are black slate, similar to that of the Mother Lode. The strike is nearly north and south.

Codfish Canon, which heads near New England Mills and empties into the North Fork of the American River, was worked extensively for placer gold.

East of the slate is a narrow belt of serpentine, and next east of the serpentine are metamorphic slates, shales, schists, dikes of conglomerate and diorite, continuous up to and above Colfax to a point near Long Ravine.

About a mile west of Colfax is located a group of highly auriferous veins of quartz in syenite and diorite. These veins have a northeast and southwest course, and are commonly known as the Rising Sun group. The Rising Sun Mine has been profitably worked to a depth of about eight hundred feet, but is now idle on account of litigation.

At Long Ravine the auriferous slates again come in and form an unbroken belt ten miles wide. The strike is northwest and southeast, with a slight dip to the northeast, and the formation continues to a strong belt of serpentine at Alta. This belt of serpentine runs about north and south, increasing in width going south to the head of Shirttail Canon, where it is over two miles wide, and contains large masses of chromite which are being profitably mined and shipped east for reduction.

Going south from the boundary between Townships 14 and 15 north, M. D. M., the serpentine narrows, crossing the Middle Fork of the American River and the Georgetown Ridge about a mile east of Georgetown, in El Dorado County.

Going north it crosses Bear River, and continues into Nevada County, passing west of Omega and Washington.

This great belt of serpentine divides the central from the eastern gold belt in Placer County.

East of the serpentine is a continuous belt, nearly eighteen miles wide, known in Placer as the East Gold Belt. This is composed of metamorphic slates, mica, talc, chlorite, and hornblende schists, quartzite, dikes of diorite, and porphyry and diabase, and on the extreme east syenite, which joins the granite near Cisco, and east of the Ralston Dam, on the Middle Fork of the Middle Fork of the American River.

The outcrops of numerous veins are seen on the ridges between Bear River and the North Fork of the North Fork of the American River, on Texas Ridge, between the North and South Forks of the American, south of Humbug Canon, near Damascus, on the ridge between the North Fork of the American River and Humbug Canon, and at Canada Hill and Last Chance. Throughout the above described region several gold-bearing veins, are being prospected and worked with very flattering results.

West of the serpentine also are numerous promising gold-bearing veins, which have been located, and are being prospected and worked, the most important of which is the Drummond Mine, on Sec. 1, T. 14 N., R. 10 E., M. D. M.

The only fossils found during my examinations were ammonites, found in a peculiar belt of slaty rock which is about two thousand feet wide and forms the foot wall of the Sterrett Quartz Mine on Sailor Canon. On top of the ridges the rocks are usually decomposed for a considerable depth, and covered with soil, and in numerous places are the beds of the ancient rivers of the Tertiary filled with immense deposits of auriferous gravel, in many places capped with volcanic debris and lava covering the ridges from canon to canon, and making it exceedingly difficult for the geologist to trace and correctly locate the contact and boundaries of the different belts and masses of rock. The rocks are well exposed in the deep canons, become more firm and compact as you descend the deep eroded ravines and river canons, and near the beds are extremely hard and difficult to break.

The strike varies from north and south to a northwesterly and southeasterly course, with a dip nearly vertical, inclining slightly to the northeast, and are mainly Jurassic.

Numerous veins of quartz are seen cropping on the sides of the deep canons, often crossing the beds and appearing on the opposite sides. The veins are usually in contacts and show strength; and the fact that in many places bodies of ore have been discovered in the veins near the beds of the deep canons of the American and Bear Rivers, as well as on the tops of the ridges from one to three thousand feet above, is positive evidence of their permanence and gold-bearing qualities at great depth.

Along the beds of the deep river canons are bar and bench deposits of auriferous gravel, varying from a few feet to one hundred feet in depth, and usually capped with a red ferruginous clay and red soil, some of them covering several hundred acres. (See sketch, Plate No. IV.) The formation of these bench deposits may reasonably be credited to the periods running from the Glacial through the Champlain, and including the recent.

These deposits were rich in gold, and were eagerly sought for and worked by the early gold miners; first, by aid of pick, pan, and rocker, followed by sluicing, drift, and hydraulic process. They were easily and profitably worked, and are, to a great extent, worked out in Placer County.

Some of the bars whose beds were below the present water level of the rivers, still remain and are being profitably worked by hydraulic elevators.

The Mammoth Bar Mining Company, located a few miles east of Auburn, on the Middle Fork of the American River, uses a hydraulic elevator, operated with four hundred miner's inches of water, discharged under a head of four hundred feet, to elevate the gravel from the bedrock, fifty feet below the present water level of the river, to the bank of the river above, where it is washed in sluices and the gold recovered. The output of gold, when the mine is running regularly, during the summer months, often reaches \$1,000 daily.

By reference to the Geological Map of the county, it will be observed that upon nearly every ridge or divide between Bear River and the South Fork of the North Fork of the American River are the lava-capped beds of the ancient rivers.

