Pamphlet No. 26 March, 1928.

STATE OF IDAHO
H. C. Baldridge, Governor

BUREAU OF MINES AND GEOLOGY
Francis A. Thomson, Secretary.

GEOLOGY AND ORE DEPOSITS OF THE ROCKY BAR QUADRANGLE

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by

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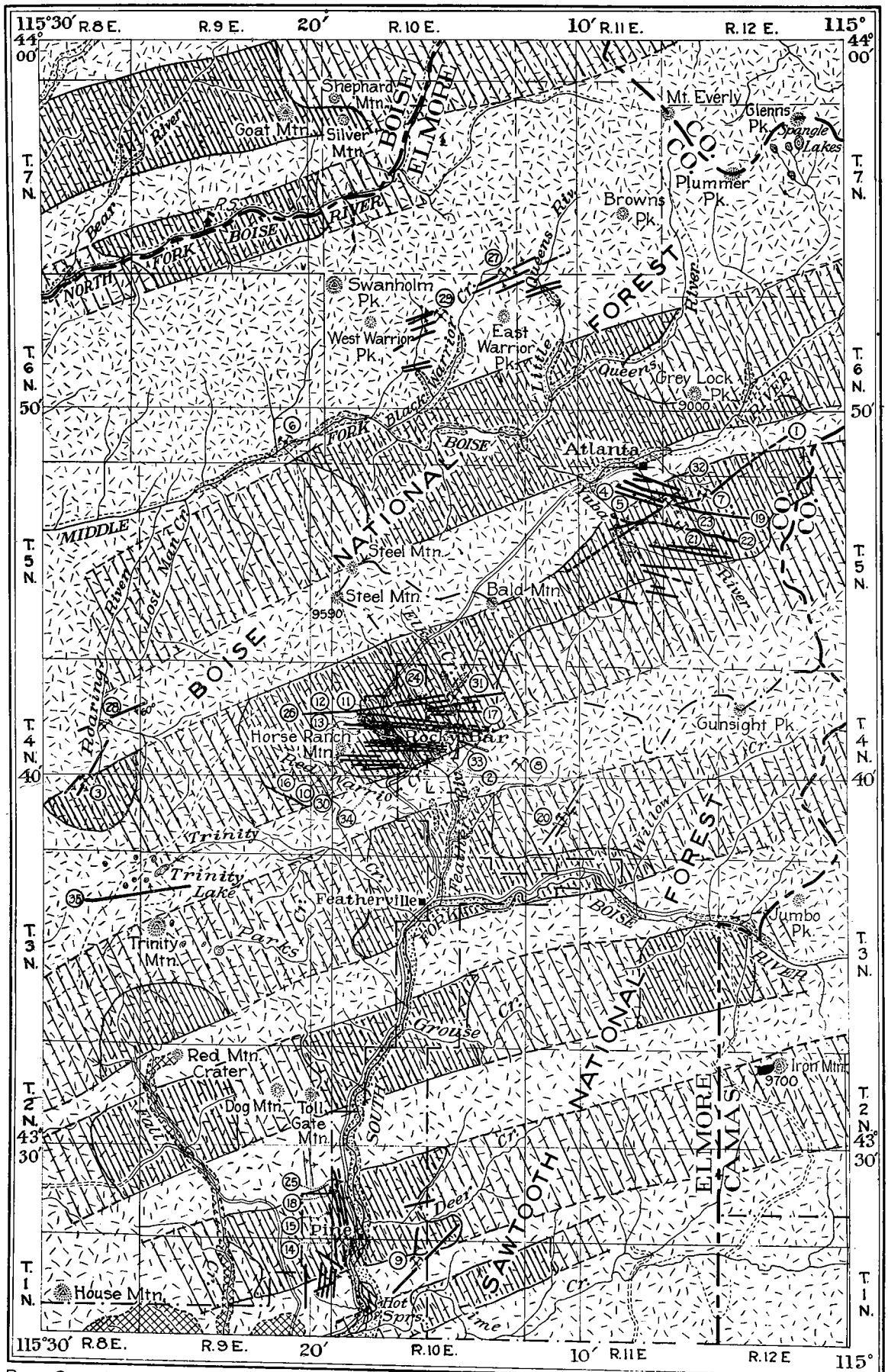

LEGEND

- Quaternary: Alluvium and gravel
- Miocene (?) to Recent: Basalt
- Cretaceous or Tertiary (?): Dike zones. Granite areas in which occur numerous dikes of pegmatite, diabase, diorite, aplite and rhyolite.
- Probable extensions of dike zones.
- Granite
- Vein Mine

1. Atlanta Vein
2. Bar Vein
3. Deckard's Mine
4. Benton Vein
5. Big Lode Vein
6. Boise King Placer
7. Boise Rochester Mine
8. Bonaparte Mine
9. Bonnie Anna Mine
10. Champion Vein
11. Clifton Bell Vein
12. Emmett Vein
13. Esmerelda Vein
14. Franklin Mine
15. Gold Hill Vein
16. Henry Clay Vein
17. Keystone Vein
18. Klondike Vein
19. Last Chance Vein
20. Marsh Creek Mine
21. Minerva Mine
22. Minerva Vein
23. Monarch Mine
24. North Ophir Vein
25. Objective Vein
26. Ophir Vein
27. Overlook Mine
28. Rhineboldt Mine
29. Rico Mine
30. Richmond Vein
31. Spanish Town Mine
32. Tahoma Vein
33. Vishnu Vein
34. Wide West Vein
35. Vein reported but not visited

Base from U.S.Geol. Survey and U.S.Forest Service maps, with corrections by S.M. Ballard

2 0 2 4 6 Miles

Geology by S.M. Ballard

RECONNAISSANCE GEOLOGIC MAP OF ROCKY BAR QUADRANGLE AND ADJACENT AREAS, ELMORE AND BOISE COUNTIES, IDAHO

Geology and Ore Deposits of the Rocky Bar Quadrangle

Elmore County, Idaho

by

S. M. Ballard

I N T R O D U C T I O N

This report is based upon data obtained in the summer of 1925, during a two months examination of the more important parts of the area under consideration. Little information could be gained from old records, as these, with few exceptions are non-existent. Some miners and operators, familiar with early-day developments, still reside in the country, and to these men, the writer is indebted for much valuable information concerning mines now inaccessible. In general, the cooperation of all those residing in the district aided materially in the field work of all sections visited.

The laboratory work on ore and rock specimens collected in the field, was done at the University of Idaho by Lester G. Morrell under the direction of Dr. Francis B. Laney.

No attempt was made to examine every mine and prospect in the area; in each district, such properties as would reveal typical conditions, were visited in order that the principal features of general interest might be observed and reported. Many prospects of merit in the country were not visited and are not described herein. It is in nowise to be construed, however, that these are of lesser importance than those described. Due to the uniformity of prevailing conditions description of all the various mines and prospects would result in needless duplication.

The literature descriptive of the Rocky Bar Quadrangle is not voluminous. Hailey's "History of Idaho" and W. M. McConnell's "Frontier Law" contain brief accounts of early day activities dating from first discoveries in 1863. Document No. 441, Bureau of the Mint, 1882, furnishes some data on production up to that date. The 16th and 20th Annual Reports of the U. S. Geological Survey, contain brief discussions of the district by G. H. Eldridge and Waldemar Lindgren respectively. The only detailed information is found in U. S. Geological Survey Bulletins 750-F, by F. C. Schrader, and 761, by F. L. Hess. These reports deal almost wholly and in considerable detail, with the molybdenite deposits of the Rapid River section in the west-central part of the quadrangle. The Raymond Reports of 1869 and 1873 contain brief reference to the area and in Vol. V of Transactions of American Institute of Mining Engineers, pages 868 to 873 there is a detailed description of the Atlanta District by Joshua E. Clayton.

S I T U A T I O N A N D A C C E S S

The area embraced in this report consists of that portion of Elmore County bounded by latitudes 43°-30', and 44° North and longitudes 115° and 115°-30' West, as shown on the map (Pl.I.). It covers the head waters of the three main forks of Boise River on the western flank of the Sawtooth Range, which here closely follows the eastern limit of the quadrangle.

The principal settlements are:--Featherville, Rocky Bar, and Atlanta. Pine lies just beyond the southern boundary but is included in the discussion.

There is only one way of approach open at the present time,--namely, that from the south over the county road, up the South Fork of Boise River, through Pine, tc Featherville and Rocky Bar. This road is usually in excellent condition for auto travel during the summer months. Hill City and Mountain Home are the nearest railroad points, the latter being about sixty miles distant from Featherville,--at present the most important settlement, industrially, within the area. There is an abandoned road leading from Boise up the Middle Fork of Boise River to Atlanta. About thirty miles of that portion on the Atlanta end, is impassable. This is the logical route from Boise into the northern portion o the country and will, doubtless, be the one opened for use upon the revival of local mining activity. The high divide between Rocky Bar and Atlanta is a serio handicap to travel from seven to eight months of the year on account of snow.

C L I M A T E A N D V E G E T A T I O N

The range of climatic conditions prevailing in the valleys is not wide. Al are from 5000 to 6000 feet in elevation, with an open season usually extending from April to November. The summers are delightful and the winters, although long, are not excessively cold. Snow covers the higher country for 7 or 8 month and, on many peaks of the main Sawtooth Range, is perennial. Such conditions insure a dependable water supply for the lower country throughout the dry summer months.

The northern slopes of the mountains, and the flat uplands are, for the mos part, covered with a dense growth of pine and fir. Except for cut-over areas about former camps, there still remains abundant timber for all local needs.

Agriculture is possible along the river flats especially of the Middle and South Forks. There are many productive ranches along the South Fork for 15 mile south-west and 10 miles east of Featherville. Hay is the most important crop, some grain is raised, and vegetables are abundant in season.

H I S T O R Y

The following statement of the history of the area is quoted from a manuscr report on the history of mining in Idaho written for the U. S. Geological Survey by the veteran engineer Dr. Walter P. Jenney. It is included in this report thr the courtesy of the director of the survey, Dr. Geo. Otis Smith.

Rocky Bar and Red Warrior Districts:

> The town of Rocky Bar, located near the center of the district, was for nearly 20 years the county seat of Alturas County. The district is situated 80 miles northeast of Boise City, upon Bear Creek, a tributary of the South Boise River. The Ada Ellmore, Idaho, Confederate Star, and Vishnu lodes were discovered in the summer of 1863; but owing in part to the isolation of the district, the mines attracted little attention for almost ten years.
>
> The annual report by J. Ross Browne and Dr. Raymond on the mines of the Territory contain little information respecting the district until 1873. In June, 1869, a few arastras were running, but the three small stamp mills in the district were idle. The Wide West lode, in Red Warrior district, about 2 miles west of Rocky Bar, was, however reported to be in active operation. The lode is 2 to 5 feet wide, of gold-bearing quartz in a granite formation. A 10-stamp mill has been

erected at the mine and the ore is reported to mill $40 per ton. The mine was opened by a tunnel and had backs sufficient to keep the mill running 3 or 4 months.* In the summer of 1870 Bonaparte Hill 13 miles southwest of Rocky Bar was reported to be the scene of active operations by the New York and Ohio Mining Company and the Bonaparte Company, which were both working on this hill, and it was believed on the same lode. It is recorded that some 400 or 500 tons of ore had been stoped in preparation for the erection of a mill. The later history of these properties is a record of continued incompetent management that resulted finally in the permanent closing down of these properties in October, 1873.

In 1873 and again in 1874, Mr. A. Wolters, Superintendent of the United States Assay office at Boise City, visited Rocky Bar, and his reports for those years give the first reliable information of the condition of the leading mines in the district. From these reports the following description is taken.** At Rocky Bar a large number of gold-bearing veins are grouped together on a very small area, and nearly all of them carry strong bodies of ore. The country rock is granite and gneiss. The leading mine in the camp is the Ada Ellmore, owned by the Pittsburgh Gold Mining Company. The lode is 4 feet wide coursing northeast and southwest with dip to the north. The vein matter is quartz and decomposed granite. The mine is opened by a shaft 100 feet deep with levels on the vein, runs east 170 feet and west 100 feet, showing all the way a solid vein of ore about 2 1/2 feet wide, of hard bluish quartz, with some disseminated pyrite and a good deal of free-gold visible to the eye. In the fall of 1872, 50 tons of ore were milled, yielding $4000, when operations were suspended, while a 6 inch pump was being installed. Work was resumed in the summer of 1873 and a lot of 100 tons of rich ore was crushed. Mr. Wolters reports that the mine needs a heavier pump in order to sink deeper and that the stamp mill is poorly equipped.

Work was prosecuted steadily and in 1874 the shaft is reported to be 150 feet deep, with the east level in good ore. A larger engine had been installed in order to hoist the water, but was provided with a poor foundation; and Mr. Wolters observes that the company which owns the claim, "is not doing as well as the excellence of the mine warrants, were capital judiciously expended in a substantial plant and in the thorough opening of the mine." In September, 1875, the Ada Ellmore was closed down, for what reason was not ascertained.

The Idaho lode has a similar strike to the Ellmore and a dip of 50 degrees to the north, with a pay-streak 2 feet wide. The mine has always borne a high reputation and has yielded large amounts of very good ore, but the vein on most of the levels has been stoped, and the present workings are in poor ore. The last lot of 13 tons yielded $97.50 per ton. The mine is opened by cross-cuts, (tunnels?) 120 feet and 400 feet in length, which cut the vein at depths of 70 and 170 feet respectively, with levels following the vein, of 400 and 200 feet in length. Nearly all the good ore above these

*Mines and Mining, etc., Raymond, 1869, pp. 247-248.
**Op. Cit., Raymond, pp 244-246, 1873; pp. 305-311, 1874

levels has been worked out and further development work is necessary. The mine was idle in 1874. Subsequently it was consolidated with the Vishnu property.

In close proximity to the Idaho and running parallel with it, is the Vishnu lode, which also dips north, but at a steeper angle than the Idaho. It is opened by cross-cut tunnel 234 feet long. On the surface there was a well defined crevice 4 feet wide with a pay streak of 10 inches, which yielded at the rate of $100 per ton. The ore-vein widened in depth, being 2 feet wide at the bottom of the 80-foot shaft, and having a width of 4 feet on the tunnel level, at a depth of 150 feet. The crevice is filled with decomposed vein-matter, with seams of quartz, pyrite and gray antimony, throughout the mass. The ore from the lower level is not as rich as that nearer the surface and averages only $60 per ton. In 1874 work was still being prosecuted through this tunnel.

A few miles east of Rocky Bar, A. and J. Pfeiffer in 1873, uncovered three promising quartz-lodes while working their placer claim. They are the General Grant, General Sherman and Poorman lodes and carry strong bodies of good ore at the surface. The Poorman shows a well defined crevice 2 feet wide with 6 to 8 inches of quartz full of free-gold. It is thought that the neighboring gulches derived their placer gold from these lodes.

In Red Warrior district, the Wide West mine and mill were sold by the owners in the spring of 1874, to Mr. Warren Hussey, banker of Salt Lake City. The consideration is stated to have been $22,000. Work was started on the property, but the financial difficulties of the owner compelled the mine to shut down in 1875.

