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6

SILVER CITY DISTRICT, IDAHO

by S. Pilcher June 1959

A POSSIBLE ORIGIN OF THE FRACTURES AND FAULTS IN THE AREA ABOUT SILVER CITY, IDAHO

INTRODUCTION

The Silver City mining district is located in the southwest part of the state (fig. 1) and includes the mines at De Lamar, about seven miles to the west, and the mines at Flint, seven miles to the southwest.

The author has attempted to analyze the sets of fractures and faults in this region by considering the fracture patterns, nature of the fractures, and the historical geology of the region. The ideas presented here can be substantiated only by a detailed mapping, both surface and underground, of the fractures and faults. Therefore the ideas presented here can only be regarded as a possible explanation of the origin of some of the fractures in the area.

The geology and descriptions of rocks, veins, and fractures briefly stated here are taken from a paper by Piper and Laney (3).

GEOLOGY

STRATIGRAPHY

Metamorphosed Sediments- These are the oldest rocks in the area. Their exact age, however, has not been determined. They occur as small, scattered outcrops of biotite schist near Flint.

Silver City Granite- This is a granodiorite intrusive which is exposed over an area about 25 miles long and 10 miles wide. It is probably late Cretaceous in age as is the Idaho batholith which is exposed 50 miles northeast of Silver City. A very small body of granodiorite crops out at Flint.

Basalt- Basalt was deposited on the granodiorite when the latter was in a mature state of erosion, and the basalt therefore varies in thickness from place to place. Its maximum known thickness is about 2000 feet. Most of the individual flows are fine-grained and glassy. The age of the basalt is Miocene.

Rhyolite- Rhyolite with a maximum known thickness of 2000 feet was deposited on the basalt. It has a finely crystalline groundmass and contains a small percentage of sanidine, quartz, and plagioclase phenocrysts. The rhyolite is only slightly younger than the basalt and is also Miocene in age.

Dikes- Dacite and diorite porphyry dikes occur at Silver City striking northeast and dipping to the southeast. They do not penetrate the overlying volcanic rocks. Some aplite dikes occur near Flint. These strike north and dip steeply to the east.

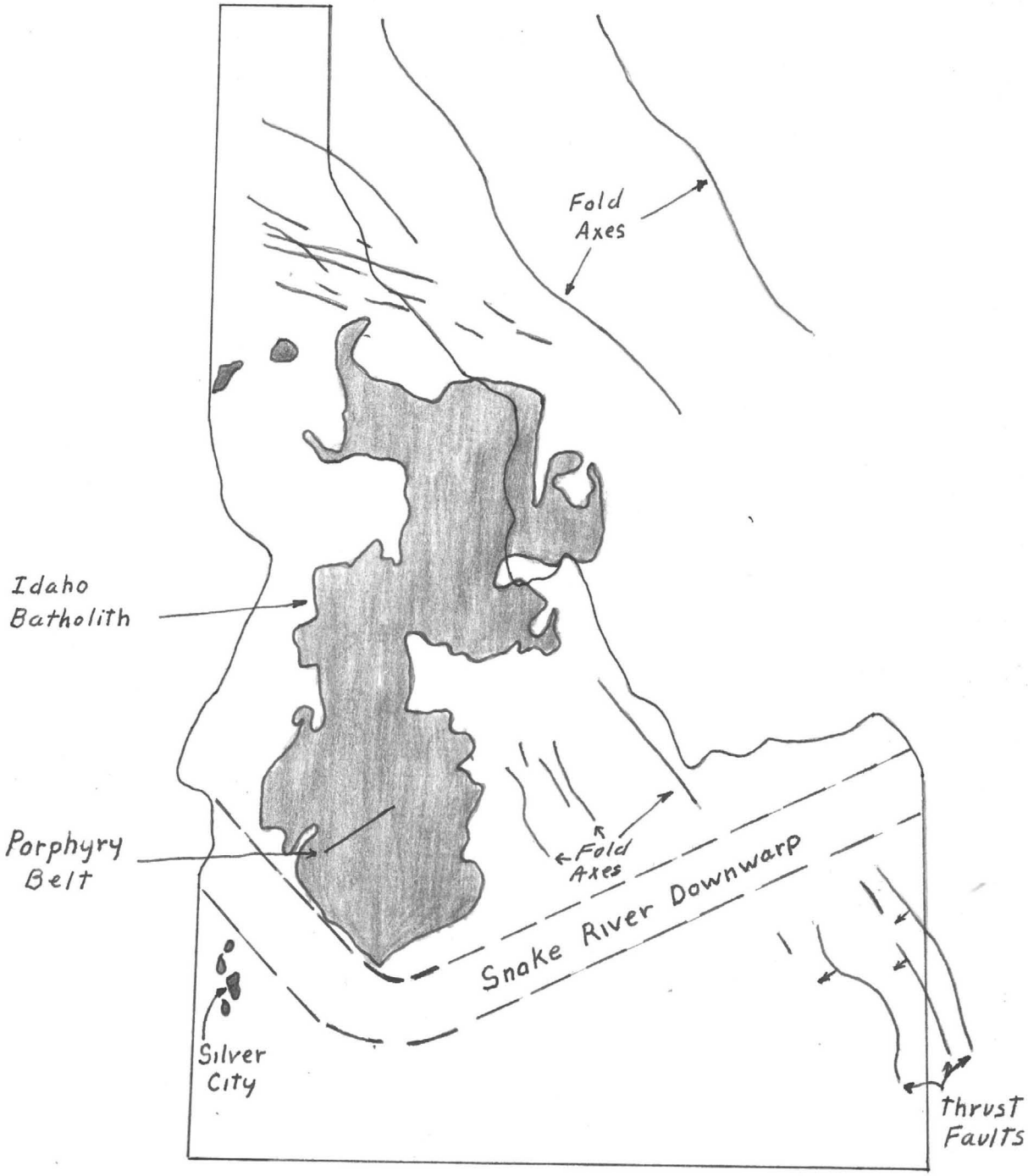
Fold Axes
Idaho Batholith
Porphyry Belt
Fold Axes
Snake River Downwarp
Silver City
Thrust Faults