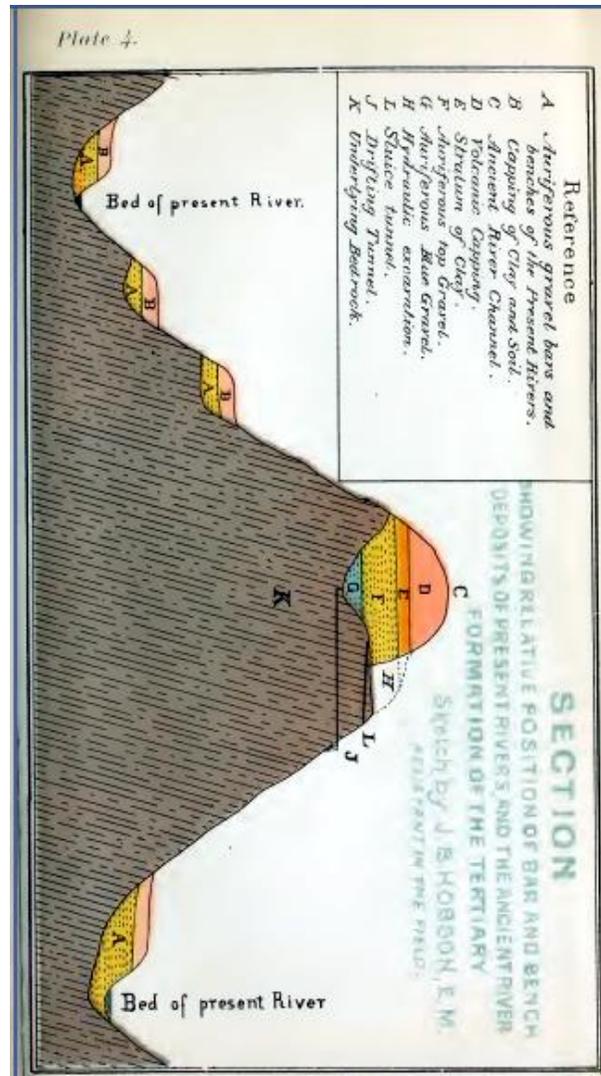
These deposits are also to be found on nearly all the ridges and divides between the South Fork of the North Fork of the American and the South Fork of the Middle Fork of the American River. By following either the gravel deposits, or remaining patches of gravel or capping, their general course can be readily traced from their source in the high Sierra to the plains. In the region north and south of Rocklin their beds are eroded, in the granite, below the present surface of the surrounding country.

These deep, well marked eroded channels near the lower plains, together with the numerous patches of Tertiary gravel and volcanic capping found on the ridges between the plains and the larger deposits at Gold Run, Iowa Hill, and Forest Hill, are almost positive proof that the ancient rivers in their course westward followed about the course marked by the remaining patches.

Assuming that they did follow a course within the limits of the remaining patches after leaving Gold Run, Iowa Hill, and Forest Hill, would account for the fabulous richness of the shallow ' placers in the vicinity of Auburn, Ophir, Newcastle, Gold Hill, and Virginia Town.

The shallow placers north of Dry Creek were very poor, and the fact that no gold was ever found in the region between the west branch of Dry Creek and New England Mills is certain proof that the ancient rivers never passed over that region.

The detail survey of the mines and contact of the Iowa Hill channel system proves conclusively that the Gold Run channel did not run southerly through Iowa Hill via Wisconsin Hill to Yankee Jims, as was originally supposed; but, on the contrary, the Iowa Hill, or what is known as the Morning Star, channel has a northwesterly course, and probably had its confluence with the Gold Run channel at some point where is now the canon of the North Fork of the American, passing thence down the course of the



canon, leaving it and passing through the country between Sees. 21, 27, and 35, T. 13 N., R. 8 E., and flowing thence southwesterly in the direction of Auburn, connecting at Boulder Ridge; thence on to the plains.

It is also probable that the Forest Hill channel passed along the course of the Middle Fork, leaving a volcanic-capped ridge at Bloomer Cut, and passing thence southwesterly connected at Lairds'; thence through the Chabot Mine and on to the plains.

In tracing ancient channels it is necessary to take into consideration the characteristics of the gravel and material composing the deposit, as well as a comparison of the size, shape, and fineness of the gold.

By making careful surveys of the contact of either the auriferous deposit or the volcanic capping with the underlying bedrock, it is possible with a reasonable degree of certainty to locate and reconstruct the system of watercourses now covered by accumulations of auriferous gravel and volcanic capping.

Such surveys would be of practical value to the miner and investor as a means of guiding them in their explorations, and of furnishing reliable data for the location of tunnels, often long and expensive, to tap the auriferous deposits.

IOWA HILL MINING DISTRICT.

This district covers the region commonly known as the Iowa Hill Divide, lying between the North Fork of the American River on the northwest and Shirt-tail Canon, from the junction of the latter with the American. It joins the Damascus Mining District on the east, and includes the northerly portion of T. 14 N., R. 10 E., and the southwesterly portion of T. 15 N., R. 10 E.

The district includes an interesting system of ancient river channels (see Geological Map of Iowa Hill Mining District, and Section Plates Nos. I to VIII, accompanying this report), commonly known as the Morning Star, Grizzly Flat, Golden Gate, Wolverine, Glencoe, Succor Flat, Long Point, and Vigilante channels. Lack of time prevented a complete survey of the whole region, including tributary channels to the west, at Elizabeth Town and on the ridge between Indian Canon and Stevens Ravine, and easterly up the ridge, including the tributaries. above the Strawberry and Succor Flat Mines, connecting at Giant Gap with the surveys of the Forest Hill divide, by Ross E. Browne, E.M.

The Iowa Hill map and accompanying sections show the elevated position of the ancient river system, with respect to the modern drainage of the present rivers, the contact of the deposits and underlying bedrock, marked by a dotted line, the elevation of the material points above sea level, the underground workings, so far as their accessibility would permit, also a delineation of the hydraulic workings, and the character and depth of the different strata composing the deposit.