Mr. R. E. Strahorn writes in 1881 of Rocky Bar district: "The formation of the country is much the same as that surrounding Atlanta (granitic), but the ores are mainly gold-bearing." "The mountains are ribbed with hundreds of veins which are the source of the gold in the placers." "The ores are generally easily worked in arrastres and stamp mills by wet-crushing, and on this account Rocky Bar can point to its product as the result almost entirely of home enterprise and capital." "In other words, it is a self-sustaining camp."* "The principal ledges are the Ada Elmore, Idaho, Confederate Star, Vishnu, Idaho Bonanza, Alturas and Mountain Buck." "The Ada Elmore lies in the bed of Bear Creek about a mile above Rocky Bar, and has been worked to a depth of 240 feet below the creek bed." "Several levels have been run on the vein each way from the shaft, a distance of 100 to 200 feet." "The vein has averaged throughout the workings, a width of 2 feet, with a yield of $60 per ton. A crushing of 9 tons of the best ore returned $4,500. The total product of the mine to the close of 1881, is stated by the superintendent, to be $1,200,000. This was stoped from a section of the vein 275 feet long and 150 feet deep. Work has been suspended for several years on account of the volume of water and the insufficiency of the machinery to handle it. The company now owns a very complete 10-stamp mill and it is proposed to place new machinery on the mine, so that by January, 1882, operations may be resumed.**

*Strahorn, Robert E., Resources of Idaho, pp. 39-40, 1881.
**Op. Cit. p. 40.

The Confederate Star is a large strong vein with pockets of very rich ore. It has been worked to a depth of 250 feet. The lower level is 750 feet in length. The ore is very easily worked and averages about $60 per ton. The croppings of the lode were very rich, often paying as high as $350 a ton in an arrastra. The mine has yielded to 1881, $350,000.

The Vishnu property, owned by Reeser and Suttle, located near the Ellmore, has two veins, one of which was formerly known as the Idaho. They carry from 2 to 6 feet of free-milling gold ore and are developed by tunnels to a depth of 300 feet, with over 1,000 feet of levels. A 12-stamp mill has been running on the Vishnu ore for the past three years. One run of 98 tons yielded $200 per ton, and for months at a time the mill produced from $35,000 to $45,000 per month. The total production is estimated by the owners at $850,000. Heavy hoisting works have been purchased and will be in position next year to follow the mine "to the deep."

The Idaho Bonanza, and Alturas, are situated in Blake's Gulch, half a mile north of Rocky Bar. A tunnel 1600 feet in length cuts the Alturas at a depth of 200 feet. Crushings from the Idaho Bonanza have netted $175 per ton, and the general average of all ores is $50. The product of these mines is estimated at $100,000.

The Mountain Buck lies one-fourth of a mile east of the Vishnu. It has been worked only to a depth of 40 feet. The ore crushed has averaged $40 per ton, but fine specimens showing free gold are frequently obtained.*

In Red Warrior district, the Wide West mine has been worked to a depth of 300 feet. The vein has averaged 2 feet in width and the ore has averaged in the 10-stamp mill, owned by the company, $35 per ton. The gross yield of the mine is estimated at $300,000 or more.

Strahorn estimates the production of the mines of Rocky Bar for 1881, based upon the shipments made by W. C. Tatro's Express, at $200,000.

The production of the placers in Bear and Elk Creeks, Feather River and Red Warrior Gulch, all near Rocky Bar, are estimated by Strahorn to total $2,000,000 -- or over $100,000 per year for the 18 years they have been worked.**

Yuba District:

Measured by the strength of the mineral-formation, as well as by the richness of the ores, the mines of Atlanta Hill, on the Middle Boise, take a high rank among the quartz-mining districts discovered in Idaho in the early sixties. The district is situated in the midst of exceedingly rugged and high mountains, and largely because of its inaccessibility the development of the mines was slow and their quartz production relatively small compared with that of Owyhee County.

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*Op. Cit. p. 41

**Op. Cit. p. 42

An excellent description of the district is found in a paper by Prof. Joshua E. Clayton,* from which the following is taken: "This remarkable gold and silver bearing district is situated on the middle fork of Boise River, in Alturas County, Idaho Territory, about 18 miles north of Rocky Bar and 65 to 70 miles, as the crow flies, east of Boise City." "The district lies in the very heart of one of the most wild and mountainous regions of Idaho." "For many miles in every direction nothing can be seen but bold granite mountains, with deep narrow gorges cutting into their sides in every direction, rendering them almost inaccessible except to the hardy mountaineer or adventurous prospector."

The only line of approach to this mountainous region at present is from the southwest by way of Rocky Bar, to which place there is a fair wagon road; but from thence to Atlanta City, 18 miles, the steep bridle path or pack trail, passes over the high range that separates the south and middle forks of Boise River. "A wagon way -- not a road -- has been made across this divide, by which heavy machinery has been hauled at great expense to Atlanta City; but all kinds of supplies that can be packed on mules are transported in the old Mexican style." "From November to June the deep snow obstructs all communication, except an occasional messenger, who makes the trip across the mountains on Norwegian snow-shoes." "Thus, six months in the year, Atlanta district is shut out from the world, isolated and alone in the bosom of the grand old mountains."** Professor Clayton calls attention to a possible outlet for the district down the canyon of the Middle Boise -- the only one that can be made passable during the winter season. To build a road down this canyon for a distance of thirty miles will require, however, "an expenditure of $50,000 to $60,000; but the importance of the mines of the district warrant the outlay."

"The geological formation is granite, of a coarse texture and in many places is traversed by numerous dikes of syenite and three or four varieties of porphyry, which cut through the granite in easterly and westerly directions, conformable with the general direction of the veins." "The largest number of gold and silver lodes are confined to a partially isolated mountain, lying between the Middle Boise and Yuba Creek." "This partially isolated mountain is commonly called "Atlanta Hill" and is surrounded by mountains much higher than itself, giving it the appearance of a hill in the center of a grand amphitheater of lofty granite mountains." "Its dimensions are about four miles long from east to west, by two to three miles wide from north to south." Its height above the river is about 1600 feet. "Atlanta City on the flat near the river is 5200 feet above sealevel."

"The vein system consists of a series of nearly parallel veins having a course north 80° west, magnetic and dipping south at 60 to 80° -- at least eight of these veins have been located, and prospected to a limited extent." "They are generally small and carry free gold in occasional chimneys, or shoots, with barren spaces between." "But the great feature of the district

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*Atlanta District: Trans. Am. Inst. of Mining Engineers, Vol. 5, pp. 468-473, 1877. Also see the full report by Prof. Clayton on the mines of Atlanta, cited by R. W. Raymond: Resources of the States and Territories West of the Rocky Mountains, 1875, pp. 213-215, 1877.

**Resources of the States and Territories West of the Rocky Mountains. 1875, p. 213.

is the Atlanta lode." "This is an immense lode that has a course north 70° east, and cuts obliquely across all the others." "Its outcrop has been traced on the surface for a distance of about two miles." "The only developments made, of a permanent character, are on the Monarch and Buffalo claims on the north slope of the hill, where the lode is opened by tunnels run from Quartz Gulch, cutting it about 100 feet below the surface." "The width of this great lode varies from 40 to 100 feet." The gangue is quartz with inclusions of granite, forming horses, some of which are very large.

The rich seam of ore varies in width from 1 to 6 or 7 feet, and alongside of it is a seam of pay-rock, but of lower grade, that carries free-gold and disseminated silver ore, making the pay-streak from 2 to 15 feet wide, and extending in length underground in the Monarch and Buffalo claims nearly 2000 feet on the course of the lode.

The metallic contents of the rich seam are gold, native silver, ruby silver, brittle silver and silver glance. The free-gold constitutes 20 to 40 per cent of the value. Brittle silver and ruby silver are the most abundant; native silver and silver glance are found only in small quantities. Free gold occurs in the outcrops but Professor Clayton notes the absence of rich silver ores near the surface, not even a trace of the chlorides of silver having been found. This he attributes to the leaching of the outcrop of the vein by surface waters, which contained no chlorides, owing to the country-rock being a primitive granite formation.* He also notes the purity of the ores and the absence of minerals of copper, zinc or lead.

Professor Clayton estimates the assay value of the first-class ore from the Atlanta lode at $1,000 per ton and that of the second-class ore at $300.

The Buffalo mine adjoins the Monarch on the west and has a length on the lode of 480 feet. Like the Monarch, it is opened by a shallow tunnel from Quartz Gulch. The grade of the ore is about the same as that of the Monarch mine. The rich ore-streak varies from 2 to 6 feet in width with large quantities of lower grade alongside.**

Professor Clayton, describing the natural resources of the district, says: "The mountain sides are covered in most part by dense forests of pine, fir and spruce timber." "In every canyon clear streams of water run, leap and sparkle over their rocky beds, until they unite in a clear beautiful little river two or three rods wide, which has plowed out a gorge through the granite barriers westward until it unites with the North Fork of the Boise."

There is very little authentic information obtainable regarding the mines at Atlanta Hill, for their discovery in the summer of 1864, until the publication of the report by Professor Clayton in

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*Clayton in fact puts forward the argument that the absence of silver chloride chows that the granite has never been exposed to salt water and is therefore of Archean age! Activity of erosion is of course the logical explanation. F.A.T.

**Mineral Resources, 1875. pp. 214-215

February, 1877, cited above. The very inaccessibility of the camp caused it to be seldom visited. The preliminary report by J. Ross Browne for 1866 made no mention of the district. In the report for the following year a general description of the district is given; but there is little information of value respecting the mines. A small mill, operated by water power, had been erected at Atlanta City by the Greenback Mining Company.* Other resources of the region, its inexhaustible supplies of fine timber, and the fine streams that will afford water for power purposes, etc., are, however, treated at some length.**

Mr. P. S. Buckminster visited the district in 1869 and has contributed a valuable, though brief, description of the condition of the mines at Atlanta at that time. The Monarch, owning 1400 feet on the Atlanta lode, was the only active mine in the district. The development consisted of a tunnel run easterly on the lode, from the bottom of a small ravine that crossed the claim 300 feet from the west end. The tunnel is 200 feet long; 125 feet from the entrance the pay streak forked and the tunnel forked also in order to follow it. The lode is wide at this point and the two branch-drifts are in quartz all the way, neither wall of the lode being anywhere seen. The right-hand drift shows in its face,and along its top from some distance, a very rich seam of ore from one to four inches wide, composed of native silver, silver glance and antimonial silver, with comparatively little quarts intermixed. On each side of this seam is low grade ore containing the same minerals accompanied by considerable pyrite. The full width of the pay vein will average two feet. The left-hand drift has developed a three-foot vein of similar ore with a rich seam, in places six inches wide. A very small amount of gold is shown by assays to accompany the silver. Four miners were employed in the mine at the time. The company has a small mill, with one French burr, one cast-iron grinder, two Varney pans and one settler, all run by water-power. It is stated that a roasting furnace is connected with the mill, but no information is given in regard to it. There are two 10-stamp mills in the district, but both are idle.***

There are many mining locations in the district. Most of those regarded of value are embraced in a tract three miles square, known as Atlanta Hill. Considerable work has been done in prospecting these locations, generally in such a scattered and superficial way as to be of little value.

Dr. Raymond, in reviewing Buckminster's report, observes: "Atlanta district is a mining field of greater promise than the developments of five years seem to have fulfilled." "Through unfortunate selection of machinery and arrangement of mills, the first tests of the ores were far too expensive and generally unsatisfactory, whereas, I think, many of them should have been remunerative."****

The following year the Monarch mine was reported to have been run-

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*This mill is mentioned in Raymond's report for 1869; it had 10 stamps, 4 pans and 2 settlers, but was not provided with furnaces for roasting the ore. The mill was standing idle in 1869.
**Mineral Resources, by J. Ross Browne, 1867, pp. 520-521.
***Op. Cit. 1869, pp. 248-249.
****Op. Cit. 1869, p. 249.

ning for six months during the year ending June 1, 1870, and to have produced $50,000.* No report was received from Atlanta District in 1871 and only a brief report in 1872.

The placers of Atlanta district have never yielded large returns. They are not extensive and some can procure a supply of water only for a limited season. Quartz Gulch, which is crossed by the Atlanta lode, has been worked ever since it was discovered, and has yielded $6 to $20 per day to the man. It is related that the Atlanta lode was discovered by following up the gravel deposits in Quartz Gulch, $100 in gold being obtained in a single pan of its decomposed croppings.** Some 15 to 16 miles below Atlanta are the placers of the Middle Boise: in 1872 they were worked by two Chinese companies***

Dr. Raymond writing in 1873 states that the Monarch property "has been bonded for the last three or four years to parties who have been endeavoring to dispose of it in the English Market." "The price asked is said to be large." "No work has been done on it since my last report, until this fall, when a lot of 30 or 40 tons of ore was taken out and worked at the mill, paying at the rate of $150 per ton." "Operations have been confined to robbing the lode of all the good ore in sight; and owing to this system of mining, the mine is now in such a shape that a stranger, unacquainted with its early history and the extraordinary richness of its ore, would be puzzled to account for the high estimate of its value put forward by the owners.****

In 1874 the Monarch property was leased to Lantis & Company, who struck a very rich vein of ore right at the surface and developed a 2 1/2 inch streak of very rich ruby silver and another streak of ferruginous quartz carrying native silver, of about the same width. The lessees took out 10 tons of ore for shipment to San Francisco, that was estimated to be worth $1500 to $2000 per ton; but winter setting in nearly a month earlier than usual and preventing transportation, the shipment had to be deferred until spring. They were caught by the first heavy snow storm without sufficient mining supplies to last during the winter and were forced to stop work on the deep tunnel which they were running to strike the lode 100 feet below the present workings.*****

The following year, Mr. Lantis continued to work the Monarch under his lease. The deep cross-cut tunnel reached the lode at about 400 feet from the entrance and was extended 300 feet on the vein. An airshaft was raised to the surface and a contract let for 1,000 feet of levels, which when completed will put the mine in good condition for regular production. During 1875, 40 1/2 tons of first class ore was shipped to Omaha which yielded over $160,000; beside a large amount of second class ore treated in the Company's mill that yielded $40 to $50 a ton.

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*Op. Cit., 1870, p. 202.
**Strahorn, R. E., Resources of Idaho Territory, 1881. p. 39.
***Op. Cit., 1872, p. 204.
****Op. Cit., 1873, p. 247.
*****Op. Cit. 1874, p. 309.

In the spring of 1875 the Buffalo Company bought the Miller ground adjoining the Monarch property, covering 500 feet on the Atlanta lode, and began development work.

The Last Chance mine, on a small fissure vein intersecting the Monarch, owned by Heath, Newton Brothers and Hogan, produced some lots of very rich gold-ore, extracted from small pockets in the vein. A piece of quartz weighing 5 pounds yielded 15 ounces of gold worth $14 per ounce. Later 7 1/4 pounds of rock yielded 46 ounces of gold or $646.