Fig. 1.

VEINS AND ORES

Most of the veins in the district are fissure veins with two clearly defined walls and with little or no mineralization in the surrounding wall rock. In some of the veins angular fragments of wall rock are cemented by vein matter. The Poorman Vein at Silver City is the only one which has been described as a mineralized shear zone. It is a narrow zone of shattered and mineralized country rock.

The veins are quite persistent in strike and dip. The Black Jack was developed for 6000 feet along its strike and to a depth of 1800 feet without notable decrease in strength. The Oro Fino was worked 4000 feet along its strike and to a depth of 2500 feet.

The ore shoots in the De Lamar Mine and the Black Jack Mine pitch to the south about 45° and are believed by Piper and Laney (3) to be controlled by flat dipping east-west fractures which occur in the volcanic rocks.

The ores consist of a large number of silver sulphides, selenides, sulpharsenides, and sulphantimonides. Quartz and adularia are the common gangue minerals. Piper and Laney (3) state that the texture of the ores indicate that the ore minerals and gangue minerals were deposited together in most of the specimens they studied.

The zones of oxidation and enrichment extend up to depths of only 400 feet. The ores, however, were commercial below the enriched zones. The ore was apparently similar in value and character in all three of the rock types in which the veins occur.

HYDROTHERMAL ALTERATION

Granodiorite- The alteration of the granodiorite surrounding the veins is apparently slight, although no mention of its intensity is given. Propylitic alteration seems to be common, characterized by chlorite and zoisite. Some kaolinite and sericite also occur adjacent to the veins.

Basalt- The alteration of the basalt is also propylitic. The common minerals developed here are chlorite, epidote, and serpentine(?).

Rhyolite- The rhyolite is intensely altered near the veins. This alteration is characterized by seritization and silicification.

FAULT AND FRACTURE SYSTEMS

Two sets of fractures occur only in the granodiorite. They are the following:

1. Fractures striking N 10°E to N 10°W and dipping steeply to the east. There are, however, parallel fractures which vary in dip from 45° east to 65° west.

2. Fractures striking about N 45°E and dipping 30° to 70° southeast. These are represented by the dacite and diorite porphyry dikes near Silver City.

Several sets of fractures occur in both the granodiorite and in the overlying volcanic rocks. They are the following;

1. Fractures striking northwest about 35° and dipping 75° to 90° northeast. These are represented by the northwest striking veins.

2. Fractures striking nearly east-west and dipping about 75° to the south.

3. Fractures striking nearly east-west and dipping 30° to 45° to the south. Some of these appear to be well developed faults which can be traced for several miles. These are especially common around De Lamar. Piper and Laney (3) believe these to be post mineral. There is apparently another group with a similar attitude to the above but with small if any displacement. These are the fractures which are believed to have controlled the ore shoots in the De Lamar and Black Jack Mines. It is not known if these fractures with little displacement also occur in the granodiorite.

Earlier Fractures

It is evident that the earliest fractures to form were those that occur only in the granodiorite. Information is lacking as to definite relationships between these fractures. Also, it is impossible to say whether or not all these fractures are related to the same deforming force or forces, and if so what the relationship is.

A possible answer may be derived from a consideration of the history of the area during the Laramide Revolution in the Cretaceous. The sediments deposited in the Rocky Mountain Geosyncline just to the east were being highly folded and thrusted. The trend of these folds and thrust faults strike northwest (fig 1) and indicate a strong compressive force acting from the southwest. This force was active up into the lower Tertiary. A compressive force from the southwest would tend to form tension fractures parallel to it, and these may be represented by those fractures striking N 45°E and now filled with the dacite and diorite porphyry dikes near Silver City. The north striking fractures are in a proper position to this compressive force to be shears.