The theories heretofore advanced as to the source and direction of flow of the Iowa Hill system of channels differed greatly from the correct course determined by recent surveys. The theory once believed by a majority of the miners of the region was that the great river flowed southwesterly from the summit of the Sierras down the ridge past Damascus to a point a short distance above Succor Flat, where it forked into two branches, both entering a basin; one flowing in the direction of Roach and Independence Hill, and the other in the direction of Wisconsin Hill.

The current eroded channels running in various directions towards the end of Long Point, Lermonds, Grizzly Flat, Hammil's Point, Wisconsin Hill, Iowa Hill, Golden Gate, and Strawberry Mines; and its northerly branch flowed towards Independence Hill, eroding the channels under Roach Hill. These beds were gradually filled with auriferous gravel, sand, and sediment, and formed a delta which was finally covered by volcanic capping.

The theory advanced by Professor Whitney, in his "Contributions to American Geology," Vol. I., was, that the ancient river flowed from Dutch Flat through Gold Run, thence towards and under the town of Iowa Hill, thence through the Morning Star Mine, passing southerly under Wisconsin Hill, and thence on southerly to Yankee Jims and the Forest Hill divide, with effluents coming in from the east.

By reference to the Iowa Hill map, following contact of rock and overlying deposits, noting the position and direction of workings and elevations, it can be plainly seen that the above theory was erroneous.

Beginning on the Geological Map, in the Morning Star channel, at a point south of the town of Wisconsin Hill, in the lowest depression of the channel uncovered by hydraulic workings, the figures 2,692 will be found, denoting the elevation of bedrock above sea level, and following the course indicated by dotted lines and arrows, the figures 2,685 will be found near the edge of the hydraulic bank.

At the workings of the Morning Star, in Indian Canon, the elevation is two thousand six hundred and eighty-five and two thousand six hundred and fifty-one feet; and at the end of workings, northwest of the town of Iowa Hill, the elevations two thousand six hundred and forty-four feet and two thousand six hundred and thirty-one feet will be found, showing the point last mentioned to be sixty-one feet lower than the one at the southerly end of the channel, equal to a mean grade of three tenths of one foot to one hundred feet of channel.

In the Waterhouse & Dorn Mine the workings had not reached the bottom of the deep channel. The elevation, two thousand seven hundred and six feet, is on the rim and above the mean grade of channel bottom.

In the workings of the Morning Star Mine it will be observed that in the easterly workings the elevation of bedrock is much higher than the mean grade line of the channel bottom. This difference of level is explained, however, by the faulting and upheaval of large sections of the country rock and overlying deposits, as shown on map and section plates.

The Grizzly Flat channel, where working began, has an elevation of three thousand and sixty-three feet, and flow in the direction indicated by arrows, until the bedrock goes below the level of the working tunnel. This was extended about two thousand feet in the overlying deposit, and a winze was sunk which struck the bedrock at an elevation of two thousand nine hundred and twenty-six feet, where it was found pitching toward the west at an angle of about 40 degrees. The rapid pitch indicates a near approach to the bottom of the channel, which, so far as developed, shows a mean grade of four and five-tenths feet to one hundred feet of channel, and is tributary to the Morning Star channel.

In tracing the course of Succor Flat channel, commence at the bottom of incline in the Copper Bottom Mine, at an elevation of three thousand three hundred and ninety-nine feet; thence follow the course indicated by arrows through the workings in the Succor Flat and Strawberry Mines, noting elevations of bedrock; thence cross Indian Canon into and through Roach Hill to the Phillips Claim; thence again cross Indian Canon, and pass through the Trio and front of the Golden Gate Mine; thence continue southwesterly along the line of Indian Canon, noting a bench in front of the Homeward Bound Mine, at an elevation of two thousand eight hundred and eighty-eight feet; thence follow in the same course to its confluence with the Morning Star channel on the north side of Indian Canon, near Iowa Hill. The average grade will be found to be three and four-tenths feet for each one hundred feet of channel.

The Wolverine and Glencoe channels are tributaries to the Succor Flat channel, making their confluence as shown by workings in Roach Hill. The Golden Gate channel was probably eroded by the Grizzly Flat stream shifting its course after the fill and clay capping of the Morning Star system, at about the commencement of the volcanic period. The cross-section exposed in the Golden Gate Mine, shows

plainly an erosion of the original deposit, and a fill of gravel and volcanic debris (foreign to the original deposit), covered with a heavy deposit of reddish colored sediment, and finally covered by volcanic capping.

For the sake of convenience in description, the channels will be divided in this case into two classes: the system just described will be classed as primary, for the reason that its beds were eroded and filled prior to the volcanic period; and the system to be described as secondary, for the reason that its beds were eroded during the volcanic period. The gravel deposit found in them is almost entirely composed of rounded volcanic rocks, gravel, and debris. The auriferous deposit is usually thin, varying from less than a foot to four or five feet, rarely exceeding twenty feet in depth, and overlaid with volcanic capping.

The Long Point channel is of the secondary class. It crosses the ridge from Little Indian Canon, going southerly to the McKinnon Claim at the end of Long Point. The elevation of bedrock in workings of Cumberland Claim, in Little Indian Canon, is three thousand one hundred and ninety-one feet, and the elevation is three thousand and seventy-four feet at the McKinnon Claim, on Long Point, showing an average grade of eight tenths of one foot in one hundred feet of channel.

A shaft sunk in the Attalus Claim and one in the Cumberland indicate the probability that they are on a small tributary, as shown on Iowa Hill map.

After leaving the McKinnon Claim, the stream probably flowed southerly, entering the Forest Hill Divide, where its course will be traced and shown on the maps of that region by Mr. Ross E. Browne.