The production of the Atlanta lode continued to increase. In 1876, 1877, and 1878, 1,000 tons of ore were shipped by the Monarch Mining Company to Omaha, which returned $700,000 probably the largest average yield per ton produced from such a large shipment from one mine. From a block of ground in the Monarch mine 400 feet long and 300 feet deep $1,100,000 in ore has been extracted and there are estimated to be 10,000 tons of $50 ore developed.*

Adjoining the Monarch on the west is the Buffalo mine, consisting of 500 feet on the Atlanta lode, owned by the Buffalo Gold and Silver Mining Company. The mine is developed by six levels from 200 to 500 feet in length and the entire breadth of the lode is explored by numerous cross-cuts. The main pay-vein is near the south wall and averages 2 1/2 feet in width; there are two other pay-streaks from 8 to 12 inches wide. The smaller veins carry more ruby silver, but the larger vein, while carrying a lower grade of ore, is more reliable.

The Buffalo has proved a steady producer, having produced $100,000 per year since 1874. The ores now being milled yield $50 to $100 per ton.**

Strahorn obtained the record of the shipments of first class ore made by the Buffalo Company, as follows:

*** Where Reduced	Pounds	Silver oz.P.T.	Gold oz.P.T.	Net Return.
Newark, Balbach & Son	19,132	196.90	9.86	$3,873.57
	55,279	373.20	8.13	
	1,218	3,300.80	4.16	19,100.43
Omaha Smelting & Refining Company				
Lot A	20,503	533.	8.65	7,914.56
" BB	1,884	4,660.	8.44	5,464.14
" B	18,399	491.12	9.38	6,805.51
" C	20,148	513.75	8.00	7,365.70
" D	20,158	507.90	5.35	6,673.00
" E	19,957	525.90	5.10	6,660.15
" F	20,403	477.50	5.23	6,453.06
" G	20,481	866.50	7.20	11,325.78
" H	20,727	807.75	10.30	11,422.03
" I	20,738	510.48	6.45	7,139.99
" K	20,328	394.20	4.90	5,357.95
" L	19,144	456.78	6.00	5,932.73
" LL	860	6,126.70	3.30	3,164.95
Total No. Pounds	299,359			114,653.55
Total No. Tons	151	Average per ton		$760

*Strahorn, Robert E. Resources of Idaho Territory, 1881, P. 36.
**Op. Cit. p. 37.
***Op. Cit. p. 38.

The Yuba Tunnel, near Atlanta, promoted by Judge V. S. Anderson and associates, is designed to develop and drain the Atlanta lode. The tunnel in 1880 was 1400 feet in length, and had cut the lode in the North Star ground, where the width is 75 feet. If extended to the Monarch and Buffalo, the depth attained will be 1000 feet below the deepest workings.*

Both Rocky Bar and Atlanta have experienced the usual vicissitudes of mining camps. There is little activity in evidence in either, at the present time. The South Park Dredging Co., of San Francisco were operating a dredge on Feather River about twelve miles below Rocky Bar at the time the country was visited. This company had started operations several years prior and their work constituted about the only important activity of the entire area. There was also some lode and placer mining being carried on in a few places near Atlanta. The lode mining was more in the nature of exploratory work, but in a few places, results of recent work, were encouraging. With the exception of that country surrounding Atlanta, the several camps of the country have fairly adequate transportation facilities. The future of Atlanta would be considerably brightened by the reconstruction of the road down the Middle Fork to Boise.

P R O D U C T I O N

As nearly as can be ascertained from such sources as are deemed at all authentic, the total gold and silver production of the quartz mines of the district up to 1881 amounted, according to Strahorn, to $4,500,000. Probably $6,000,000 for total lode production is a liberal estimate. That of the placer mines is too conjectural even for an estimate, though it is locally reputed to be far in excess of that of the lode deposits. Such has been the relative production from other gold camps of Idaho, and judging from the amount of placer mining done, is considered a reasonable assumption for this region as well.

With the exception of the more recent operations at Atlanta and the dredging now in progress at Featherville, the main producers of the country have been idle for a period of twenty years or more. Most early day operators apparently attached little importance to records, and even less to maps, so that data are now difficult to obtain. The principal lode producers have been the Pittsburg, Elmore, Mountain Goat, Wide West, and Ophir at Rocky Bar: the Boise Rochester, Buffalo and Monarch at Atlanta: and the Franklin at Pine. Several other quartz mines of the country were productive at different times, but the amounts produced are matter of considerable uncertainity, as might be expected in the case of properties which have lain idle for twenty or thirty years. The only producing property at present in the district is that of the South Park Dredging Co., at Featherville. Work has been in progress here for several years with a seeming assurance of several years production ahead.**

P H Y S I O G R A P H Y

The main physiographic feature of the country is the Sawtooth Range. This extends northerly along the eastern boundary of the quadrangle and forms the divi between Boise and Payette Rivers to the west and Salmon River to the east. Many sharp granite peaks along the main ranges rise to elevations exceeding 10,000 feet and perennial snows cover many of their northern slopes. Sharp crested spurs extend westerly and southwesterly across the country for several miles from the main range with many peaks along their course that closely approach

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*Op. Cit., p. 39.

**The 1925 gold production of Elmore County was 5,578 ounces, practically all of which came from dredging operations.

the main divide in elevation, and gradually blend thereafter with the foot-hill country bordering the Snake River Plain to the west. As viewed from some of the ridges, it is evident that an old erosion surface, now several hundred feet above the present base level of the country formerly characterized the present piedmont area. This is more evident in the southern half of the quadrangle, where the remnants show along the numerous ridges. Here the former level shows considerable tilting due to the uplift of the main Sawtooth Range to the northeast.

The main drainage of the country is to the west, and to some extent, to the south and is comprised almost wholly of the three main forks of Boise River. These streams have cut deep canyons which, at places, especially as they approach the main Sawtooth Range, are very precipitous, ranging from 3500 feet to 4000 feet in depth.

Glaciation is strongly in evidence among the high peaks where many of the streams originate in glacial cirques. The glaciers evidently were small as there is nowhere any extensive area of glaciation in the country. As shown by moraines they probably extended in several places down to about 6000 feet above sea-level and not over eight or ten miles from their sources.

Erosion is still in an exceedingly active stage throughout the higher country. Although streams have cut their channels to great depths, these are still swift, and, in late spring, often torrential. Snow slides are exceedingly common in the higher country, and, judging from the amount of detrital material carried down, are exceedingly active allies of the streams in the general leveling process now in force.*

G E O L O G Y

GENERAL GEOLOGY

The area under consideration is situated near the southern extremity of the extensive granite batholith that comprises much of the mountainous part of central Idaho. The southern end of the quadrangle begins but a few miles north of the country where the granite rises gently from the Snake River lavas to the south. The change is one of lava to granite with no noteworthy evidence, at any place visited, of intervening metamorphic or sedimentary rocks, such as are frequently found elsewhere, notably in the country to the east.

The granite, to which Lindgren** ascribes a late Cretaceous or early Eocene age comprises by far the major portion of the rock exposure of the Rocky Bar quadrangle. This has been intruded by numerous complimentary dikes, varying in width from a few feet to 500 feet or more, and in composition from basalt to quartz. These crop out at intervals of few miles in broad east and west zones from one to two miles wide in which the dikes are approximately parallel, at intervals seldom exceeding 600 feet. In passing, it may be mentioned here that this same zonal tendency of the acid and intermediate dikes has been noted elsewhere in other parts of Idaho, notably in Boise Basin. The only pronounced exception to this rather orderly occurrence of the dikes, is that of the basic type. These, in some places, show a tendency toward parallelism but at others quite as frequently do not. This same tendency towards an erratic or exceptional strike or dip is a common characteristic of the basic intrusions throughout other parts of the state.

One thing noteworthy in connection with the country is the great number of hot springs, most of which are found along the main streams. In some places

*The erosive effect of snow slides as a common geologic process in high altitudes has probably received less emphasis than it deserves. F.A.T.

**Lindgren, W., U. S. Geol. Survey, Ann. Report pt. III pp. 617-19, 1898.

these rise in the stream channels and temper the water for many miles below. Their temperatures so far as was determined range between 125 and 140° Fahrenheit This taken in connection with their number is believed to indicate a period of igneous activity more recent than that of much of the surrounding country. The lava flow on Fall Creek, below Pine, further supports this assumption.

HISTORICAL GEOLOGY

A brief outline of the assumed geologic events, based upon correlations made with those of nearby country where some of the evidence regarding the sequence is much clearer, is as follows:

The general granitic intrusion was evidently a gradual or recurrent process, and is believed to have reached an advanced stage near the beginning of the early Tertiary. The development was accompanied by some igneous activity but was followed by a long period of quiet during which erosion played the important part until Miocene time. Now, occurred a comparatively sudden and very extensive revival of igneous activity.* Lava in successive flows eventually filled the Snake River bas There is evidence that some few of these flows, though comparatively insignificant are but a few hundred years old. This disturbance was one that affected the entire mountainous section of Idaho, as is witnessed by the several extensive areas of uplift, subsidence and local extrusions of basaltic, and in some places, rhyolitic lavas. Shortly following the great lava extrusion and probably related to them, occurred extensive faulting accompanied by uplifting at some places and subsidence at others. With this deep-seated shearing, very evidently a recurrent phenomenon, through a short period of time, was associated the main mineralization of the country. Post-mineral faulting by its prevalence throughout the region, indicates that crustal movements continued long after the period of ore deposition. There is some evidence that this has not yet entirely ceased.

The most conspicuous, geological feature of the present time is the channel cutting of streams. Where these emerge from the mountains, the channels are generally surcharged with gravel, and the few level valleys bordering the streams ar composed of gravel outwash from the hill country, in which large boulders are numerous. These gravel deposits are often terraced, and some of these narrow valleys are, doubtless, old lake beds. In connection with the terracing, it is interesting to speculate whether this is due solely to the normal channel cutting of the streams, or, primarily to the slow uplifting force along the main Sawtooth range which may still be at work.

ROCKS OF THE AREA

The granite, more properly granodiorite, of the country, is mainly of the normal biotite, medium grained type, commonly encountered throughout central Idaho with considerable range in the proportion of plagioclase to orthoclase feldspar. There are local variations in compositions and texture to be found, but these do not depart radically from the type rock, and interpose no difficulty to their proper classification in the field. Hornblendic phases are not uncommon. No sedimentary or metamorphic rocks were found in place. A few boulders, thought to be sedimentary rocks, were found along the South Fork about twelve miles east of Featherville. At several places, rounded boulders of granite gneiss were found in stream-beds, but nowhere abundantly. Deer Creek, northeast of pine, contained a noticeable number. A few fragments were found as float, south of Atlanta, but no was seen in place.

*Ross in Custer County and Kirkham in Boise County have mapped areas of Miocene granite.

The dike rocks constitute the remainder. For convenience they will be briefly and non-technically discussed under the three heads, acid, intermediate and basic. The following specimens of dike rocks were collected here and there throughout the district, largely because they were variations from type and attracted special attention in the field.

Acid Dike Rocks

Aplite: The aplite dikes are fine grained, white or cream colored rocks, of an even granular texture, resembling at times a fine-grained sandstone, although the constituents are almost entirely feldspar with lesser quartz and small amount of muscovite and, rarely, biotite. Under the hand lens the rock appears to be merely a fine grained granite with feldspar in excess. The only specimen examined petrographically was one from a dike in the Franklin No. 3 tunnel at Pine, although in other parts of the area, aplite dikes are a frequent and often an invariable accompaniment of the quartz veins and appear at times to be genetically associated with them, quartz lenses being found, which grade off into aplitic phases of the granitic country rock.

Rhyolite Porphyry: Rhyolite porphyry dikes occur frequently in the vicinity of many of the quartz veins. These can usually be distinguished in the field by the fact that the rock is weathered to a light gray or lavender color, is fine-grained in texture and shows either feldspar phenocrysts or the white "splotches" of kaolin derived therefrom. Small glassy round grains of quartz, of course unaltered, are frequently present.

Numerous dikes of this type are found on the Middle Fork 5 to 10 miles below Atlanta. A typical specimen from one of these shows a creamy-gray color, fine texture, and breaks with a rough or hackly fracture. It shows small feldspar crystals and occasional rounded quartz grains. Under the microscope the most striking feature of this rock is the microspherulitic groundmass. The spherulites are usually centered by quartz grains, and consist almost entirely of orthoclase. Small amounts of ferromagnesian minerals are present and the orthoclase shows considerable evidence of alteration.

A specimen selected from one of the numerous rhyolite porphyry dikes between Atlanta and Queens river, shows, under the microscope, large phenocrysts of quartz in a groundmass of orthoclase, quartz and biotite. Magnetite and biotite are present as accessory minerals. Biotite is altered to chlorite, orthoclase to kaolin.

Another dike about 4 miles below Atlanta is very fine grained and in places dark gray in color. Microscopic examination showed the dark gray color to be due to silicification and apparently mineralization.

A light gray medium grained rhyolite porphyry dike occurs at the Franklin mine, near Pine, the feldspars in this dike are almost entirely decomposed. Quartz phenocrysts are abundant.

A prominent dike parallels the vein on the Mountain Lilly claims near Elk Creek. This is classified as a trachyte porphyry.

A rock which upon superficial examination appeared from its dark color to be decidedly basic is found beside the trail to Beaver Creek about four miles above Atlanta. The most conspicuous minerals in the hand specimen are biotite and hornblende. Under the microscope the rock is distinctly granitic in texture, and shows about 30% orthoclase, 30% oligoclase, 25% biotite and hornblende, and 15% quartz. It is therefore classed as granodiorite.

Intermediate Dike Rocks

Diorite: As would be expected there are numerous dikes of medium or intermediate

acidity. These are largely of diorite or diorite-porphyry in many varieties of texture and color.

Numerous dikes of this classification occur below the Monarch power dam on the Middle Fork near Atlanta. The rock is fine-grained, even granual textured and contains orthoclase, microcline, plagioclase, quartz and muscovite in order of abundance as listed. The rock is classified as a dacite.

Farther down on the Middle Fork, are many fine-grained dark-colored dikes, hand specimens from which show, when moistened, numerous small intermixed black and white crystals of feldspar and hornblende. These prove upon microscopic examination to be typical diorite.

Similar dikes, sometimes showing a somewhat porphyritic texture, are found at the Skelton and Verdun mines near Pine, also in the March mine near Featherville.

Basic Dike Rocks

Basic dikes, distinguished by their dark color and usually by fine texture, complementary to the quartz vein-dikes and to the numerous aplite and quartz porphyry intrusions, are found in almost all parts of the area.

Lamprophyre: Dikes are numerous, these usually show phenocrysts of orthoclase and plagioclase in a fine groundmass of orthoclase, plagioclase, hornblende and some magnetite. As elsewhere indicated these dikes are particularly conspicuous in the vicinity of most of the ore-bodies.

Basalt: Dikes are not infrequently the most conspicuous being that near Deer Creek two miles east of Pine. This dike is probably related to the basalt flow on Fall Creek, not far distant. Some of the specimens contain numerous amydules of aragonite.