If it is true that all the north-striking and north-east striking fractures were produced by this compressive force from the southwest, and if the former are shears and the latter tension fractures, then it would seem that the compressive force remained constant in direction at least while the tension fractures were forming since they seem to be quite regular in strike. However, there have been variations during the deformation as is indicated by the marked variation in the dip of both the north-striking fractures and the north-east striking fractures, and possibly also by the variation (20°) in the strike of the north-striking fractures. These variations in dip may be accounted for by variations in the inclination of the axis of elongation, or by variations in the inclination of both the axis of elongation and the axis of shortening during the deformation.

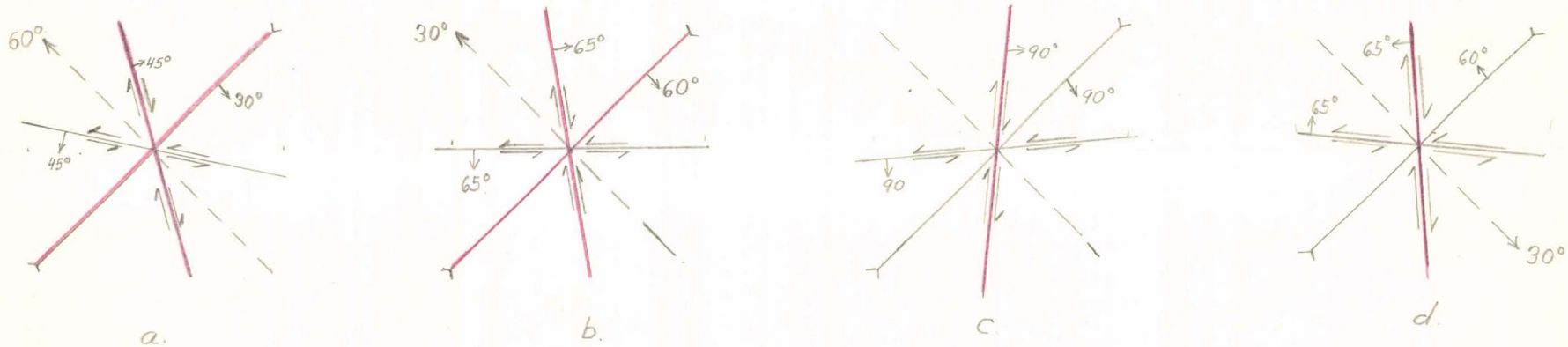

Fig 2

The fractures fit a situation in which there has been only a change in the inclination of the axis of elongation, the compressive force being horizontal and remaining constant in direction. It may be possible, as was noted above, to account for the fractures by variations in the inclination of both axes, however, in an analysis of this type where none of the ideas presented are substantiated by field evidence it seems best to consider the least complex situation which would give rise to the fractures present. Also, because the compressive force from the southwest was apparently constant in direction for at least part of the time, it does not seem unreasonable to assume that it was also constant in "inclination".

Figure 2 shows by means of charts the different fractures possible by some variation in the dip of the axis of elongation. In (a) the axis is inclined 60° to the northwest causing the plane of maximum stress to be inclined 30° southeast. The north-striking shear dips about 45° east. This could represent the situation at the time of formation of the most flatly dipping tension fractures and the flatter of the east-dipping, north-striking fractures. From (a) to (b) the axis becomes less inclined with the result that both the tension fractures and the east-dipping, north-striking shears become steeper in dip. A point between (b) and (c) where the plane of maximum stress dips about 70° would represent the last formed tension fractures. From here on the north-striking shears would become dominant. These are represented by the many north-striking, steeply dipping fractures. At (c) the axis is horizotal and the shears would be vertical. From (c) to (d) the axis of elongation becomes inclined to the southeast, and the shears would at first dip steeply to the west and then gradually decrease in dip. The weak, last stages of this deformation would be represented by the few north-striking fractures dipping about 65° west.

No definite cause can be given for the rotation of this axis. A possible explanation would be the existence of a "negative zone" or a zone of weakness at depth to the northwest, to which the rock tended to "give" or flow in the beginning stages of deformation. During the deformation the flow or "give" in this direction gradually ceased and later became active to the southeast.

It is also possible that this change of dip of the axis of elongation occurred in the opposite manner, that is from (d) to (a). However, it seems likely that the tension fractures formed in the earlier stages of deformation in which case (a) to (d) would be the proper sequence.

It must be pointed out that the apparent variations in dip of the earlier fractures may be the result of several different deforming forces active at different times, in which case there is no relationship between the fractures. The variation in dip of the northeast-striking fractures as shown by the diorite and dacite dikes may be the result of a rotation of blocks containing these dikes along later faults, in which case the idea of a change in dip of the axis of elongation is entirely wrong.