The Vigilante channel is of the same class as the one in Long Point. Its bed at the upper end of Vigilante workings has an elevation of three thousand and thirteen feet, and its course is southerly, making a bend to the west from the Lermond Claim, crossing what is now the bed of Grizzly Canon, passing in the shape of a horseshoe through Webber & Co.'s claim, and thence out through Stone's claim at an elevation of two thousand eight hundred and seventy-two feet. The mean grade is one and seven tenths feet to one hundred feet of channel.

The cross-section plates show the relative position and elevation of beds of present and ancient rivers. Plate I (section on line from A to B, see map) illustrates bed, gravel deposits, and capping of Morning Star, Wolverine, and Glencoe channels. Plate II (section on line from C to D) illustrates beds of Morning Star, Grizzly Flat, Golden Gate, Long Point, and Succor Flat channels. Plate III (section on line from E to F) illustrates beds of Vigilante and Long Point channels; also, the probable position of Grizzly Flat channel prior to the erosion of Grizzly Canon. Plate IV (section on line from G to H) illustrates beds of Morning Star, Grizzly Flat, Golden Gate, Vigilante, and Long Point channels, and the workings of Drummond Quartz Mine.

Longitudinal section plates are drawn on line following the beds of the different channels.

The fill of the Morning Star channel for a depth varying from sixty to one hundred feet next the bedrock is made up of rounded boulders, cobbles, gravel of metamorphic rock, and sand cemented together with lime, iron, and silica, forming a very hard conglomerate, which cannot be mined without the aid of powder, requiring also the aid of stamp mills to crush and disintegrate it so that the gold it contains can be separated and recovered. This hard cement has a light bluish gray color, and is known as blue gravel, often carrying a large percentage of iron pyrites. There is but a small percentage of quartz in the bottom, or blue gravel, and the sand contains a large percentage of mica, indicating a granite origin; but no boulders or cobbles of granite have s» far been found in any of the workings. Overlying the blue gravel is a heavy deposit of mixed gravel no cemented. This top gravel is composed principally of metamorphic gravel, mixed with a large percentage of quartz, gravel, pebbles, and sand. The greatest

depth of this highly auriferous deposit, including the blue gravel, is about three hundred feet, thinning out towards the rims, as shown in cross-section, Plate I.

Overlying the gravel is a continuous stratum of siliceous sediment varying from a few feet to sixty feet in thickness, called clay by the miners when soft, and hardpan when found cemented.

A careful leveling of this stratum of clay, for the purpose of determining its elevation, at different points where exposed, demonstrate the fact that at Wisconsin Hill it was higher than at the Sugar Loaf near Iowa Hill. It was also found higher at Roach and Independence Hills than at Iowa Hill, showing a grade from both Wisconsin and Roach Hills toward Iowa Hill, a fact which may be considered another link in the chain of evidence as to the direction of flow of the ancient river.

The Succor Flat channel, in its course coming down the ridge towards Iowa Hill, crosses the serpentine belt lying a few miles east, which accounts for its auriferous deposit being mixed with a large percentage of serpentine boulders and gravel. It is not cemented like that of the Morning Star channel. It is mined easier by blasting, not requiring milling, and is termed by miners free gravel.

Following down and examining the workings of Succor Flat, Strawberry, Stockton, Columbus, White Pine, Phillips, Star United, and crossing Indian Canon to the Trio and Golden Gate Mines, boulders and cobbles of serpentine are found mixed with the bottom gravel. This is also the case on the bench fronting the Homeward Bound Claim, and in the deep channel passing northwesterly under Iowa Hill. On the contrary, in the Morning Star Channel from Wisconsin Hills to a point where its course crossed Indian Canon, not a serpentine boulder, cobble, nor pebble could be found. This fact may reasonably be considered another link in the chain of evidence in favor of the flow of the ancient river going as indicated on map, instead of taking the southerly course suggested by Professor Whitney.

Serpentine gravel was found in the Glencoe but none in the Wolverine channel.

The absence of serpentine in the Morning Star channel south of Iowa Hill is proof that the river did not cross the serpentine belt lying to the east.

The question as to where it came from remains unanswered, since there is no similar deposit at Gold Run, Yankee Jims, or anywhere on the Forest Hill Divide. The bottom gravel, however, and also the gold, have a close resemblance both in character and fineness to that found in the Breece & Wheeler and May Flower Mines; but the direction of the workings in those mines and the rim on the north side of the Forest Hill Divide are evidence against the possibility of the Morning Star being a continuation of the May Flower channel.

There is no doubt, however, that the Morning Star channel at some time prior to the erosion and fill of the Forest Hill system, crossed the Forest Hill Divide in its course toward Iowa Hill.

For the sake of illustrating this theory (see Geological Map of Placer County), let us begin on the deposit above Volcanoville in El Dorado County and follow a northwesterly course across Forest Hill to Wisconsin Hill and Iowa Hill; thence westerly, making confluence west of Iowa Hill with Gold Run channel; thence following course of American River Canon and the remaining patches in its course westerly to Boulder Ridge and the plains. The elevation of bedrock and similarity in character of deposit and capping of remaining patches between Iowa Hill and Boulder Ridge offer a reasonable basis for the theory that the ancient river flowed westerly in the direction near that marked by remaining patches between Iowa Hill and Boulder Ridge.

Accurate surveys, however, are the only reliable means of determining, delineating, and reconstructing with any degree of certainty the system of ancient rivers of the Tertiary.