A conspicuous basalt dike is found in the No. 3 tunnel of the Franklin Mine at Pine. In this case the dike has intersected a white quartz vein and at the intersection, shows numerous large fragments of vein quartz engulfed in it.

Basalt dikes are not infrequent above and below Atlanta. At the base of Greylock Peak, across the river from Atlanta, a small rhyolite dike cuts a similarly small basalt dike.

At the Ella and Eagle or Bogart property at Rocky Bar a basic dike was observed intersecting a quartz vein at a flat angle with the strike of the latter. From the point of intersection for a distance of 150 feet the dike had apparently "stoped out" the vein and appropriated the vein fissure, after which the dike broke away from the vein and resumed its original course.

VEINS

There are two types of quartz veins in the area which apparently differ in age and occurrence. The first may be described best as the intrusive variety. The name, vein-dikes, may be applied to these. The second is clearly of hydrothermal origin and probably represents a final stage of deposition from the more attenuated solutions. Although the first is by far the more prominent, the second is believed to be the more important economically. Many of the large "bull" quartz veins of the country have been proved to be barren for most of their extent. Important ore deposits therein are invariably of later age, and are confined to zones of subsequent fracturing.

The veins of the second type generally follow pre-existing fissures and occur therein as lenses or irregular replacements of the enclosing granite wallrock. One small deposit was noted, wherein the joint planes of the granite afforded the ave-

nues for the ascending solutions, these had replaced the granite irregularly for several inches either way from the original opening. Fracture zones in the older veins, quite frequently show a recementation by a later generation of quartz, often accompanied by deposition of metallic sulphides.

Based upon field relations, the intrusive type of quartz vein is believed to be related to the acid dikes of the country (rhyolite and aplite). A few apparently independent occurrences in granite areas, distant from the dikes named, frequently show in the wall rocks, a change in phase from granite to aplite or micropegmatite as irregular patches along the vein outcrop, very suggestive of the last stages of transition from acid dike to white quartz.

The genetic relationship of the second type of quartz deposit to any variety of intrusion is not always clear, though in some instances, it is. The extent to which the following relationship applies, must be determined by future observation. Here, and in other sections of Idaho, there appears to the writer to be a very clear relationship associated with deep-seated fissuring between the later quartz with attendant metallization, and the basic dikes so commonly found in the important camps of the granite area of the state.*

FISSURING

Three major zones of fissuring were observed in the country. These vary in width from 1 1/4 miles to 2 miles and could be traced a few miles each way from the camps of Atlanta, Rocky Bar, and Pine.

Residents of the country reported tracing these zones much farther than was done by the writer, but, with a few exceptions, it seems that very little of importance had been discovered except at the camps named. Another zone about one mile wide, of possibly less importance from the standpoint of past production, crosses the head of Black Warrior Creek.

The main fissures comprising the zones are, approximately, parallel and occur at intervals of 100 to 1000 feet. The average strike at Rocky Bar is about N. 75° E. with local variations from S. 75° E. to N. 60° E. Most of the veins dip steeply to the north. Cross-faulting in a N. 15° W. to N. 10° E. direction, both older and younger than the main system, was noted at this place. At Atlanta, the major fissure known as the Atlanta Lode, can be traced for a distance of about three miles between Yuba River and Montezuma Gulch, with an average strike of about N. 55° E. dipping to the southeast near Yuba River and to the northwest at Montezuma Gulch. The continuation each way beyond the section mentioned seems to be marked by two gulches that conform fairly well to the strike given--but this has not been proven by actual work. "Branch" veins striking about N. 70° E. to S. 75° W. lead into the major fissure from both sides and dip mainly to the north. These branch leads are thought to be an older fissure system which has met with considerable displacement along the Atlanta fault.

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*Mr. Ballard has repeatedly called attention to the association between basic dikes and ore deposits in quartz veins in connection with the Idaho batholith, and is disposed to emphasize the demonstrated frequency of their association. The most logical explanation of this relationship is perhaps this: That the basic dikes and the veins both occupy fissures of the same period of disastrophism, that is, of nearly contemporaneous age, and are thus structurally related; also that the differentiation of the sub-batholithic magma had proceeded to such a point that at one extreme there was a basic segregate available for dike filling, and at the other extreme an acid segregate available for vein filling. These would tend to be extruded from the magma and would invade the hostrock at about the same time and would to this extent, and in this remote manner, be genetically related. This hypothesis at least fits the observed facts and recognizes the significance of the basic dikes as diagnostic features for the prospector. F.A.T.

At Pine, the main faulting strikes N. 10°--20°W. and dips steeply to the East. Within this zone, which is a mile and a quarter wide at this place, fourteen main fissure veins and numerous smaller ones are reported. Another system of much lesser width about one and a half miles southeast of Pine, striking N. 60° E. should intersect the above mentioned northwest system at a short distance below town. At places, the vein fissures parallel the dikes of the country but were often observed crossing them with displacement of the dikes. At such intersections, the ore deposits, where such were in evidence, followed the vein fissure rather than the dikes.

MINERALIZATION

The ore deposits of the Pine District are mainly auriferous pyrite and some arsenopyrite with lesser amounts of galena and sphalerite. Some chalcopyrite was found at a few places in very small quantities. Cinnabar was reported at one place about one mile south of Pine at the McGuire Ranch, but samples taken by the writer and others handed to him, failed to show any mercury. The oxidized zone of the country in which gold and silver constitute the principal valuable metals, has been the main source of production.

The ore of the Rocky Bar District is essentially auriferous pyrite and lesser arsenopyrite, with the main production derived from the oxidized ores, as at Pine.

Recent work at the Boise-Rochester Mine at Atlanta, has developed a considerable body of auriferous pyrite of commercial grade at a depth of 900 feet beneath the surface. From report, the Monarch, to the southwest, had similar ore at about 500 feet depth, and, in addition, spotted occurrences of ruby silver. Some specimens of the ruby silver were supplied the writer. Auriferous pyrite and ruby silver occur also at the Minerva Mine to the south of the Monarch, although at the Minerva the stoping was confined, almost wholly, to free-milling gold ore. The ore of neighboring mines was almost wholly free-milling, and, of course, from the oxide zone.

At no place visited, was there observed any noteworthy amount of valuable metal other than gold and silver. The molybdenum deposits of Roaring River, about twelve miles west of Rocky Bar, were not visited by the writer. These were thoroughly covered in a report by F. C. Schrader, (Bull. 750-F., U. S. Geol. Survey). Some beautiful specimens of molybdenum ore, from this section, were furnished the writer, by the owner of one of the deposits.

The ore of the Black Warrior region, northwest of Atlanta, is principally gold-bearing pyrite with production almost wholly from the oxidized portion of the veins. Persistent rumors of the discovery of platinum came from this district, and these were investigated during the visit to that section. Samples were supplied the writer by owners of the several reputed platinum deposits. A careful analysis of all these has, so far, failed to substantiate any claim that platinum occurs in the country.*

*The platinum "ghost" reappears perenially first in one part of the state then in another. Usually it has its origin in assays from Grants Pass, Oregon, where numerous self-styled assayers continue to report fabulous amounts of platinum, palledieum, iridium, and other metals of the platinum group, from samples in which neither the U. S. Bureau of Mines nor the Idaho Bureau analysts can find a trace of such metals. A detailed report of one such case in Idaho is given in Pamphlet 5, A PRELIMINARY INVESTIGATION OF A REPORTED PLATINUM DISCOVERY NEAR COEUR D'ALENE, IDAHO, which should be consulted by anyone interested in the possibility of platinum being contained in this ore. More recently the Grants Pass "assayers" seem to have turned their attention to finding tin and extreme precaution should be observed in accepting results of any kind from such a source.F.A.T.

As a rule, the former operations of the various camps of this country ceased with the exhaustion of the then known deposits of free-milling ore. In 1908-9 some attempt was made at Atlanta to treat the underlying sulphide ore, but due to inadequate milling facilities, results were not wholly satisfactory. From time to time, other similar attempts have been made, and, from report, the problem facing operators was mainly metallurgical. Subsequent experimental work, conducted by one company on its ore, clearly proved that satisfactory recovery was very largely a question of fine grinding, preparatory to cyanidation. The shipment of concentrate to the smelters has proved unprofitable because of excessive transportation costs.

Prospecting has been carried on in the country for the past several years, largely by individual claim owners, and good ore has been exposed at some places. At no property visited had work progressed sufficiently to permit making any tonnage estimates. The most noteworthy development work of recent years is that done at the Boise-Rochester Mine near Atlanta. Here, at a depth exceeding 900 feet, was exposed in three cross-cuts, a 30 foot vein of milling ore apparently well beneath the lower limits of oxidation and surface enrichment. Similar conditions were reported at a mine near Rocky Bar at a depth of 600 feet. That mine, however, was inaccessible. While the general impression prevails, locally that the mines cannot be worked profitably beyond the lower limits of surface enrichment, developments at the Boise-Rochester clearly prove that this is not always so.

Regarding the probable amount of free-milling ore awaiting exploitation in this region, little can be stated definitely. After visiting the various camps, the statement seems warranted that the supply by no means has been exhausted. Most of the veins of the country can be traced along their outcrops very easily, so that prospecting, during the open season, presents no unusual difficulties.

PINE DISTRICT

Franklin Mine

The principal mine of this district is the Franklin, located about half a mile southwest of the town of Pine on the South Fork of Boise River. Two patented quartz claims originally comprised the property, but, at the present time, there has been added to it a portion of the W. R. Deckard property, covering what is known as the objective vein, 645 feet east of, and parallel to the Franklin. Both the Franklin and the Objective veins strike about N. 20° W. and dip steeply to the East. They are two of a series of approximately parallel veins that here strike N. 10°-20° W. across the country, at 100 feet to 500 feet intervals, for a zone width of about a mile and a quarter. The two veins mentioned are near the eastern margin. This zone has been explored at different places for 6000 feet north and 2½ miles south of the mine, but the Franklin is the only one with any noteworthy production.

The veins are fault fissures from 1 to 5 feet wide, containing gouge and crushed quartz, mineralized with pyrite and occasional bunches of galena and sphalerite. Oxidation is strongly in evidence throughout the veins to the depth now exposed. The high grade gold ore obtained in the upper workings evidently owed its value to the process of surface enrichment. Manganese and iron oxides are much in evidence in the fissures.

The country rock is granite, into which, were intruded prominent dikes of diorite, rhyolite, and diabase, apparently in the order given. These strike northeasterly and are cut by the two fissures named.

The workings on the Franklin vein were inaccessible, but, from ore specimens gathered on the dump, and information supplied by W. R. Deckard, the following was gathered. Pyrite, galena, and sphalerite in the quartz fissure filling, and, to some extent, in nearby altered country rock, constitute the ore. Galena and sphalerite occur as small kidneys throughout the vein, generally four to six inches in diameter; pyrite is by far the most abundant sulphide, and is more or less disseminated throughout the entire vein.

Oxidation is reported in evidence here and there in the lowest Franklin drift to a depth of about 450 feet beneath the surface. At such places, small amounts of ore were mined which assayed from $35 to $76 per ton in gold. Ore of this character and value was far more abundant throughout the upper levels where oxidation was more complete. There is apparently a rather pronounced change from sulphide to oxide ore about 50 feet above the point at which the lowest, or No. 3 crosscut, encountered the Franklin Vein.

In all, about 1,775 feet of tunneling has been done at this mine. The vein above the No. 3 level has been rather extensively stoped to the south of the main crosscut and a comparatively limited amount of work to the north. The ore was treated locally in a 10-stamp mill, a short distance south of the mine. The total production as shown by U. S. Mint records is slightly over $750,000.

Recent work on this property is being confined to opening the objective vein. At about 140 feet from the portal the objective crosscut entered into and cut a 40 foot shear-zone to its foot-wall. This zone consists of sheared and altered country rock shot through with numerous small quartz veinlets. Four of the most prominent were sampled with the following result:

		Gold oz. p.t.	Silver oz. p.t.	Lead %	Zinc %
Streak No. 1	2 to 5 feet wide	0.84	3.6	0.2	0.0
" " 6	1 " 6 " "	0.01	0.3	0.0	0.4
" " 3	0.65 " "	0.00	0.2	0.0	0.1
" " 4	3.0	0.15	0.7	0.6	0.0

Such information as could be obtained regarding the early day treatment process at the Franklin Mill may be of interest. The mill consisted of two 5-stamp batteries which crushed an average of 27 tons of ore through 30 mesh in 24 hours. Plate amalgamation was the main method of recovery employed, though cyanidation was successfully used during the last months of operation. Agitation was effected by forcing air through the charges from the bottoms of the tanks. A recovery of 95% on the oxidized ore is claimed.

The mill, now idle, was built in 1903 and ran intermittently for fourteen years, using water power during the summer months and steam during the winter. From records, the mill heads averaged $27 per ton in gold and silver, the former predominating in value. Small lots of custom ore were occasionally treated, though the amounts could not be learned.

Bonnie Anna or Mountain View Group

The Bonnie Anna, consists of three unpatented claims owned by Fred Skelton, Pine, and is about two miles southwest of Pine. The property is now idle, but certain portions were accessible and reveal some things of interest. About $5,500 mostly gold, has been produced from oxidized ore obtained at depths not exceeding 200 feet. The ore was hauled to the Franklin mill for treatment.

The work at this place, has been confined principally to one prominent quartz vein known as the "Big" vein, striking N. 65° E., and dipping 60°S.E., which can be traced across the foot-hill country to the northeast for several thousand feet. Its outcrop in the opposite direction is covered by the river gravels of the South Fork of Boise River, beyond which, it was not investigated. Prospecting along the northeasterly outcrop beyond this property has not as yet resulted in the discovery of any deposit of importance.

The ore is mainly a shattered iron-stained quartz varying in width from 3 1/2 feet to 8 feet in the vicinity of the main ore shoot. The average width of its outcrop elsewhere across the country, is three feet. A short distance to the southeast of the vein and approximately parallel to it, occurs a large aplite dike to which there is possibly, a genetic relationship.

Localization of ore to a particular portion of the "Big" vein is thought to be related to the cross-fracturing prominently in evidence here. Crossing this main vein, on a strike approximately north, is what is known as the "little" vein from which some good ore is reported. Other shearing closely parallel to the little vein, is in evidence in the locality. Outcrops of basic dikes were observed in the vicinity of the intersection of the big and little veins. These were probably another factor in the development of the ore structure.

At the highest point of the outcrop on this property the owner reports average assays obtained in some shallow workings as $4 to $6 per ton, $1.50 of which was silver and the balance gold.

In the main tunnel, about 300 feet southwest of the high point on the ridge and about 100 feet below, in what is called the "sublevel" (small underhand stope) the quartz vein is exposed for a width of about 8 feet. One section, 4 1/2 feet wide, across an unfractured portion, assayed $1.12 in gold. A second section, 3 feet wide, constituting the rest of the vein, showing fracturing and iron stains, assayed slightly over $10 in gold. The vein, which is 5 feet wide at the portal of this tunnel, is reported to assay $17 in gold.