Later Fractures

Of the later fractures the dominant set strikes about N 35° W and 75° to 90° usually to the east.

These fractures parallel the Snake River downwarp which is just a few miles to the northeast (fig. 1). There is some question as to the

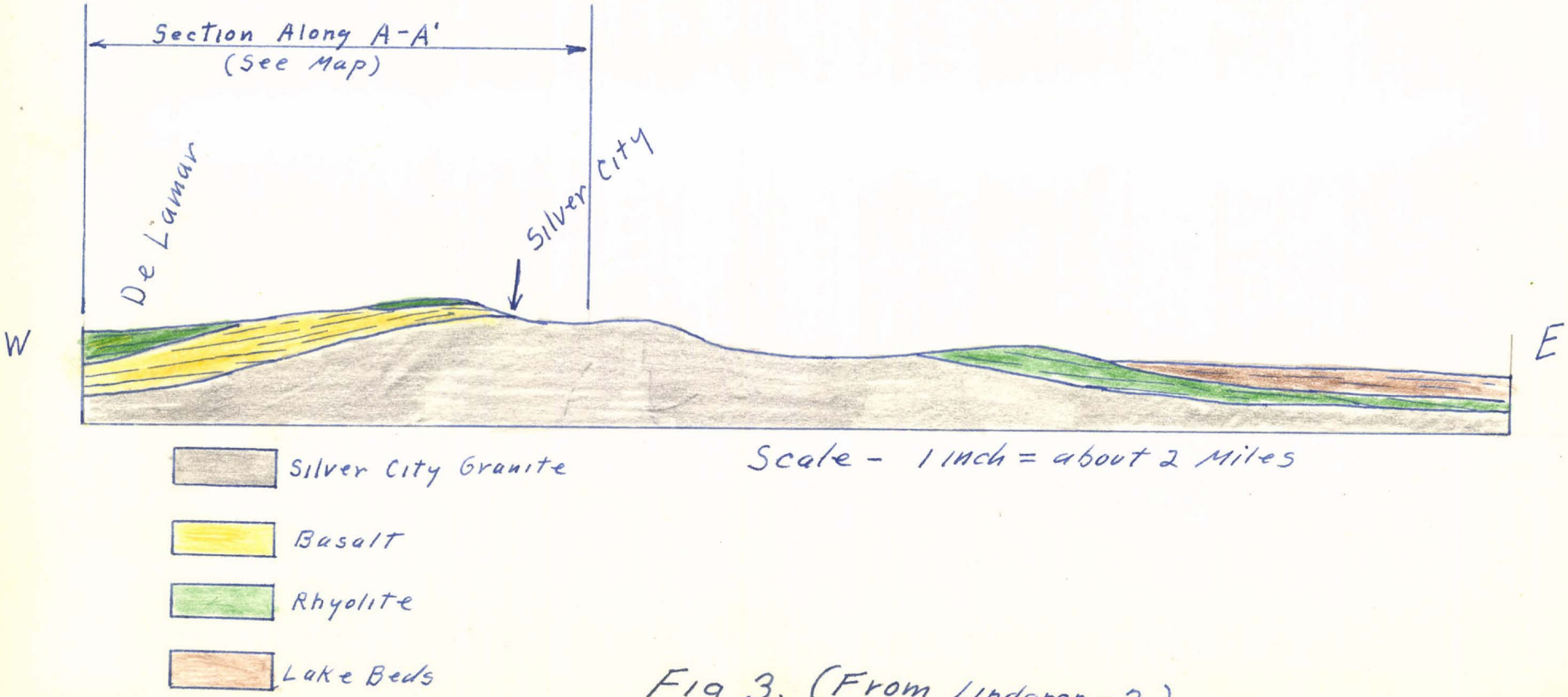

Fig 3. (From Lindgren-3)

origin of this downwarp but as Kirkham (1) pointed out the volcanic rocks on either side of it dip towards the axis, indicating that the downwarp originated as a fold. It may have later become fault bounded. Kirkham believed that this warping was caused by vertical forces only, and he gives for evidence of this the fact that the downwarp makes a sharp bend and a compressive force acting normal to the axis of one part of the fold could not be the cause of the folding in the other part and therefore the warping is not likely the result of compressive forces. This warping occurred during the Miocene after the extrusion of the basalt and rhyolite any may represent crustal movement in response to the removal of this material. Kirkham also states that the areas on either side of the downwarp are gentle upwarps or anticlines. A cross section by Lindgren (2) shows that Silver City lies near the crest of one of these broad anticlines (Fig 3) which strikes northwest parallel to the downwarp. If this is the true situation then one would expect that the northwest striking fractures are tension fractures produced by the arching of the rock. When rock is domed or arched it is stretched, and this stretching produces tension fractures. If this arching is caused by vertical forces,continued stretching results in the formation of grabens and synthetic faults. These features seem to be indicated by the manner in which the dikes near Silver City have been offset along these northwest-striking fractures. There are small grabens between some of the fractures and the varied direction of offset of the dikes between others indicates synthetic rather than antithetic faulting.