A survey of the volcanic-capped ridge above Damascus, made by the writer in the year 1878, maps of which are on file in State Mining Bureau, resulted in delineating and locating the course of the

beds of an extensive and valuable system of auriferous channels now being worked at Red Point, and in course of development at Indian Springs, Golden Fleece, New Basel, Macedon, and Hogsback Mines.

Prior to the anti-debris litigation there were thirty-three hydraulic mines operated in the Iowa Hill District, all of which are now closed. Since the cessation of hydraulic mining several of the mines have been reopened for working by drift process, giving satisfactory and profitable results.

The Waterhouse & Dorn Mine.

The Waterhouse & Dorn Mine is located at Wisconsin Hill, and has an area of one hundred and sixty-three and thirty-seven one hundredths acres, covering several thousand feet of the Morning Star channel.

The mine is opened with a tunnel eight hundred feet in length, from which a shaft is raised and a station opened in the cemented blue gravel. Gangways have been driven up and down the course of channel, exposing a deposit of rich gravel similar to that in the Morning Star Mine.

The mine is provided with a three-drill compressor plant of the Rix & Firth pattern, also two of Bryan's twenty-ton roller mills. A ditch owned by the company, having a capacity of five hundred inches, furnishes water for power to drive both mill and compressor.

The power drills in use at the mine are the Ingersoll and National, which work to perfection in the hard cemented gravel. They are used in the breasts, as well as in the drifts and gangways, and are found much cheaper than hand drilling.

The gravel extracted is first run through a rockbreaker and fed by self-feeders to the Bryan roller mill, which is provided with No. 4 wire screens. The gold is recovered on plates. The gravel extracted yields \$9 per carload of one ton. The company intend erecting a twenty-stamp mill, which will be more suitable for crushing hard cemented gravel than mills of the roller pattern.

It is unnecessary to give detailed descriptions of the drifting operations at the Morning Star and other mines in the vicinity, as they were fully described in the Annual Report of 1888. They are, however, working steadily and are in a prosperous condition.

The Drummond Quartz Mine.

This property is located on the north half of Sec. 1, in T. 14 N., R. 10 E., M. D. M., which lies on the ridge between the north and south branches of Shirt-tail Canon at an elevation of three thousand six hundred feet, just west of the serpentine belt. The claim covers three hundred and twenty acres United States patent, and includes several other very promising veins besides the Drummond.

The course of the Drummond vein is about north 60 degrees west, and the dip about 80 degrees northeasterly. The country rock is metamorphic slate, mica, chlorite, and talc schists, with occasional dikes of diorite and porphyry.

The Drummond vein, so far as explored in workings, varies from two to thirty feet between walls. The foot wall is altered slaty diorite, and the hanging wall quartz diorite.

The mine is opened near the north end by a tunnel driven two hundred and ten feet on the vein; and also by a crosscut tunnel two hundred feet lower driven three hundred feet, and cutting the vein, which is at that point twenty-one feet wide. From the main tunnel a level is driven north in the foot wall

about three hundred feet, and from this level crosscuts have been driven to the hanging wall, exposing a vein varying in width from three to eighteen feet.

Going south the level is extended about one hundred and fifty feet, from which crosscuts are driven, exposing a three-foot vein of ore next to the hanging wall, and a six-inch streak on the foot wall. The space between quartz is filled with gold-bearing porphyritic slate.

The walls at south crosscut No. 2 are thirty-one feet apart; from crosscut No. 2 a winze is sunk fifty feet on the ore vein next to the hanging wall to connect with the level driven on the vein from tunnel No. 3. The length of the ore shoots has not been determined. Considerable ore has been stoped from above the second level, and yielded about \$7 a ton. There are two twenty-ton Huntington mills on the property run by steam (see sketch-plate showing workings).

The Eclipse is an east and west vein, about eighteen inches wide, and probably a spur of the Drummond. A shaft eighty feet deep was sunk on this vein, from which was extracted some very high-grade ore.

The Wolford vein is also an east and west vein, about ten inches wide, and probably a spur of the Drummond. A shaft forty feet deep was sunk on the vein, from which some high-grade ore was extracted.

The Drummond may be considered an important discovery, as it promises to develop into a large and permanent mine. Numerous quartz outcrops can be seen in the region south of the Drummond Mine. The prospecting done on the Newsom Claims gave encouraging results.

North of the Drummond on Sec. 36, T. 15 N., R. 10 E., are several promising prospects.

Located on the north side and near the bed of North Shirt-tail Canon, is the Providencia Quartz Mine. This vein is about three feet wide, its course northwest, dip 80 degrees northeast, the walls being hard metamorphic slate. A tunnel is driven northwest on the vein about eighty feet, exposing a strong three-foot vein, showing free gold. The property was purchased a few years ago by Prof. Wm. P. Blake, who secured a United States patent, and left the property idle since.

DAMASCUS DISTRICT.

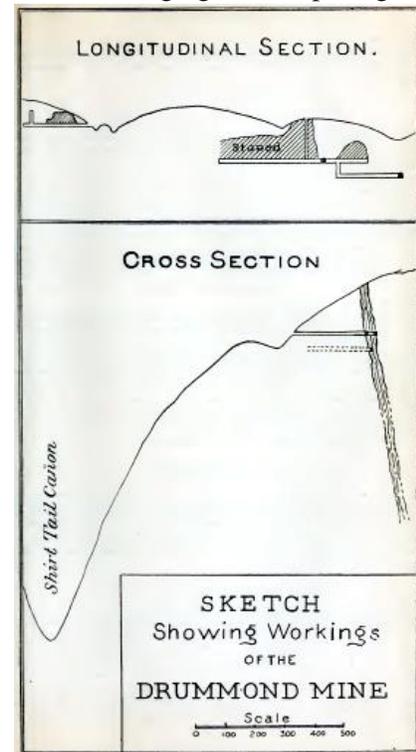
The Pioneer Mine is running full blast. The Superintendent, Mr. Sullivan, reports the mine looking well and promises to keep the twenty-stamp mill running steadily. The property was fully described in report of 1888.