The most extensive working now accessible, is the Lebar tunnel, driven S. 40° E. to cut the Big vein at a depth of 200 ft. The vein, 3 1/2 feet wide, shows two sections, one hard white quartz, slightly iron-stained, and the other somewhat shattered and rather abundantly iron-stained. Samples were taken across each section. Results were as follows:--Iron stained quartz 8 inches wide, 8.8 ounces gold, 52.5 ounces silver; hard white quartz 3 feet wide, no gold, 3 ounces silver. From the intersection of the Lebar cross-cut with the Big vein, a raise was run to the surface about which, however, no information was obtained.

Former leases began a diagonal crosscut into the hill from the river slope, to cut the veins described, at a depth of about 400 feet or more. This was driven several hundred feet but was not extended far enough to reach either vein.

A reported occurrence of cinnabar on the L. E. McGuire ranch about one mile east of Pine was investigated. Samples were taken at the several shallow workings along a large basaltic dike, but with negative results.

Verdun Group

Located about one mile up Sloan Gulch which extends southwesterly into the South Fork, 2 miles below Pine, is Verdun group of nine unpatented quartz claims belonging to W. R. Deckard, of Pine. These claims cover a portion of the same north and south vein system along which the Franklin group is located, but are about one-half mile west of the Franklin Mine.

Some of the more recent workings were open and disclosed several interesting features. The old workings near the eastern and lower limits of the property were inaccessible, so that conditions prevailing had to be judged from material found on the dumps.

Here, as elsewhere in this district, pyrite, galena, sphalerite, and occasionally, chalcopyrite in small amounts, generally in quartz gangue, constitute the sulphide ore. The quartz veins range from small seams to 3 feet in width, and although some appear to be persistent across the country, there is a decided tendency toward lensing shown underground.

A sample was taken across a 4 inch vein in the third from lowest adit tunnel on the southeast claim of the group, near the point where the adit first exposed the vein. The ore shows considerable amounts of iron and manganese oxides. The sample assayed 1.66 ounces gold: 3.5 ounces silver; 1.8 percent lead, and no zinc.

Another sample was taken in the adit next above, about 500 yards to the north west of the place from which the first was obtained. The vein consists of 6 inches of quartz showing sulphides, mainly pyrite with oxidation much in evidence. A sample of this assayed 1.2 ounces gold; 2.9 ounces silver; 4.7 percent lead; 2.4 percent zinc. Neither arsenic nor antimony were present in appreciable quantity.

Former operations at this property were confined to the free-milling ore, which from report, was worked to a maximum depth of 75 feet on the southeast claim of the group. One 5 ton shipment sent to Rocky Bar for treatment "milled" $23 per ton, indicating a probable gross value of $40 per ton for the ore. Subsequent treatment at the nearby Franklin mill, to which the ore was hauled by team, yielded $45,000 gross. These old workings have been idle for several years.

Marsh Creek Property

The Marsh Creek property, consisting of three unpatented lode claims, is on the head waters of Marsh Creek, a tributary of the South Fork about 5 miles above Featherville. The principal work consisted of a 400 foot adit crosscut which at a few feet from the portal, cuts through a large quartz vein, about 30 feet wide. A drift has been run for 30 feet northeasterly on the quartz vein, exposing a width of 9 feet in the face. A chip sample across this did not show sufficient gold and silver to constitute ore, although the quartz was fractured and considerably stained with streaks of iron oxide. Where unstained, it is the typical white, opaque "bull" quartz, for the most part, with little or no sign of sulphides. Some pieces of ore on the dump at this place, show chalcopyrite and occasionally galena and sphalerite, with coarse grained pyrite rather abundant. The source of these was not found underground.

There are several open cuts and shallow tunnels on the claims. In some of these oxidized ore is exposed which, according to samples taken by the owner, carries considerable gold and silver. At one open cut, about 200 feet northeast of the main crosscut mentioned, a sample was taken across a fractured and iron stained shear zone, showing a foot or so of altered granite and a foot of quartz. This assayed 0.8 ounce gold and 0.4 ounce silver. An examination of surface conditions at the property, showed numerous dikes of aplite and diorite porphyry. Parallel to these are several rather prominent quartz croppings. The quartz is often tightly frozen to enclosing rocks. Evidence of extensive shearing was not found.

Numerous prospects are reported at the head of the South Fork of Boise River. There are also three prospects on the head of Skelton Creek, and two on Bear Creek. From one of these, the Red Horse, 6 tons averaging $62 per ton was shipped to Garfield, Utah, in 1922. There are several other prospects to the east of the Rocky Bar Quadrangle, and although some of these have shown evidence of considerable merit, there is, as yet, no activity in the region worthy of note. Such work as is being done now, is mainly that of complying with annual assessment requirements.*

ROCKY BAR AND VICINITY

(Bear Creek Mining District)

Rocky Bar first attracted attention by reason of the placer deposits which were discovered in 1862. Work was begun in 1863 and continued until the early seventies. The principal diggings were confined to the headwaters of Bear Creek, and the gold was definitely traceable to a system of veins striking easterly across the country in the vicinity of Rocky Bar.

The country rock is granite, with small aplite dikes rather abundant. Some few dikes of rhyolite were observed, and large diorite porphyry dikes are fairly common. Basic dikes are frequent and are the last intrusions in the country. The general trend of all the dikes is about N. 70° to 90° E. The country has been extensively fissured in the direction of N. 60° E. to S. 70° E. and an apparently local fissuring strikes N. 10° W. to N. 5° E. The latter fissure system in most instances appears to be the older, though not always so.**

The principal veins have an easterly strike and consist of quartz and gouge more or less mineralized with auriferous pyrite. Galena and sphalerite are occasionally present but in insignificant amounts. As measured along the outcrop few of the veins are continuous deposits of quartz. Many show a tendency towards "lensing" with a feathering out marginally into numerous stringers. Some few workings that were accessible indicate that the quartz occurs as nearly vertical chimneys of lenticular cross section. Some outcrops in this locality, however, were traceable for several thousand feet without a break, usually showing from 2 to 6 feet of solid quartz.

Contrary to expectation some of the most productive deposits have been of the lens type, with the long direction of the lens parallel to the strike. The quartz is often tightly frozen to the surrounding rock which it replaces, and into which it fades marginally in numerous reticulated veinlets which cross and re-cross in a most intricate manner.

One large quartz vein at the head of Elk Creek a few miles north of Rocky Bar showed a solid mass of "bull" quartz about 30 feet wide. Work done here disclosed little or nothing of value.

In one apparently continuous vein, about a mile northeast of Rocky Bar, considerable drifting had been done. As shown here, the ore is confined to short shoots with comparatively barren intervals between.

The Rocky Bar vein system can be traced several miles both easterly and westerly but at only a few localities other than near Rocky Bar, have any important deposits been found. This localization is thought to be due to cross-

*The Mines of this section were beyond the limits of the area under consideration and, from report, were inactive and showed no unusual features.
**Probably both systems are nearly contemporaneous.

fissuring which seems to have been an important factor in deposition. In other words, the more thoroughly fractured country has naturally afforded more favorable avenues for ascending and descending solutions. The presence of the basic dikes in the immediate vicinity in nearly every instance of important deposition is significant.

As reported by those familiar with underground workings at Rocky Bar, the main veins, as a rule, faulted transversely to the left. This condition was observed at several places, thus confirming the local tradition. It is said that former operations ceased upon encountering these transverse faults, thus, seemingly affording a basis for the statements current that ore yet remains unexploited in some of the old workings.

Idaho Gold Corporation

The property of this company consists of a consolidation of several of the old producers immediately north of Rocky Bar, including the Esmeralda, Vishnu, Bullhide, Clifton Bell, and Mountain Goat groups. Forty-three claims about half of which are patented, comprise the present holdings of this company.

When visited in 1925 work was being confined to the Montana crosscut adit near the extreme northwestern portion of the property. This tunnel, 640 feet in length extends northerly from a point about 300 feet, north of, and 50 feet above Bear Creek.

Seven quartz veins striking easterly and dipping steeply to the north are exposed in the crosscut named. The first was cut at about 300 feet and the last, known as the Clifton Bell, at about 600 feet from the portal. Development work in 1925 was being confined to the latter, and consisted of a 50-foot winze, on the vein a few feet to the east of the Montana crosscut, with a short crosscut to the north from the bottom of the winze. As reported by the management, this work failed to reveal any ore of consequence.

Drifting had been done previously, on the Clifton Bell--about 350 feet to the east, and 40 feet to the west. Short crosscuts to the north and south had been run from the east drift. In former years a short intermediate drift, 30 feet above the main drift, had been run with connections to the surface. The stopes were accessible to a limited extent, only, but some ore had been obtained.

The vein consists of 3 to 4 feet of considerably sheared and highly altered granite with, here and there, lenticular masses of quartz from a few inches to 20 inches in width. These quartz lenses as measured along the drift, range in length from a few feet to 40 or 50 feet and constitute the principal ore at the deepest level. Some sampling was done along the lower drift of the Clifton Bell at the most likely looking places, not so much to prove the value of the deposit, as to compare the relative gold content of the oxidized surface ore with that of the sulphide ore beneath. Nothing but thorough sampling at close intervals should be taken as conclusive data regarding the value of the deposit as a whole. Even so, it was somewhat of a disappointment to find that the gold and silver content of six samples taken over widths of 4 to 20 inches, was practically negligible.

The veins cut in the Montana adit were largely inaccessible. The few which were open, reveal the same general features as were described in connection with the Clifton Bell. Stoping had been done on most of these veins and at a few places, the workings reached to the surface. These old stopes were also inaccessible, but, from report, it would appear that the principal ore was obtained in the oxidized zone.

The results of the sampling are admittedly not conclusive as to the value of the sulphide ore, but they are such as to indicate very clearly that work in the oxidized zone is far more likely to prove profitable than that at greater depth.

In general, it may be said of all these veins that they are gouge-filled fault-fissures in granite showing considerable alteration of the walls. Sericite is abundant and the ferro-magnesian minerals have been altered, at some places, as shown in crosscuts, for several feet each way from the vein. At irregular intervals along the fissures, occur tabular bodies of quartz, lenticular in horizontal crosssection, to which the principal mineralization is confined. Some few of these lenses attain widths of 5 or 6 feet. It is very evident that considerable shearing has taken place subsequent to the deposition of this quartz and it is, as a rule, considerably shattered. Usually, the quartz is found along one or the other wall, from which it is separated by a thin gouge streak. Occasionally, the quartz is found tightly frozen to the walls, with numerous stringers branching out into the highly altered granite. These stringers often show a gradual blending into the inclosing granite.

The greatest range of vertical development is that on the Vishnu vein, on which a shaft, now carved, was sunk a few hundred feet west of, and from a level about 50 feet above the portal of the Montana adit. This same vein was cut in the Montana adit about 380 feet north of the portal. In the crosscut, the vein strikes S. 80° E. and dips 65° to 70° N. It was drifted upon for 300 feet towards the Vishnu shaft and stoped overhead for widths of from 2 to 15 feet. The ore is reported to have been freemilling and of good grade.

The Vishnu shaft was started well in the hanging wall of this vein and was sunk vertically to a depth of 700 feet. No maps are available but the shaft evidently cut the vein on its northerly dip at a depth of 400 or 500 feet. From testimony considered reliable it appears that some drifting and stoping was done between the 250 and 500 foot levels. From the shaft, two crosscuts were found, one extending north about 225 feet, at the 250 foot level, and the other south about 300 feet of the 700 foot level. Each crosscut exposed a small vein near each face. Small bodies of sulphide ore, principally above the 500 foot level, are reported to have been mined, which ranged in value from $7 to $16 per ton in gold and silver. The average recovery by amalgamation is given as $2.65 per ton. With such returns, it is evident why the mine closed down after a short run.

Surface investigation to the north of the Montana crosscut, plainly discloses the existence of several other parallel east and west quartz veins a short distance beyond the present face of that crosscut. No work was apparent on these. Elsewhere, to the east, these veins at a few places were highly productive throughout the zone of oxidation.

The lower tunnels of the Mountain Goat workings were accessible, though the stopes were caved. These stopes were worked to the surface, approximately 150 feet above. As shown in the lower tunnel, the old workings were located in the immediate vicinity of a series of vein intersections. Four veins, striking about N. 80° E. are intersected by a prominent north and south vein, and the stopes were confined to the immediate neighborhood of these intersections.

The Mountain Goat workings show extensive faulting. Lack of uniformity in it probably represents surficial movement. The deepest workings do not exceed 200 feet, and the complex faulting is evidenced by numerous small slips in the country rock rather than by any one great displacement. There has been consider-

able movement along veins, however, resulting in the development of gouge and in shattering of the quartz. As nearly as could be seen, the quartz filling is inclined to be lenticular in horizontal cross-section, rather than continuous, along the vein. The quartz veins according to report, are tabular chimneys (or vertically elongated lenses, if lenselike). Some quartz veins were followed upward, it is reported, but pinched out before reaching the surface.

It is very evident that supergene secondary enrichment played a most important part in the deposition of gold at this place. The localization of the deposits at, or near, vein intersection is characteristic of the district. Basic dikes crop out in the vicinity of the Mountain Goat, but, not near enough to permit any positive assumption of genetic relationship to local ore deposition.

Elmore and Pittsburg

The two most famous mines of the Rocky Bar country are the Elmore and Pittsburg on Bear Creek flat about a mile above the camp of Rocky Bar. About all that can now be seen of these mines are two wrecked shaft-houses, a few hundred feet apart in the brush covered creek bottoms, a few old mine dumps strewn with decayed timbers, and here and there, several dilapidated mine buildings which the winter snows have not yet entirely collapsed. Standing on the hillside, overlooking the scene, one feels the sensation of desolation that only a deserted mining camp can give.

Such information as the few remaining residents of the country could give, may be of interest. Recollections of thirty years ago, lose something of the sharpness of detail, but there seems to be substantial agreement, regarding the main features. The ore of these two mines was not exhausted, but the gradual change from free milling to "base" ore, rendered further operation at that time, unprofitable. The gross production of the Elmore is given as approximately $2,500,000; that of the Pittsburg is variously estimated to be, from one fourth to one half that amount. These figures can at least be interpreted to mean that these mines were important producers in their day.

The Pittsburg, and the Elmore workings on the adjoining claim to the east, are supposed to be on the same vein which strikes due east and dips about 65° N. This vein projected easterly on the same course for about a third of a mile, would pass close to the portal of the Montana tunnel of the Idaho Gold Corporation. Such a projection is, of course, conjectural as there is considerable transverse faulting of all the east-west veins in this section. The statement will, however, serve to give the relative positions of the three mines.