The veins that fill these fractures have the features of filled tension fractures. They have sharp, well-defined walls with little or no mineralization in the surrounding wall rock. The veins contain angular breccia fragments of wall rock, No ribbon structures are present.

The mineralization apparently occurred during this period when the northwest-striking fractures were opened as tension fractures. The stretching must have opened up some of the earlier north-striking fractures at this time also, permitting the ore-bearing solution to penetrate a number of them.

The long fault on the western edge of the Flint district may belong to this group of northwest-striking tension fractures. This fault dips northeast only 45° however. Since this area is on the western flank of this fold at some distance from its axis, tension fissures if formed here would be expected to be flatter in dip than those occurring near the axis of the fold.

An interesting feature is that the dacite and diorite dikes are not offset along the northwest-striking fractures where the latter are mineralized. Possibly the fractures were cemented tight by vein matter by the time most of grabens and synthetic faults were formed.

No satisfactory explanation could be determined for the flat dipping and steeply dipping east-west faults and fractures. If more information on these fractures was available possibly ideas on their origin could be developed. Figure 2 (a and b) indicate that there are possible shears which could have developed in this sequence which correspond in strike and dip to the above mentioned two sets of fractures. It may be that these shears were developed earlier in the granodiorite and at a later time became active and penetrated the overlying volcanic rock.

Summary and Conclusions

The earlier fractures which occur in the granodiorite are possibly the result of a compressive force acting from the southwest which produced tension fractures striking northeast and shears striking north.

After the volcanic rocks were deposited, the area experienced a broad uplift, trending northwest and probably caused by vertical forces. The crest of this arch passes through Silver City, and it is believed that the northwest-striking fractures are tension fractures produced by this doming and stretching of the rock. At the time of mineralization some of the north-striking fractures were apparently also opened by this stretching.

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SILVER CITY (DELAMAR) IDAHO New class ?

Light-colored qtz-rich rhyolite. Relatively local. Both Miocene
Basalt, coarse-grained, alied to diabase.

Structure-Broad NW uplift; crest passes thru Silver City (E of Delamar). Many veins are longitudinal tension fissures or synethetic faults.)

At Silver City a rhyolite dike paralle.s the NNE vein set. In W Silver City area Black Jack vein (NNW) in the underlying granite follows a narrow basalt dike, feeder for the basalt flows.

Gangue qtz., adularia. Silver sulfides, selenides, sufarsenides, sulfantimonides
Silver City veins in granite, basalt, rhyolite; elamar, confined to rhyo;ite.
Delamar, early calcite, barite, rep aced by gold-qtz. Ratio 1:10 to 1:20
Mi or f uorite in Black Jack mine, als valencianite.
Black Jack vein in rhyolitew der than in ranite.

In the granite, rhyolite dike occurs at intervals in HW of basalt dike. May not have been recognized up in the rhyolite.

This is one district where ore solutions followed extrusive feeder.

BOHEMIA Class?

~~OLYMPIA,~~ OREGON

General on Mine al Belt: Blacl lavas along W margin of mange. Labroadorite andesite, IB tuffs, cgls; many rhyo flows, some basalt. Barren of ore, mostly. In ore belt: gray andesite, E of black lavas; bordered on E by overlapping hypersthene andesie and basalt of High Cascades.

Gray andesite: mainly also labradorite andesite; augite. Dacite; rhyolite in many places, bu small % of otal mass. Fragmental rocks associated with the flows, mainly volcanic breccias. Individual flows can be traced for short disances only; derived from many ocal vents. Gray andesite belt conta ns most of mineralized districts.

Small mases of diorite inrusives mainly restriced to a narrow belt that coincides with the belt of mineralized areas. Max. size 1.5 x 2.5 mi. All porphyritic, but in larger bbodies % of phenos is so great as to give a grani oid appearance. In some bodies crystals of GM are so large that rock is fine-granular and nearly even-grained.

Olypia District.- Bohemia
Labradorite andesite flows; IB tuffs. volc. breccias
Rhyolite flows Lenticular
Agglomerates, volc. braccias

Stock and large dikes are GD or GD porphyry; sma;; plugs and small dikes dacite porphyry.

Structure: On E limb of a large anticline. Structure of the E limb complex; on N, beds form a broad bulge convex o NE; stock in this bulge. Several veins parallel con ours on N side of bulge; to S, E limb fairly sraght (trend W of N) several veins are anti hethetic or syntheric faults or tension breaks parallel to limb.