CANADA HILL DISTRICT.

At Canada Hill proper there is at present quite a stir, owing to the fact that a San Francisco company purchased the old Buena Vista, Iowa Hill, and Van Vactor Quartz Claims. They have erected a five-stamp prospecting mill, and are at work driving a tunnel to prospect the veins below the old workings of early days.

At Sailor Canon the Van Vactor Consolidated Gold Mining Company is driving a long bedrock tunnel to tap the channel in the main ridge. The tunnel is now in about one thousand feet.

The Bald Mountain Mining Company have a large claim located on the channel south of Bald Mountain at Flat Ravine. The company, several years ago, sank a shaft from the bed of Flat Ravine eighty



feet to the bottom of the channel, where they found rich gravel, but a heavy flow of water prevented the possibility of working without heavy machinery.

The topography of the country prevented the possibility of driving a tunnel to tap their discovery near the shaft, so the company were compelled to go along the course of the channel nearly three quarters of a mile to a place sufficiently low for the location of a tunnel to tap the channel bottom. Here they have been steadily working for four years, driving a hard bedrock tunnel about fifteen hundred feet, which finally broke through the rim of the channel into a heavy body of clay that overlies the gravel. Their tunnel is too high, but they hope to be able to drain the water by the aid of a siphon, and work up stream until the bedrock of the channel rises to the tunnel level.

LAST CHANCE DISTRICT.

There is but little doing in this district, as the drift mines that were accessible with tunnels of reasonable length are about all worked out; the deeper deposits, requiring long and expensive tunnels, must remain until opened by organized companies having large capital. There is, however, considerable prospecting in the vicinity on veins of quartz, several of which show free gold.

DEADWOOD DISTRICT.

At Deadwood there is little doing. The Davis Claim is being drifted by a few men. Deadwood, like Last Chance, has been a lively drift mining camp, but the accessible channels were worked out; while those, like the well known and celebrated Devil's Basin channel, which was worked as far as possible below the levels of present tunnels, rich as it is known to be, are waiting the aid of capital to drive long bedrock tunnels to tap and drain the channel, and open for working gravel that will probably yield, like the old workings, at the rate of an ounce of gold to the carload.

GOLD RUN DISTRICT.

This district is situated on the line of the Central Pacific Railroad. It was, a few years ago, one of the most nourishing hydraulic mining regions in the State. The mines are all idle, having been stopped by anti-debris injunctions. The once prosperous town bearing its name is almost deserted, and the few old miners remaining eke out an existence by crevicing and cleaning bedrock in the old hydraulic pits.

The district covers an immense ancient river channel filled with a deposit of auriferous gravel to a depth of about four hundred feet, the deposit between rims being about a mile wide. In places the top gravel was worked in two benches of one hundred and fifty feet each, leaving the bottom or blue gravel remaining. This bottom gravel is known to be rich, as it had just been opened by a long and expensive bedrock sluice tunnel, and worked sufficiently to prove its richness. The time, however, is not far distant when attention will be directed to opening up the deep channel for working the cemented bottom gravel by drifting process, and crushing it in stamp mills. If so opened, it would give employment to a large number of men for a great many years.

DUTCH FLAT DISTRICT.

This district was also a flourishing hydraulic district prior to the anti-debris litigation. The mines are all idle, and the once prosperous town bearing its name is partially deserted and going to decay.

The bottom gravel is known to be rich, and an effort is being made to consolidate a number of the claims on the channel, and raise funds to drive a tunnel and open the channel for drifting.

OPHIR MINING DISTRICT.

This district is about two miles north of Newcastle on the line of the Central Pacific Railroad.

The country rock is syenitic granite and syenite, with narrow belts of schistose rocks; and dikes of diorite are usually found walling the numerous veins of quartz.