The Pittsburg shaft was an incline which followed the vein to a depth of 250 feet. The vein was drifted and stoped for an unknown distance each way from the shaft. The Elmore shaft, about 300 feet east, started on the outcrop of the same vein but was sunk vertically 325 feet in the footwall. Evidently some crosscutting was done to the north from the 200 foot level, as connection was made, at this depth, with Pittsburg workings, leading east from the bottom of the inclined shaft of that mine. At a depth of 300 feet the Elmore shaft cut a flat dipping vein, striking about east, and dipping about 30°N. It is reported that from this flat dipping vein, the Elmore got most of its high-grade, free-milling gold ore, with a daily output of approximately 100 tons. A 100 foot incline was sunk on this vein from the Elmore shaft, and No. 4 level was extended each way from the bottom of it. The flat vein was stoped from this No. 4 level for an unknown distance each way. The ore was reported as free-milling, permitting a good recovery on the plates. There seems to be no record of any exploration of this flat vein by the Pittsburg Company whose shaft should have cut it at an additional depth of about 175 feet.

The Elmore company had their own mill in which they treated their own and custom ore. It was the conventional type of amalgamation plant, but evidently some experimenting in cyanidation was being done toward the close of operations. The plant has been idle for over thirty-five years and has been stripped of most of its portable equipment. Enough remains however to show the method of treatment.

Steam power was used, with wood for fuel, so that the supply of firewood in that locality was considerably depleted. The primary crushing was done in two 8 by 14 inch Blake crushers and then by five 10-stamp batteries with 1000 pound stamps. The stamps discharged on ten 5 by 8 foot plates, thence to vanners and later to Wilfley tables. What success was had with cyanidation was not ascertained. Evidently its application did not pass the experimental stage.

There are several other, though smaller mills in the country, of later construction than the Elmore, but all of the same type. All but a few of these are now in a bad state of repair; their idleness, a poor advertisement for the country.

SPANISH TOWN DISTRICT

Spanish Town Property

The Spanish Town property, so named because it embraces the former site of Spanish Town, is located on the main fork of Elk Creek, about five miles southeast of Steele Mountain and about four miles north of the junction of Elk and Bear Creeks. Seven unpatented quartz claims comprise the group. The mine has been idle for several years and in 1925 was in sole possession of a caretaker.

An examination of the surface shows the existence of several veins striking northeasterly at intervals of a few hundred feet. Evidence of transverse faulting striking about N. 40° W. was observed. Some small quartz veins were also seen with this same strike. Several basic dikes, striking northeasterly, cross Elk Creek a short distance down stream from the mine. The dikes observed in the immediate vicinity of the mine are aplite and diorite porphyry in granite. The principal workings are confined to one quartz vein averaging from 2 to $2\frac{1}{2}$ feet in width, best shown in the 500 foot drift extending southwesterly into the hill at creek level a short distance below the camp. There are several chutes leading to stopes overhead in this adit drift.

According to report, much of the ore assayed over $50, in gold per ton but less than 10 percent was saved by amalgamation. No explanation was given for this There is no record given of former production. The great difference between the reported value of the ore, and the recovery, may be due to faulty sampling. The several samples taken by the writer would bear this out.

There is reliable information to the effect that there was a good grade of free milling ore at this mine throughout the upper levels of the old workings. In the early days, it was worked in arrastres, remains of which are yet on the ground. Later a 5-stamp mill was built with provision for inside and outside amalgamation but results were not satisfactory.

One is impressed with the sight of the several pieces of heavy machinery to be seen here, and knowing that these were hauled into the country from Rocky Bar over a road which could hardly be called such except by a considerable stretch of the imagination, one must admire the pluch and persistence of the freighters who succeeded in bringing this heavy equipment into camp.

The Spanish Town vein is reported, by those familiar with the country to mark, locally, the northern limit of any significant gold veins. The vein has been traced southwesterly to an adjoining property where it becomes known as the North Ophir. The owners of the North Ophir likewise claim that the vein there marks the northern limit of the gold belt. Old placer diggings by their location seem to confirm this statement.

Ophir Group

Located about two miles easterly from Rocky Bar, on what is known as Ophir Gulch, is the Ophir mine, from which a production of $80,000 up to the year 1880 is recorded in the U. S. Mint reports. Subsequent production is unknown but the total is reputed to be $2,250,000. The property, consisting of six quartz claims and one mill-site, is located along a vein which can easily be traced for a mile or more to the east and west of the main workings. The vein has been exposed in numerous cuts and shows quartz to a width of from 2 to 6 feet with an average width close to 3 feet. The Ophir vein is the most prominent and persistent, horizontally, of any observed in this section of the country.

Two adit drifts, extending east and west from Ophir Gulch at about creek level, with stopes above and below, constitute the principal workings on the property. The vein is well exposed in an open cut just above the portal of the west drift. Here, a 3 foot quartz vein crops out in granite, striking southwest and dipping 50° N.W. into the hill. For a width of 15 feet, the hanging wall, which has been sheared to a pronounced degree, shows a few broken fragments of quartz, and is reported to carry some gold.

The workings are now inaccessible for the most part. The following data was given the writer by Mr. E. C. Towne of Rocky Bar. The west drift follows the quartz vein mentioned above for about 400 feet, at 200 feet from the portal an inclined raise was run on the vein to the surface and, at 30 feet towards the portal from the foot of the raise a 45 foot inclined winze was sunk on the vein to explore it at depth. About 20 feet down this winze, the vein abruptly changed from a northwesterly to a southeasterly dip and was not followed thereafter. From the bottom of the 45 foot winze, a 42 foot crosscut to the northwest exposed a 5-foot vein which was followed northeasterly for 25 feet, from which point a 90-foot winze was sunk on the vein which here had the same strike and dip as the first vein above the main level. The several inclined workings described, followed the main ore shoot, and, according to Mr. Towne, the bottom of the 90 foot incline was still in ore.

On the opposite side of Ophir Gulch, at about the same level as the west drift, an adit drift, now caved, was run northeasterly on what is believed to be the north vein of the other workings. About 300 feet from the portal, an ore shoot was found and stoped to the surface and to a depth of approximately 150 feet, beneath the main level. A vertical shaft 285 ft. deep, located 200 ft. up the hill from the vein out-crop, was used to mine the ore beneath the adit level. It is reported that the ore mined here was from a section of the vein, about 165 feet long, included between two transverse faults. No effort was made to locate or explore the continuations beyond these.

The ore, as shown by specimens, was mainly pyrite in a quartz gangue. Some specimens were found showing small amounts of copper, lead and zinc sulphides but these constituents were negligible. The greatest production was from the oxidized or partly oxidized ore. The mill which former owners used, has been wrecked, but, from information obtained, it was the conventional stamp mill

followed by plate amalgamation.

Lison Group

The Lison workings are downstream, about one mile south of the Ophir. This property produced considerable gold, both placer and lode, exact total amounts being unknown. Such ore as was obtained by quartz mining was treated on the ground in a 20-stamp mill. The recovery was made on plates alone. For a short period, concentrates were saved on tables. These were discarded later as a "useless feature of the process."

Twelve claims, 5 patented, and 7 unpatented, comprise the group. Four prominent veins strike east and west across the property of which the northern or Republic vein is claimed to be the easterly continuation of the Ophir. South of the Republic, are the Poorman, the Gold Bug, and the General Grant veins, at 600, 1200 and 2400 feet intervals, respectively. An undeveloped vein, the Homestake lies about midway between the last two named, but, seemingly, former owners did not consider it worthy of development.

The Republic vein alone shows any marked shearing. The several veins mentioned, strike almost due east and dip north from 60° to 70°, striking diagonally --S 45° E.--across the country, in the vicinity of the Lison workings are several basic dikes. No shearing was observed along the contacts of these and the enclosing granite.

None of the workings at this place was accessible, when visited, except a few short tunnels, north of the camp, in which there was little of interest. Some good specimens of sulphide ore from the old workings, were obtained from the dump of the Gold Bug lower tunnel. A ten-pound sample composed of small selected pieces of this was taken. This when assayed showed only negligible amounts of gold and silver. A sample of the Lison concentrate was taken from that stored in the mill on the property. Panning a portion revealed a very few fine colors but an assay showed 1.54 ounces gold; 1.2 ounces silver.

RED WARRIOR DISTRICT

Just over the ridge to the south of Rocky Bar, lies the Red Warrior district, so called from the creek of that name. According to unverified local belief, the Wells-Fargo records showed total shipments of $33,000,000* worth of placer gold from Red Warrior Basin. From all indications, the gravel in this area was worked wherever water could be had for sluicing. Much of the ground has been worked three different times, lastly by the Chinamen, who usually leave little gold when they stopped work.

Quartz mining was confined principally to an area of about two square miles along the top and south slope of the divide between Bear and Red Warrior creeks south-east of Rocky Bar.

There are several groups of claims in this section but no other than annual assessment work is being done at the present time.

Wide West

The principal producer of this section was the Wide West to which a production of $1,250,000 is locally accredited. The ore was treated in a 20 stamp mill on Red Warrior creek, just south of, and below the mine. The mine was inaccessible in 1925, though some data could be obtained. An examination of the

*Undoubtedly a gross exaggeration. F.A.T.

surface workings and vein outcrops shows that the same conditions prevail here, as at Rocky Bar. The Wide West vein strikes S. 75° E., and dips steeply to the north. According to Raymond (1870) the vein was from 2 to 5 feet wide, well defined, and gave a milling return of $40 per ton. There is evidence that cross-fracturing and basic dikes characterize the area. Of the two, the fracturing seems to play the more important part in the mineralization. The main southeast vein system is traceable both to the east and west of this locality, but, so far, there has been no noteworthy production elsewhere along these veins.

E. N. Stone Property

This group, known as The Keystone, consisting of three unpatented quartz claims, is well up on the north slope of Red Warrior creek on the divide that separates Red Warrior and Bear creeks, about a mile south of Rocky Bar. Old workings show several veins striking about S. 75° E. across the property. Two adit drifts are accessible and reveal typical conditions of vein structure.

The ore consists of narrow lenselike bodies from 6 to 12 inches wide with considerable shattering of the quartz. Iron oxide stains are prominently in evidence, Pyrite occurs, sparsely scattered throughout the quartz. In the absence of oxidation, (enrichment) the ore is generally low grade. Vein outcrops from the surface to a depth of from 5 to 10 feet are usually reported to be barren or nearly so. Thereafter the veins are productive until the lower limits of enrichment are reached at various depths of from 200 feet to 300 feet. No mine in this locality seems to have been able to operate profitably on strictly sulphide ore. A grab sample from an ore pile on the dump of the uppermost tunnel of the Stone group assayed 0,48 ounce gold; 0.5 ounce silver. Oxidation was much in evidence and pyrite was the only visible sulphide. Qualitative tests on selected pieces of the sulphide ore showed no arsenic, antimony or copper.

The workings at this property show two intersecting systems of faulting and afford some evidence of age-relationship to two prominent basic dikes that cross the upper tunnel. The main fracturing is confined to two systems striking approximately N. 20° W. and S. 80° E. respectively. The main ore deposits of the region are associated with the southeast system, and there appears to be both pre-mineral and post-mineral faulting along the conjugate or northwest system. At one point an older northwest fissure ends against the main southeast fissure, but the quartz at the junction has filled both fissures without a break.

The aplite and diorite porphyry dikes are older than the faulting mentioned. In the upper Stone adit, here extending N. 80° W. on a prominent vein, two closely parallel basic dikes cut N. 25° W. across the tunnel with considerable displacement of the vein along the dike and granite contacts. So far as could be seen or learned, this faulting along the dikes is post-mineral. The lens-shaped quartz fissure-filling commences a few feet west of the dikes and extends many feet beyond, along the drift. This constitutes the ore. Although it is somewhat shattered, there does not appear to have been much shearing subsequent to deposition.

Based on the above as well as on evidence elsewhere in the area, it is believed that there is a close age-relationship between the east-west fissuring, the basic dike intrusion, and the mineralization. Although this is thought to apply to this particular place and to many of the others of the surrounding country, the problem is not always simple. There is evidence that the faulting, probably surficial, is still in progress, and also that igneous activity has extended down to comparatively recent time, geologically.

ATLANTA AND VICINITY

(Middle Fork or Yuba Mining District)

This district embraces an area of approximately 30 square miles centering about the old camp of Atlanta twelve miles northeast of Rocky Bar with which it is connected by the only wagon road now open into the country. In going from Rocky Bar, whose elevation is approximately 5,000 feet above sea-level, one trave for six miles up Steele Creek to an elevation of 8,000 feet on the divide between the South and the Middle Fork of Boise River. The road follows the divide for about two miles, then drops down James Creek for four miles to its junction with the Middle Fork at an elevation of 5,200 feet. The James Creek section of the road has an average grade of little less than 13 per cent. Some comparatively level stretches along this portion of the route are about 5 per cent grade which means that others exceed 13 per cent. There are some types of automobiles better adapted to level roads than to this.

The principal drawback to the district is the long winter season during which the road described is blocked to all but travellers on snowshoes. Snowslides are of common occurrence along James Creek and cause considerable delay to the opening of the road each spring. Such conditions retard the development of the country to a pronounced degree. Until a better route of travel is provided, there is little hope of any great mining activity for this district which is the most promising of any in the area.

A feasible route for travel lies down the Middle Fork to Boise, in a direct line, less than 55 miles distant. A road was formerly open down this river, but that half from the vicinity of Troutdale to Atlanta, has been allowed to lapse into a sad state of disrepair, some sections, in 1925, being little more than a mountain trail. Re-opening this road would mean much to Atlanta and tributary shipping points.

Geologically, the Atlanta district differs in structural features from the other mining districts of the quadrangle. The town and environs lie in a fault basin surrounded on all sides by rough, mountainous country of much higher elevation. There is some evidence of lacustrine deposit on surrounding hills, notably a few miles northwest of the town. The local depression is thought to be the result of subsidence, and to this, through the resultant shearing, is attributed the comparatively abundant mineralization of this particular section. In this respect, there is a pronounced similarity, structurally, between this area and the Boise Basin, 35 miles west.

The Atlanta district differs markedly from the rest of the area in the character of its ore deposits. Here and only here are found any noteworthy amounts of anitmonial silver sulphides. The deposits of the surrounding country are almost exclusively auriferous pyrite, with occasional small amounts of sphalerite a lesser galena. The nearest known deposits of similar silver ores of any importance are found in Beaver Creek Basin about 15 miles easterly on the opposite slope of Sawtooth Range. E. V. Shannon in his "Minerals of Idaho", page 168 reports as follows:

> In Elmore County stephanite has been the most abundant and important ore mineral in the rich silver ores of the Atlanta District. The mineral occurs as granular, imperfectly crystalline, and columnar black masses associated with a less amount of pyragyrite in comb quartz. Often the pyrargyrite forms lines along the sides of narrow veins while the centers are filled with stephanite (Cat. No.

51864, U.S.N.M.). In some specimens the stephanite occurs as grains with pyrargyrite in coarse granular galena. (Cat. No. 30199, U.S.N.M.). In the Atlanta lode stephanite was the most abundant ore in the bonanzo deposits; next in quantity came pyrargyrite, while argentite, stromeyerite, and native silver were present in relatively small quantities. According to Clayton Transactions A.I.M.E. Vol V, page 471 "The rich streak of black stephanite and ruby silver varied in width from 1 foot to 6 or 7 feet, alongside which was a band of similar width of payable ore containing free gold with disseminated silver minerals, making the workable vein from 2 to 15 feet wide and extending in length underground in the Monarch and Buffalo claims nearly 2,000 feet on the course of the lode."