In the central part f the district, between the N bulge and the simple li b on the S, is a sharp jog to the NW of the N-S contours on the S; vein s and diorite or dacite porphy dikes parallel the jog. Most productive area.

Summary-uplif of E flank of main anticline was irregular, due to differential rise of blocks in a fault mosaic in the basement. Evidence exists for a buried E-W crustal flaw, and a NE faul zone (+ line of plugs).

Due to close associatio of eins with dacite dikes, a genetic assoxiation is suggested. (Pach ca veins, rhyodacite).

Ga gue drusy qtz; grecciated, altered, partly rep, aced CR locally containing ZnS, dominant; PbS, ccpy, py. s.t. tetrahedrite. Stibnite, l mine. Calcite. Ratio 1:0.36 Most ore mined oxidized. Ratio 1:0.6? This is oxidized ore; original ratio according to authors 1:7.

THE GOLD AND SILVER VEINS OF SILVER CITY, DE LAMAR AND OTHER MINING DISTRICTS IN IDAHO.

Waldemar Lindgren, 20th AR, USGS, 1898-9,Pt.III,75-256.

West-central Idaho. Boise is just SW of the center of the area,and it includes the Salmon River on the N, Salmon and Hailey on the E, the Snake River and Silver City on the S, and the Oregon line on the W. See map.

General Geology of West Central Idaho. The Idaho batholith shows strong contact matamorphism where in contact with Paleozoic rocks, hence is post-Paleozoic and an intrusive similar to the granite batholiths of Calif. The Columbia lava plateau, N of Weiser and W of the Snake River, consists of a great number of basalt flows,aggregating 2000' plus. Early Miocene.

Granite. Uniform composition and texture. Gray, mod. coarse; orthoclase (often large crystals), plagioclase, qtz., biotite,s.t. somes muscovite. Grain averages 3 mm. Qtz.is gray. Plagioclase exceeds orthoclse in amount,and is acidic. Structure is normal granitic. Rock is really intermediate between granodiorite and quartz monzonite: lime is too low for granodiorite,and it has no hornblende; on the other hand, alkali and soda-lime feldspars are not equal in amount,so it is not typical quartz monzonite.

There are some local variations. Near Willow Creek, Boise Co., the rock contains hornblende and approaches granodiorite; other similar localities. Gabbroitic and dioritic modifications occur near the contact west of Hailey. The granite of Silver City, Owyhee Co., and Warren, Idaho Co.,has much reddish of pink orthoclase and muscovite;more acidic than the normal type.

Granite nearly always massive. But Eldridge (16th AR USGS, Pt.II, p.225) says that typical gneiss occurs in some spurs of the Sawtooth Range,esp. about the drainage system of upper Redfish Lake. Joint planes common,and may strike in any direction,but the commonest course is N70E,planes dipping N or S at 45-80. This is parallel to that of a large number of veins.

Differentiate dikes in the granite range from acid pegmatites to minettes & etc. Granite-porphyry dikes strike mainly N-S or NNW;many others have an E-W direction. The narrow lamprophyre dikes always strike E-W.

Granite porphyry is common everywhere. Near Boise the dikes strike NNW,at Silver City (War Eagle Mt.) NNE. Rock is light-colored, with porphyritic qtz. in a microcrystalline GM. Allied quartz syenite porphyry; these have large porphyritic orthoclase crystals in a groundmass of the same material, often in micropegmatitic or microspherulitic intergrowth with quartz.

Diorite porphyry and quartz-diorite-porphyry dikes are also common. These usually show large plagioclase crystals, hornblende and s.t. qtz.in a relatively coarse GM of unstriated feldspars, often in micropoikilitic intergrowth with qtz. Dike system of this series: extends from Rock Creek,Boise Co., ENE to Quartzburg. These dikes s.t. form small irregular masses in the granite.

The lamprophyry dikes are fine-grained synenites and diorites rich in FMs. Widespread but seldom over 2' wide; strike almost always E-W;often followed by qtz. veins in FW or HW. Minettes in Golden Star vein near Boise, Sub Rosa and Iron Dollar veins in the Idaho Basin. Vogesite in the Scarpion vein near Boise. Quartz veins always later than the dikes.

Mineral Deposits.

The deposits of the batholith area are fissure veins,containing gold, silve or both in a quartz gangue. The adjoining sedimentary areas carry either veins or irregular contact deposits, generally containing silver, lead, zinc and copper. The Tertiary volcanics contain in places peculiar gold-silver veins. A relation of the type of deposits to the country rock certainly exists in a broad way.

The central Idaho area must have been a solid, competent block, probably since the earlier Tertiary, because any part of the crust cut by faults and subjected to various displacements could not have yielded evidence of such a uniform resistance to pressure as these veins indicate.