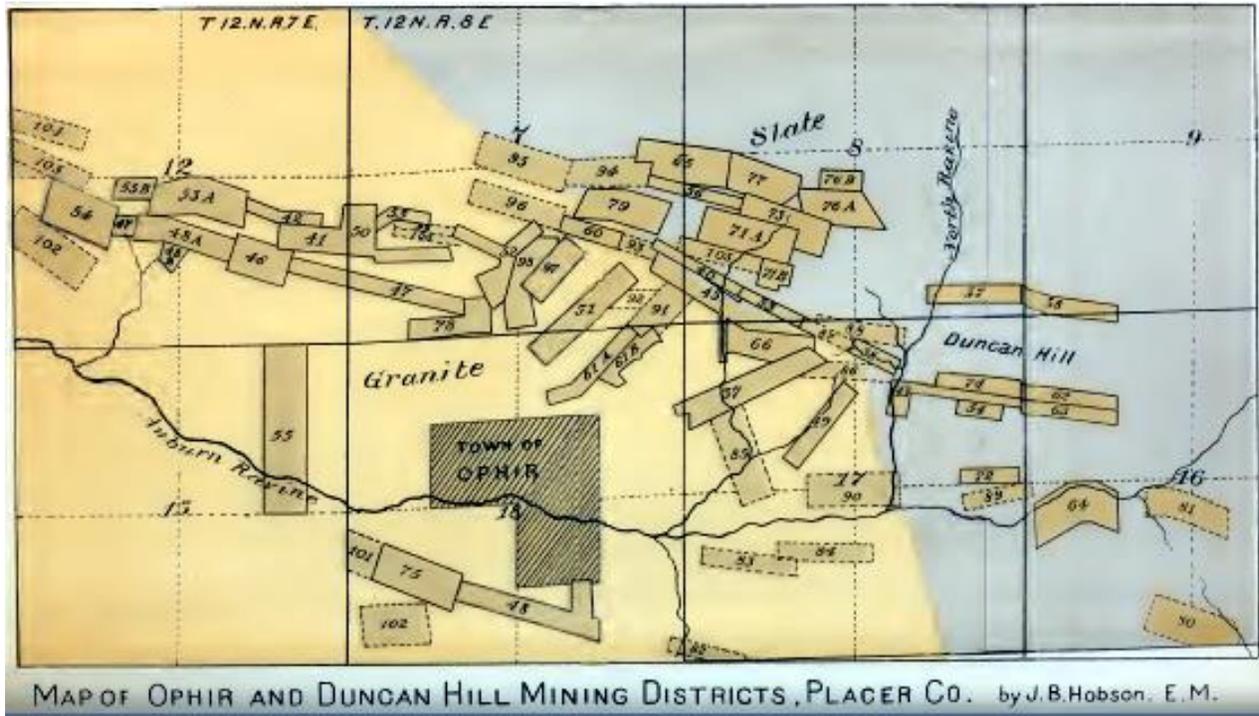
There are fifty-three or more quartz mining locations and claims in the district, all of which have been more or less worked at intervals since 1851.

The deepest workings were prosecuted in the Crater Mine to a depth of eight hundred feet.

The ores in a great majority of the mines are high-grade, but of such a rebellious character that they cannot be profitably worked by the free-milling process. The rebellious ores are quartz, containing besides free gold, a large percentage of argentiferous galena, tellurides, zincblende, and the sulphides of antimony, arsenic, copper, and iron.

A number of the mines, however, have shoots of free-milling ore.

The South Yuba Canal Company supplies water to all parts of the district, affording a cheap and reliable power for hoisting and milling machinery. (See map of Ophir and Duncan Hill Districts.)



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Hathaway Mine.

This mine is located about three quarters of a mile southwest from the town of Ophir, on the south side of Auburn Ravine, at an altitude of seven hundred and sixty-five feet, and consists of a location six hundred by eighteen hundred feet.

The ore vein is quartz, three feet wide, carrying argentiferous galena, zincblende, and pyrites containing copper, arsenic, and iron.

The course is north 75 degrees west, and the dip 75 degrees to the south. The foot wall is syenite and the hanging wall talc schist.

The upper level of the mine is worked through a tunnel fourteen hundred feet in length, and the lower levels through a shaft two hundred feet deep. (See plan of workings.)

The ore shoot is about twelve hundred feet in length, having a pitch of 60 degrees to the east. The main shaft is being sunk to open another level. The water in the mine averages nine thousand gallons in twenty-four hours, and is hoisted with buckets.

The mill has twenty stamps of eight hundred and fifty pounds each run by a four and a half foot Knight wheel, driven by water delivered under a head or pressure of two hundred and thirty feet. The mill is provided with rockbreakers, also four of Hendy's Challenge ore feeders, and four Woodberry concentrators. The method of treating ore is free-milling, amalgamation in battery and on silver-plated plates, on aprons four and one half by twelve feet having an inclination of one inch to one foot. Plates

inside battery are five by twenty-four inches. The sulphurets are sent for treatment to chlorination works. The percentage of sulphurets saved is If per cent, valued at. \$230 a ton.

The hoisting works is run by a six-foot Pelton wheel, driven by water delivered under a pressure of one hundred and ninety-five feet. Sixty-two miner's inches of water measured under a four-inch pressure are required to run both mill and hoisting works.

Altitude, aneroid reading: 765 feet.
Course of vein: North 75 degrees west.
Dip of vein South: 75 degrees.
Average width of vein: 3 feet.
Character of foot wall: Syenite.
Character of hanging wall Talc: schist.
Length of ore shoot: 1,200 feet.
Vertical depth reached by workings: 200 feet.
Length of first level tunnel: 1,400 feet.
Length of second level: 900 feet.
Number of stamps: 20
Weight of stamps: 850 pounds.
Drop in inches: 5½
Value of sulphurets per ton: \$230.
Nature of sulphurets: principally Galena and iron pyrites.
Kind of power: Water.
Number of men employed in mine: 22.
Number of men employed in mill: 4.
Number of men employed on outside work: 5.

Drops per minute: 92.
Duty of stamp in twenty-four hours: 1½ tons.
Water used in battery: 1 ½ inches.
Kind of screen: No. 35 wire.
Size of apron: 4½ by 12 feet.
Kind of feeders used: Hendy Challenge.
Percentage of value saved in battery: 60 per cent.
Percentage of value saved on plates: 20 per cent.
Percentage of value saved on concentrators: 20 per cent.
Kind of concentrators: Woodberry.
Percentage of sulphurets saved: 1¾ per cent.
Wages of miners per day: \$2 50.
Wages of millmen per day: \$3.
Wages of men on outside work: \$2 50.
Amount of water used for power to run mill and hoisting works: .62 inches.
Cost of water per inch, twenty-four hours: 12½ cents.