The silver ores mentioned occur mainly on the Monarch and Minerva groups. They are not reported by the present management at the Boise-Rochester, to the east of, and adjoining the Monarch, on what is known as the Atlanta lode. On the 500 foot and 600 foot levels of the Monarch, silver was much in excess of gold in value; on the 900 foot level of the Boise-Rochester along the very limited portion of the vein exposed, gold with an exceedingly small amount of silver, both associated with pyrite, constitute the only valuable metals of the ore, in that particular vicinity. However, the extent of the lower workings referred to at this level is so limited that no conclusion can be drawn regarding the probable eastern limits of the silver deposit on the Monarch property which lies immediately west.

Throughout the zone of oxidation native gold is the important thing and first attracted the pioneer prospector. Such silver as occurs in the highly oxidized ore, is almost wholly in the native form--cerargyrite is reported, but none was recognized in specimens collected. Silver bromide is reported, but its existence is doubtful. Specimens of "bromide" were collected but tests failed to reveal bromine in any of them. Green, silver-bearing copper carbonates are not infrequently mistaken for silver bromide.

The master-vein of the district is that along which the Monarch and Boise-Rochester mines are located. It crops out boldly across the country, striking N. 40°-60° E. with steep dip to the northwest on the Boise-Rochester and an equally steep dip in the opposite direction on its southwesterly extension beyond the Monarch property. According to Mr. Daniel Kirby, former manager of the property, a reversal in dip was also disclosed in the workings at the Monarch shaft.

Monarch Mine

The history of the Atlanta district and of the Monarch mine are closely interwoven, as the discovery of the mine in 1863 marked the date of the first activity in the area. The discovery was made on what is known as the Buffalo claim at the head of Quartz Gulch about 2½ miles south of Atlanta. A large quartz outcrop marks the discovery point. This outcrop can be traced a few thousand feet each way from the Buffalo claim and is the vein now known as the Atlanta lode. In the late '60's and early '70's high grade gold ore, probably sorted, assaying $2000 per ton and upward, and amounting in all to $200,000, was shipped from the Buffalo workings on mule back to Kelton, Utah, the nearest railroad point, 230 miles away, and thence to Omaha for treatment. Later, roads were built into the country and bull teams were used to haul the ore to Kelton. Ore shipped during the late '70's netted close to $800 per ton. About this time a 5 stamp mill was built as the grade of ore was decreasing with depth and ship-

ping costs were becoming prohibitive. The first ore treated assayed from $25 to $100 per ton, but owing to its refractory character and to the fact that amalgamation was the sole process relied upon an average recovery of but $25 to $30 per ton was made. When the value of the ore later dropped below $20, operations ceased. This occurred in the late '80's and the property closed down until 1902. When mining was again resumed by the Atlanta Mining Co., and was continued until 1908. During this period, amalgamation and cyanidation were used. The mill head averaged close to $8 per ton in gold and silver. Roasting the concentrates was found necessary as the ore became more heavily sulphidized, and the added cost of this, resulted in closing down the mine during the summer of 1908. Aside from the subsequent work of leasers on old dumps, the property has lain idle. The workings are now almost wholly inaccessible, so that the writer is indebted for the following information to the manager, Mr. Daniel Kirby, and to several of the residents of Atlanta who have at some time worked in the mine.

The Monarch group of claims, consists of six patented lode claims, five patented mill-sites, and three patented placer claims, together with several unpatented locations of recent date. From workings in the vicinity of the original discovery through what was known as the Buffalo shaft, 100 feet deep, about $1,000,000 was produced. Later, from the Monarch shaft, sunk on the same vein a few hundred feet northeast to a depth of 600 feet, about an equal amount was produced. The production was mainly from workings above the 100 foot level, but to some extent from that section between the 100 and 400 foot levels. Although considerable drifting has been done on the 500 and 600 foot levels, there has been comparatively little stoping. The average value of the ore on the two lower levels, according to assay records is close to $7.50 per ton in gold and silver.

The decrease in length of the several stopes, as depth is gained, might easily lead one to conclude that the ore-shoots have been bottomed. Examination of the assay records does not confirm the conclusion but points rather to the bottoming of the free-milling gold ore, some of which, near the surface, was specimen rock. At depth, the ore turns "base" and, while of much lower grade than that above, may still be termed "ore". This company has kept a rather complete assay record of the lower workings, and kindly gave the writer access to all such data. Mill heads assayed close to $8 per ton in gold and silver for that ore taken from the 500 foot and 600 foot levels during the last period of operation; although pyrite, according to report, is the prominent metallic constituent of the ore, ruby silver is, at places, fairly prominent. Some beautiful specimens of the typical silver ore were obtained from the lower levels of this mine.

The Atlanta lode or Monarch vein, as it is known locally, can be readily traced along its northeasterly strike across the Monarch property, and for a few thousand feet both ways beyond it. Yuba River, to the east, and Montezuma Gulch to the west, seemingly limit the productive section. What are supposed to be the continuations beyond the limits mentioned, have nowhere proven to be ore-bearing to any noteworthy extent. The productive section extends across an area characterized by numerous dike intrusions, intersecting quartz veins, and extensive faulting, in places exceedingly complex.

The Monarch vein strikes northeasterly with numerous "branches" each way therefrom, at irregular intervals, having an approximately east-west strike. These "branching" veins are seemingly productive for comparatively short distances each way from the main vein, though the branching quartz veins themselves are traceable for many hundred feet farther. This apparent branching is actually caused by displacement of the east and west veins along the younger Atlanta lode. It is reported that these east-and-west veins were usually considerably fractured at the intersections with the Atlanta lode, and the angle between the two for a short distance from the junction quite often contained numerous connecting

high-grade seams which were fully as productive as the main veins, expecially in the oxidized zone.

The ore from the Monarch mine was carried by aerial tram to the company's mill located along the South Fork of Boise River about half a mile below Atlanta. This plant, now idle, has been dismantled, to some extent. The mill had a capacity of 100 tons or more per day, depending upon the character of the ore. Both water power and electric power were used to operate the mill and mine; the former was developed from a ditch above the mill; the latter from the company's plant on the South Fork of the Boise about two miles below Atlanta.

An outline of the treatment process last used is as follows;--The ore passed from bin to gyratory crusher; thence through coarse and fine rolls to Huntington mills, screened to grind to 40-mesh. The Huntingtons discharged on amalgamamation plates, pulp going thence to Johnson vanners. The concentrate was roasted in an Edwards reverberatory furnace, salt being added at the feed end. The roasted concentrate went to the cyanide department. The tailing from the vanners was classified, the sands going to leaching tanks and the slime to a canuas plant. The strength of cyanide solution used was one pound per ton of water with an occasional increase in the strength of this upon the appearance of copper in the feed. Precipitation was done with zinc shaving. The precipitate was treated and melted into bars at the plant. Some of the bullion was high in silver averaging only $8 in gold, or a ratio of silver to gold of about 2 to 1. This was sold in San Francisco. The bullion recovered by amalgamation usually exceeded $14 in gold per ounce and was sent to the U. S. Assay Office at Boise.

Boise-Rochester

This property, consisting of eight patented and several unpatented lode claims adjoins the Monarch property on the northeast and covers the continuation of the Atlanta Lode in that direction. At present, only the necessary maintenance work is being done, but access was to be had to the N. 6 tunnel and to the lower or No. 9 tunnel and to the drifts therefrom. The upper workings were inaccessible when visited but some information was supplied by the superintendent, Mr. James W. Stewart, and by local miners who were familiar with the old workings.

The property was located and first worked about 1869 with the main production from the "Pettit" ore shoot. The mine was subsequently purchased by the Bagdad-Chase Co., who did considerable mining, with production of about $320,000 in bullion. Later the Bagdad-Chase property together with adjoining property was operated by the Boise-Rochester Mining Co., with production of $400,000 in bullion from the "Old Chunk" ore shoot (Atlanta Lode) distant some 1100 feet N. E. of the Pettit ore shoot.

From a point a few hundred yards south of and above the mill an adit crosscut (No. 9 tunnel) has been run southeasterly to the "Atlanta Lode" cutting the vein at a depth of approximately 1100 feet beneath the highest point of outcrop.

These cross-cuts reveal a shear zone about 50 to 70 feet wide in which the sheared granite, considerably sericitized, is exceedingly soft and crumbly. Throughout this are numerous irregular quartz seams carrying medium fine-grained pyrite. This mineralization is also evident in some of the more highly altered granite. This zone of altered granite and quartz seams is reported to be sufficiently mineralized to constitute ore. On the footwall occurs a quartz vein from 3 to 5 feet in width and somewhat shattered. It is considerably mineralized

here and there with pyrite. This constitutes an ore that is reported to average much better than the sheared granite. No evidence of oxidation by descending surface waters was seen anywhere in the vein at this level. Specimens of ore were "mortared" and carefully panned but showed no "colors" in the pyrite concentrate. From what could be gathered concerning tests made, the gold and silver are closely associated with the pyrite and are not amenable as a rule to amalgamation. At no place in the three cross-cuts mentioned, were any silver minerals noted. This is in marked contrast to their reported occurrence along this same vein at the Monarch mine, adjoining on the southwest.

As nearly as can be seen, the best ore consists of quartz carrying pyrite. Those in charge report the result of their sampling on this level as indicating an average value close to $8 in gold and silver over widths from 5 to 20 feet. Several selected pieces of ore were taken from some of the quartz lenses exposed in the main vein. Assay of these results ranging from $4 to $15 per ton in gold and silver. Pyrite could be distinguished and a qualitative test of the concentrate obtained from the above specimens showed no lead, zinc, antimony, or arsenic, and but a trace of copper. A concentrate from these specimens assayed 42.36 ounces gold and 26.5 ounces silver. These figures do not purport to give the value of concentrate to be produced by milling, but do convey some information regarding the relative amounts of gold and silver in the ore at this level. A grab sample taken from an old ore pile on the dump at No. 5 tunnel, about 450 feet above No. 9 level, assayed 0.30 ounces in gold and 4.6 ounces in silver and showed no lead or zinc.

The gross production of this property so far as is known is about $1,000,000 derived mainly from bullion obtained by amalgamation. Some concentrate was shipped, a few years ago, and some was treated locally by cyanidation. The concentrate ranged in value from $40 to $140 per ton. Haulage and railroad freight charges were about $40 per ton, varying with the season and condition of roads.

Old workings at this property show two main shoots, both in the main Atlanta lode. The maximum "vein" width in the old upper levels are reported to be from 30 to 50 feet, but with the more highly mineralized sections ranging from 5 to 15 feet. So far as could be seen on the surface and in No. 9 tunnel, this estimate is reasonably accurate.

Recovery at this property from amalgamation was from 50 to 64 per cent of the assay value of the ore. The additional returns from concentrates brought the total to about 70 per cent.

Numerous tests by present operators show a probable mill-head of $7 to $10 with a recovery of about 90 per cent. According to them, there is nothing complex in the treatment process. Briefly the essential features proposed fine-grinding and cyanidation as ordinarily practised in modern plants. Flotation followed by chloridizing of the concentrates is a possible alternative. The ore is not refractory and presents no unusual metallurgical problems.

The Boise-Rochester Company owns a 120 horsepower hydro-electric plant about two miles up-stream from Atlanta on the South Fork. During the winter season, however, the water supply is insufficient and as a result the capacity of the plant is reduced to such an extent that power will have to be brought into the country to permit any extensive operations.

Minerva

The Minerva Mine is located about two miles due south of Atlanta with the main camp on the Yuba River about four miles above its junction with the South

Fork of the Boise. The camp is easily reached by auto over a good road during the open season.

Ten patented and three unpatented quartz claims comprise the group, covering the steep southern slope of Atlanta Hill from its summit down to Grouse Creek, a fork of the Yuba River. The property has been idle for several years and the underground workings were inaccessible in 1925. Maps were available, however, and much data was supplied by those in charge of the property.

Due to their opposite dips, the Monarch vein or Atlanta lode, and the Minerva vein should join at a comparatively shallow depth. The similarity of the ores and the presence of antimonial silver sulphides may indicate a common origin, such as a junction of the two veins would afford. The silver minerals here are a rather prominent constituent of the ore even more so than at the Monarch to the north.

The old mill, now wrecked, is near the southern limits of the property on Grouse creek from which water was obtained for the camp and mill. An aerial tram connected the mill to the mine 2000 feet north of and 1350 feet above the mill ore-bin.

The portal of the main adit crosscut at the head of the tram was caved and the following data were obtained from maps. The crosscut extends northerly about 900 feet to the "north" vein which, at the place of intersection, strikes east and dips 45°N. In all, about 2200 feet of drifting was on the vein at this level, mainly to the east of the main adit crosscut. The vein was stoped overhead for a distance of about 500 feet each way from the crosscut to the next level, 150 feet above. Here, a short crosscut south, intersected what is called the "south" vein, from which some ore was stoped. Ore was stoped out on the main or north vein, above this upper level, but nothing definite could be learned of the size of the stopes. The ore was reported to be free-milling.

About 600 feet above the main lower level, as measured on the dip of the vein, are several hundred feet of shallow workings, now caved, from which rich gold ore was taken in early days. The map shows no connection between these and the later workings below. Two prominent faults striking northeasterly, cut through both the older and later workings, and evidently, displaced the vein from 100 feet to 150 feet to the right. From the amount of cross-cutting done at the first fault encountered, the operators had considerable difficulty in locating the continuation of the vein.

Several specimens of ore from the Minerva were supplied the writer by those in charge of the property. It is essentially auriferous pyrite in quartz gangue. Small bunches of what appeared to be ruby silver are acattered throughout the quartz. Specimens of this showed both the dark and light varieties.

This vein, one of the east-west systems of "branch" veins from the Atlanta lode, would unite with the latter about half a mile to the east of this property on its calculated strike, and at less than 800 feet beneath the Monarch workings on its calculated northerly dip. The fact that the Monarch and Minerva veins both carry ruby silver with no known deposits elsewhere nearby, in connection with the probability of a junction at depth, indicate very strongly that the two deposits are of common origin, although not necessarily connected.

Such field evidence as could be obtained indicated that the Atlanta lode, rather than such veins as the Minerva vein, was the source of mineralization. As nearly as could be ascertained, the older "branch" veins elsewhere along the

Atlanta lode were more strongly mineralized near their junction with this main lead than at considerable distance therefrom, which would further confirm the belief regarding the source of mineralization. This has some bearing on any future prospecting of other veins at this place.

Other Prospects

To the north of the Atlanta lode and on other members of the east-west system are several old mines and prospects at which more or less work was in progress. The old mines were in most instances caved, but the limited work at some of the more recent prospects was open for inspection. Among those visited were the claims of Lou Frankie, Geo. Bixby, F. C. Davis, and Howard Gracie, along Quartz gulch between the Monarch mine and the town of Atlanta.