South of the Snake River begins the Great Basin structure. Many N*½S fx faults,and some Basin Ranges have been produced by sinking and tilting of these small crust blocks. The uniform E-W veins system,as would be expected, are not found here. It is natural that the strike of the Owyhee veins should be N-S, parallel to the fractures thought to have outlined the Owyhee range.

Two vein-forming periods. Most of the veins north of the Snake River are pre-Miocene and post-Carboniferous, probably Cretaceous or Eocene. Considerable amounts of Placer gold are found in gravels in Neocene lake beds. Miocene basalts, andesites and rhyolites occur at Willow Creek and Wood River and cover the vein croppings.

The second period is postMiocene. Some veins of this period probably occur north of the great valley (Custer beeins, possibly),but the best evidence is from the Owyhee region,where the gold-silver veins cut the granite, and the Miocene rhyolite and basalt.

Classification of the Veins.

A Pre-Miocene Veins in Granite.

Gangue quartz,rarely calcite in part. Open fissure filling. Adjoining rock changed to sericite-quartz-calcite aggregates,pyritized.

1. Silver Veins.

(a) Banner Type. Strong,well-defined,with small amounts of pyrargyrite, argentite,blende,tetrahedrite,rare galena,very little if any gold. Banner,Silver King and Vienna, Flint.

(b) Democrat Type. Fissure veins,galena and blende,with some pyrite,arsenop tetrahedrite, in small amounts of siderite gangue. Democrat mine, Hailey.Rare.

2. Gold-Silver Veins.

Atlanta Type. Strong well-defined qtz veins,pyrargyrite, stephanite,argentite,native Au and Ag, py, s.t.a little galena and blende. Common ration Au:Ag 1:25. In metasomatic granite. Atlanta (J.E.Clayton,TAIME V,471,1876-7) and Rocky Bar.

3. Gold Veins.

(a) Florence Type. Well-defined qtz veins,with native gold and a small % sulphides;very little galena and py. Au:Ag::1:2.Florence.

(b) Gold Hill Type (18th ARUSGS, pt.III,691). Well-defined simple or composite quartz veins,with free Au and notable sulphides:py,arsenop.,gal-, blende; occ. stibnite. Sulphs. 4-8% of the ore,and generally rich(2.5 oz.Au.,5 oz.Ag/t) Gold Hill, Boise Co.,Neal District, Elmore Co. Warren gold veins between 3a and 3b.

(c) Willow Creek Type.(18th ARUSGS,pt.III,712). Well-defined,simple, narrow veins,with abundant sulphides:py,arsenop.,galena blende,with relatively small amount of qtz and calcite gangue;rare ccpy. CR well sericitized and pyritized, with trace of Au. No free gold. Au:Ag ratio often 1:1. Checkmate,Goodfriday etc. veins, Willow Creek dist.

(d) Croesus Type. Veins in granite or diorite;qtz-cal.gangue;abundant ccpy pyrrhotite,py,with minor arsenop,galena, blende. First class ore is fissure filling;second class ore replaced CR. Au:Ag::1:6. Less than half gold free-milling. Only near Hailey,in Camas No.2,Tip Top,Croesus etc. mines. Resembles Rossland, B.C.,with this difference: Rossland ore formed by metasomatic replacement of the diorite along the fissures;little if any free gold;instead of sericite,abundant brown mica, with secondary calcite and qtz.

B. Pre-Miocene Veins in Granite Porphyry and Diorite Porphyry.

These rocks are intrusive dikes or irregular bodies in granite. Veins in these usually characterized by a great shattering of the rock;the minute seams are filled with rich ore,separated by metasomatically altered rock. Pioneer and Newburg mines, Quartzburg,Idaho Basin.

C. Pre-Miocene Veins in Limestone,Quartzite, Shale.

Wood River Type. Fissure veins with abundant galena and some blende,tetrahedrite, py, arsenop.,in gangue of calcite,siderite, or intermediate mixtures Ca, Mg.,Fe carbonates. Some cavity filling,but much of ore by CR replacement. Per ton concentrated ore, 50% Pb, 100 oz.Ag. Au never above 0.5 oz./ton. Common near Hailey and Ketchum, Wood River;probably also near Bay Horse,Custer Co.,Ruth burg, Washington Co.

D. Post-Miocene Veins in Granite, Rhyolite or Basalt.

(a) Black Jack-Trade Dollar Type. Normal fissure veins-fissure filling;some low grade replacement OBs in rhyolite. Ore minerals minor argentite and ccpy. Gangue qtz. and valencianite. Au:ag::1:120. Black Jack,Trade Dollar mines,Owyhee Co

(b) De Lamar Type.Filled fissures in rhy.Few or no sulphs visible.Occ.py, argentite, pyrargyrite. Gangue lamellar qtz. Au:Ag::1:10.

Contact Deposits.