Gold Blossom Mine.

This mine is located about one and one half miles northwest of the town of Ophir, on the north side of Auburn Ravine. The property includes the Gold Blossom and Ohio Claims, covering about eighteen hundred feet of the Gold Blossom lode, and also a strong spur known as the Marion lode.

The Gold Blossom vein is two feet wide; the course is north 80 degrees west, and dip about 85 degrees south. The foot wall is syenite, and the hanging wall diorite. (See plate showing workings.)

The foot wall of Marion vein is chlorite schist, and the hanging wall syenite. Both veins are worked through a shaft two hundred and eighteen feet deep, from which there are driven two levels. The first is five hundred and eight feet, and the second two hundred and eighty-nine feet in length. A crosscut is driven north from the 180-foot level to the Marion vein, which is about twenty inches wide, similar to that extracted from the upper levels. The length of ore shoots has not been determined.

There is a ten-stamp mill on the property, provided with a rockbreaker, Triumph self-feeders, and a system of canvas blanket tables for concentrating sulphurets; also, a Frue concentrator for secondary concentration of the sulphurets saved on canvas tables.

The ore contains, besides free gold, a large percentage of argentiferous galena, zincblende, and pyrites containing copper, iron, and arsenic.

The ordinary class of ore is worked by amalgamation in the mill and on the plates. The sulphurets are saved on canvas blankets and dressed up by the Frue concentrator. The heavily sulphuretted ore is selected and shipped to smelting works for reduction. Both sulphuretted ore and concentrates are of high grade. The percentage of sulphurets saved is 2½ per cent.

The following gives the result obtained from lots of ore and sulphurets worked at Reno and Salt Lake City: Reno, February 18, 1889.

Reno S., M., and R. Works, bought of Gold Blossom Mine, Ophir, California.

15,714 lbs. sulphurets:	
Assay per ton: gold, \$17.55	90 per cent \$137.89
Assay per ton: silver, \$57.04	90 per cent 360.91
3,247 lbs. of sorted ore called No. 2:	
Assay per ton: gold, \$54.23.	90 per cent 79.23
Assay per ton: silver, \$72.92.	90 per cent 53.27
487 lbs. No. 1 sorted ore:	
Assay per ton : gold, \$220.93.	90 per cent 48.36
Assay per ton : silver, \$72.92.	<u>90 per cent 15.97</u>
	\$695.63
Charges and reduction, etc.	<u>196.16</u>
Amount remitted.	\$499 47

Salt Lake City, Utah, August 27, 1890.

Hanover Smelting Works, bought of E. J. Daley, Agent.

Lot 1, Gold Blossom concentrates, 34 sacks, or 5,895 pounds. Average assay, 64 ounces silver and 12.76 ounces gold.

64 ounces silver, value \$1.18 per ounce:	\$75.52
12.76 ounces gold, value \$20 per ounce:	<u>255.00</u>
Total value per ton of concentrates:	\$330.52
Gross weight:	5,895 pounds.
Less weight of sacks:	<u>33 pounds.</u>
	5,862 pounds.
Less weight of moisture:	<u>12 pounds.</u>
Net weight:	5,850 pounds.
5,850 pounds of concentrates at \$330.52 per ton	\$966.77

The Eclipse.

This mine is situated about one half mile northeast of Ophir, at an altitude of nine hundred and fifty feet. The claim covers about two thousand feet of the Eclipse lode, which has a course north 70 degrees east, and dip 45 degrees to the south. The foot wall is syenite, and the hanging wall hornblende schist.

A New York company has purchased the property and has completed a first-class ten-stamp mill, driven by water-power and steam hoisting works.

The company intends sinking the shaft to develop the mine below the old workings.

Minna Ricca.

This mine is situated about two miles northeast of the town of Ophir, at an altitude of one thousand feet; dimensions of claim, four hundred by two thousand seven hundred feet.

The vein has a course northwest and southeast; dip, southerly about 87 degrees, and an average width of twenty-two inches. The vein crosses the contact of syenite with slate formation of the Duncan Hill District, which lies to the north and east. The foot wall is syenite and slate; the hanging wall is hornblende schist and slate.

This mine was recently purchased by an eastern company, who are erecting a first-class ten-stamp water-power mill and hoisting works, and intend sinking to develop the mine below the old workings.

Crater Hill Consolidated.

This mine is situated about a mile northwest of the town of Ophir, at an altitude of twelve hundred feet. The Crater Hill vein is evidently a continuation of the Gold Blossom. The strong outcrop is continuous between the two mines, and traceable quite a distance north and south from the end lines of both.

The Crater is one of the deepest mines in Placer County, the shaft being eight hundred feet deep; course of the ore vein is north 80 degrees west, dip 48 degrees south; average width, thirty inches; length of ore shoot, four hundred feet.

There is on the mine a first-class ten-stamp steam mill and hoisting works. The mine has been idle since the death of the owner, Mr. George Aldrich.

DUNCAN HILL DISTRICT.

This district is to the north and east the Ophir District and west of the town of Auburn.

The formation is metamorphic slate, hornblende, talc, mica, and chlorite schists, and occasional dikes of diorite.

There are thirty or more mines and locations in the district, all of which have been more or less worked to depths varying from fifty to three hundred feet. The veins are usually found in contacts, and the ores resemble those of the Ophir District, but do not carry so large a percentage of sulphurets.

The only mine at work in the district is the one owned by the White Bros., who are taking out ore very rich in free gold, but refused positively to allow an examination of the mine, or to furnish any data whatever for publication.