These prospects in their general features are much alike and permit a common description.

All have good showings of oxidized ore carrying free gold, so that in each case, the owner's problem is mainly that of proving quantity. The workings of the various prospects had, at no place penetrated to a depth beyond the reach of oxidation though sulphides were in evidence at some of them. The question of the depth of the ore has not yet been proved in any of these prospects, and is, of course, the vital thing to the camp, as the limits to which lateral exploration can be carried on with hope of reward are not wide.

Numerous dumps and open cuts at these prospects were visited. The ore here is essentially pyrite in quartz gangue. No ruby silver was seen. A sample composed of picked pieces from an ore pile on the dump of the Paymaster, showing a greenish stain rather prominently, and assaying 68.0 ounces gold and 118.2 ounces silver, was tested for bromine with negative results.

As shown by surface cuts and vein outcrops, the veins are fairly continuous; they pinch and swell after the usual fashion throughout this section of the country. The gold and silver of the oxidized ore are usually confined to the limonite-filled vugs or cavities resulting from oxidation of pyrite. As nearly as can be determined in the field, the limonite throughout the district is mainly residual after pyrite; there is exceedingly little chalcopyrite in the ore. The presence of limonite in such cases (filling pyrite cavities) seemingly indicates descending solutions rather low in free sulphuric acid.

It is believed that at these and several other prospects in other sections of the country, the expense of future development work could be lightened considerably by the erection and operation of small mills, such as are manufactured for prospector's use. At most places, ample water-power is available for a portion of the season, and at some, for the entire summer. At two places small portable mills were in operation and the owners were well pleased with the results. The showings at many prospects fully varrant such an endeavor and it is believed that only through some such effort as this will the majority of the deposits be successfully exploited.

BLACK WARRIOR DISTRICT

The Black Warrior country consists of that section comprising the drainage area of Black Warrior creek. This stream, about ten miles long, heads well back in the high mountains and flows southwesterly through a rugged country to unite with the Middle Fork of the Boise, about nine miles below Atlanta. The district in 1925 was accessible by horse-back only; the former temporary road, built to permit the haulage of some heavy mining machinery to the Over-

look Mine can hardly be distinguished in places from the many sheeptrails which mark the hillsides.

The mines are mainly in the upper or northern portion of the Black Warrior water-shed along a series of quartz veins that strike about N. 70° E. for a zone width of about a half mile. The continuation of these veins beyond the particular section was not traced, though there are some prospects located along their northeasterly extension in Little Queen River basin. The veins crop out prominently across the ridges, notably in the vicinity of the Rico and Overlook properties; some quartz outcrops were seen which measure 15 feet across, but 3 feet is the average width.

The particular part of the country crossed by the veins is exceedingly steep, with quartz fragments abundantly scattered over the neighboring slopes. Some of this float is a fairly good grade of ore that yields gold readily upon mortaring and panning. One viewing the scene from the top of one of the sharp crested ridges can readily visualize nature's milling process in its slow but sure operation. Much waste had to be removed to get at the ore but this is now exposed and is slowly on its way down to the creek below. Here, in a pebble mill, longer by several miles than any built by man, the ore is slowly crushed and the final concentrates delivered far down stream to the placer miner.

There are some gravel banks along the lower stretches of Black Warrior Creek and also several miles of gravel flats. There seems to have been very little placering through this section, apparently because of the lack of grade for dumping. Some work had been started in 1925 near the junction of the West Fork of Black Warrior with the main stream, with results very satisfactory to the owners.

The quartz mines of Black Warrior District are now idle or merely marking time; assessment work was about all that was being done during the summer of 1925. In years past, at several of the mines, some very rich free-milling gold ore was taken out. This was milled locally in arrastres, or small stamp mills. From report, as well as inspection of the few workings now accessible, it seems that most of the high grade free-milling gold ore came from a depth not exceeding 200 feet. In the few accessible workings, located well up towards the summits, sulphide ore was observed at a much higher level than was expected. In other words, the zone of oxidation and enrichment seems to be comparatively shallow. Information gathered from those acquainted with the district bears this out.

There are two possible explanations for the shallow depths to which oxidation extends. One is based upon the comparatively pronounced activity of erosion, and the other upon an apparent lack of regional shearing such as was noted in so many instances in connection with important ore deposits elsewhere. Sufficient work has not been done, however, to warrant any positive statement of general application though these points should be well considered before undertaking any extensive development work.

Some sampling was done often for a special purpose and where not so, it was admittedly of such a limited nature that it would be presumptious to pass judgment, favorable or unfavorable on the mine sampled. For this reason, general conditions as observed have been given, and no attempt has been made to give a detailed description of any property. The value and quantity of the ore developed at the several places must remain a matter for private investigation.

Several specimens of so-called platinum ore were furnished the writer by a few resident claim owners for the purpose of analysis. In no case did the samples furnished show any trace of platinum, not is it believed that any commerical deposits of this metal will be found in the country.

Overlook Property

The Overlook property is the principal quartz mine of the Black Warrior district and the most accessible. The property, consisting of 24 unpatented quartz claims is about eight miles up Black Warrior Creek and about sixteen miles by trail from Atlanta. There is no wagon road into the country though one could be built without heavy expense when conditions warrant it. Some portions of an old road built many years ago, can be traced here and there along the present trail from Atlanta to the mine but it has long since lost its continuity.

The camp and nearby 10-stamp mill are in a well-watered and timbered country along Black Warrior Creek at about 6000 feet elevation. The main workings are to the southwest, well toward the top of Queen's River divide, at an elevation close to 8,000 feet. An aerial tram connects the 700-foot level of the mine with the mill almost 1100 feet further down the steep mountain slope.

In 1925 development was confined to a vein found at mill-level, about 150 feet east of the mill, consisting in all of about 200 feet of tunnel work. About 10 feet of this is drifting on a gouge-filled fissure. The ore exposed carried free gold in seams of iron and manganese oxides and according to report of the superintendent, some of these seams are very rich. No average value of the ore was reported, as no recent mill run had been attempted.

The Overlook vein was first discovered a short distance below the main summit to the southwest of the camp. Some very rich, free-milling gold ore was obtained here in a 50 by 200-foot open cut along the outcrop, having an average depth of about 25 feet. What seemed to be the main portion of the deposits was followed downward and stoped to a reported depth of 30 feet. Subsequently a cross-cut was run from a point 100 feet lower, to permit more economical exploitation. The shoot was found, but at the new level, was much diminished in size. The workings above were inaccessible, so that no estimate can be given of their extent. The vein was drifted a few hundred feet each way from the above mentioned crosscut but the ore found was too low-grade to permit handling. As shown in the main crosscut and in a second crosscut to the northeast the vein is from 25 to 30 feet wide, mostly quartz, and does not constitute ore in a country so remote from transportation. Later, two other adit crosscuts were driven into the vein at depths of 300 feet and 700 feet beneath the original discovery. Drifts were run on the vein from these but the results were exceedingly discouraging so that further work at this place was discontinued.

The present policy of the company is to open another vein at mill level, the croppings of which are easily traced on the surface a short distance above the mill. As the plant is equipped to treat free-milling ore only, it is intended to confine work to the oxidized portion of the particular vein now being opened. At the time visited, this had but recently been cut and drifted a few feet north-easterly into the hill. On panning, the soft decomposed, highly iron-stained, gouge fissure-filling showed a small amount of gold. Later reports from the property are to the effect that with the advancement of the drift a commercial grade of free-milling ore about 3 feet wide has been exposed.

GRAHAM DISTRICT

The section around Graham in the northeast portion of the quadrangle was not visited as the country has been deserted for many years. Former activity centered about Silver Mountain with the camp of Graham as the central point. From report it would appear that the work at Silver Mountain was an ill-advised venture with a rather lavish expenditure of money, which resulted disastrously so far as the main undertaking was concerned. After a short mill run the camp closed down permanently. A few prospectors spend the summer months in that region but, so far, nothing of importance has been reported.

CROOKED RIVER BASIN

The only section to the north of the North Fork of the Boise and within the quadrangle, of any apparent importance from a mining standpoint, is the Crooked River Basin. The stream was worked in early days for placer gold, and the surrounding country, to a limited extent, for lode deposits. Report is to the effect that small, rich pockets of gold ore abound in the hill country. Such work as the early prospectors did, and it is believed that this part of the country has been thoroughly prospected, apparently showed that the ore was confined to shallow depths.

P L A C E R M I N I N G

The principal activity of this type in the country during the summer of 1925 consisted of the dredging operations at Featherville. The only other similar work in progress was the hydraulicking at the Greenwalt property on Black Warrior Creek below Atlanta. The Boise King Placer Co. the S-Bar Placer Co., and F. W. Miller Placer Mines are situated about fifteen miles down the Middle Fork below Atlanta, but were all idle. There are placer diggings at the head of the South Fork (beyond the limits of the area); at Rocky Bar, and in the immediate vicinity of Atlanta. There is apparently little gold, if any, at the head of the Middle Fork above Atlanta probably owing to the fact that such lode deposits as occur there, are largely lead and zinc with some pyrite and ruby silver.

SOUTH PARK DREDGING CO.

The South Park Dredging Co. has been working Feather River for the past few years and has mined the main channel for about a mile and a quarter above its junction with the South Fork of the Boise. The dredge is the conventional type with continuous bucket-line, and was built by the Yuba Construction Co. It is electrically driven, with a daily capacity, under favorable conditions, of about 4,500 cubic yards. The power is supplied by the Idaho Power Co. The maximum demand is reported as close to 390 kilowatts.

The dredge works satisfactorily but when visited had encountered some rather large boulders. These occur on bed rock for a depth of 5 to 10 feet. Overlying these is a medium gravel that is very easily worked. Some of the bed rock is decomposed gravel and easily cleaned; at other places the hard diorite porphyry makes operation a more difficult problem.

No data on production was available. The bullion recovered averages very close to 738 fine in gold and 248 fine in silver. So far, there has been no platinum found in the clean-up.

BLACK WARRIOR PLACERS

Although the quartz mines of Black Warrior Basin have not so far proven very productive the placer mines promise to offset this fact to some extent at least. Erosion has been exceedingly active in this country and to this very largely is attributed the shallow depth of the lode deposits. By the same token, the placers might logically be expected to show an important production.

The operations of the Greenwalt placer had barely got under way when visited in 1925, but the subsequent clean-up made in October has justified the owner's optimism. The gold is coarse and readily amalgamates, and, at the site of the present hydraulicking, the gravel is from fine to medium and all of it goes readily through the sluice boxes.

The present camp is at the junction of West Warrior and Black Warrior creeks. The claims, six in number extend two miles up West Warrior and about three miles up and one mile down Black Warrior Creek. The main course of water is the latter stream which at the camp has a minimum flow of 2000 inches.

For about two miles up Black Warrior and a half mile down stream from the camp, the creek bottom is from 200 feet to 500 feet wide and quite flat for the most part. The depth to bed rock, as shown in a few test pits in the vicinity of the camp, is from 10 to 15 feet. Along the margin of the bottom lands, the hills rise abruptly to considerable heights.

Across the head of Black Warrior and West Warrior creeks, striking N. 40°-70° E. is a system of fissures and quartz veins in which, to shallow depths, high grade gold ore has been found rather abundantly in the past. It is also a country of numerous stringers in the vicinity of the veins, many of which are productive of free gold. This mineralized zone is about one half mile wide and is, judging by the amount of erosion which has taken place, the probable source of the placer gold.

There are other streams above and below Black Warrior heading into the mineral zone mentioned. A limited amount of placering has been done on Queen's River, which heads similarly to the Black Warrior. There are also placer diggings at its junction with the Middle Fork. There are numerous high gravel bars along this latter stream, here and there, for twenty-five miles or more below Atlanta, many of which were worked in the early days. Judging from the amount of work done at many of these, the deposits paid well, although it seems probable, that some of the statements made regarding the value per yard are slightly optimistic.

It is thought, that, instead of originating solely at Atlanta and being fed from the Atlanta lode as has been claimed, these gravel banks along the Middle Fork with their deposits of placer gold also originated from such tributary streams as Black Warrior Creek and Queen's River.

S U M M A R Y

Up to the present time, the only metals of value mined in the Rocky Bar quadrangle have been gold and silver. Molybdenum may be added to the list at a future date, though the transportation problem is a factor entering into the exploitation of these deposits. No deposits of lead, zinc, or copper have as yet been found in sufficient quantity to warrant the recovery of these metals.

Regarding the probable depth of the gold and the silver ores, the writer believes that he is justified in saying that with the exception of the Atlanta lode, there seems to be little evidence that these will persist to a point justifying deep mining. Evidently, the best ore of the country was confined to the zone of oxidation and enrichment. It is believed that recognition of existing conditions will aid the direction of future work in the district and prevent assuming unwarranted risk regarding the depth of the ore until some positive proof is to be had in each particular case.

The shallow depth to which a gold content of workable grade persists in certain sections, notably in the Black Warrior district, is thought to be explained largely by the activity of erosion. Whether or not erosion has been the main cause, may be altogether a matter of individual opinion, though there can remain but little doubt of its activity. If the writer's conclusion is correct, the placer deposits there, while they last, will be of first importance.

The occurrence of the antimonial silver minerals pyrargyrite and stephanite at the Monarch and Minerva mines is an exceptional feature in the ore deposits of the Rocky Bar quadrangle. Similar deposits are found rather abundantly about ten miles to the east and northeast on the opposite slope of the Sawtooth Range in a system of veins that, if direction alone be considered, might well embrace all the deposits of this character on both sides of the range.

At a few places visited, were found small workable deposits of free milling ore which the owners were treating on the ground in small portable mills. The enterprise shown was certainly commendable and a welcome relief from the monotonous custom elsewhere of "dressing" the prospect for sale. There are several small mines and prospects in the country where some similar endeavor to mill the ore would be warranted.

C O N C L U S I O N

In closing this report there shall be no lapse into the prophetic. It is trusted that the reader may be able to picture the future from the account of present and past. Certain sections justify optimism and exploration; others have not been fully proved; still others have yielded the only crop their mines can produce. Imposing production records of a mine, even though absolutely reliable, may or may not furnish the true explanation for its present state of idleness. Such interest as is being shown in certain sections is being turned toward some of the old producers with a view to proving the continuation of the ore at depth. In those areas characterized by surficial enrichment the wiser policy might well be to search for continuations and extensions of formerly productive veins within the oxidized zone. To this end surface trenching is recommended as the least expensive and most effective method of prospecting.

It has been the intention to describe existing geological conditions attending ore deposition in the proved portions of this part of the country, with a view to aiding prospecting and development of the remaining mineralized areas, some of which warrant more work than has been done. With the possible exception of the Atlanta district it is not believed that present developments within the Rocky Bar Quadrangle, warrant any flamboyant optimism nor spectacular claims or promotions.

Careful conservative prospecting and diligent search for new ore bodies or for extensions of old ones is however, certain to meet with a considerable measure of reward, if carried on with a recognition of conditions outlined in the report and under intelligent geologic and engineering direction.