Silver-Lead. South Mt. Type.Arg-gal.,blende in contact meta calcareous strata,with gangue of cal.,qtz.,actinolite, ilvaite.S.Mt.,prob.Sheep Mt.,Custer Co.

Copper. 7 Devils Type.Bornite,with up to 20 oz.Ag,very little Au,in gangue of garnet, epidote,specularite,calcite qtz.,as irreg.bunches on ls-diorite contact. 7 Devils district;prob. Copper Camp in Cuddy Mts.,Wash.Co.

THE VEINS OF SILVER CITY AND DELAMAR.

(pp.107-189).

IN SW Idaho, Owyhee Range,on S side of Snake River, near Oregon line. Range has a granite core. In pre-Miocene times it was narrow but abrupt,with same N-S trend as today, 40 x 15 mi. It was flooded in Miocene times by rhyolite and basalt flows (Columbia River lavas).

The oldest flow,basalt,often coarse grained, allied to diabase. It buried W slope of range to known depth of 2000'. Rhyolite flow followed, light-colored, qtz rich. It covered basalt on the west slope to 1000',and the granite of the east slope by as much or more. The source vents for these flows were near the summit of the range. Probably during the Pliocene, new basalt broke thru the flanks and summit. Fissuring followed,many fissures following old dike lines, then mineralization.

The granite (an outlier of the Idaho batholith) is a normal muscovite granite, average grain size 4 mm. ends toward the porphyritic,some feldspars 3 cm. Biotite. Weathers easily. Locally it is medium-grained diorite,but this may be an intrusion. The granite is traversed by a 150' belt of qtz-bi schist and quartzite-a roof pendant.

De Lamar Mine.

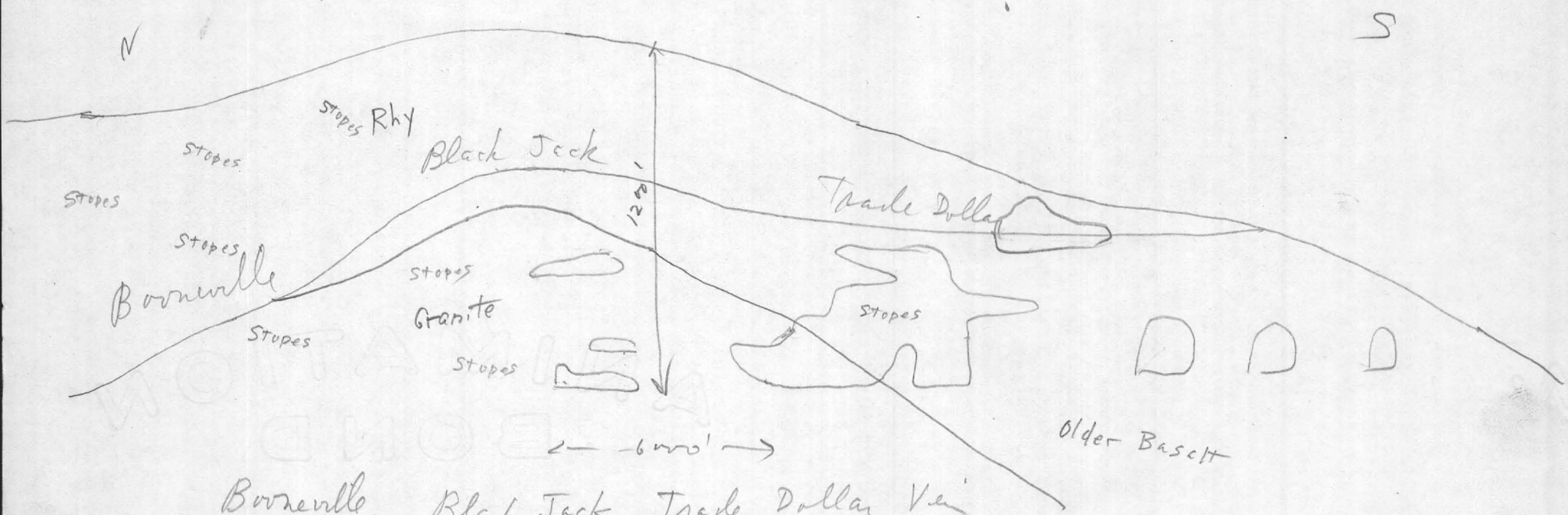
Production, 1891-1898 149,211 Oz.Au.;2,544,475 oz.Ag. Au:Ag::1:20.
The country rock is rhyolite,showing widespread alteration-pyrite,marcasite sericite. Silicified near veins. Streaks of rhyolite in or near the veins show kaolin mixed with sericite to form a soft yellowish clayey mass often very rich in gold and silver.

Iron Dike. Tabular mass of stiff, compact, green-gray clay,pyritized. Dips S or SE, with many rolls and curves. The veins abut on it. Very rich silver ores along the plane of contact-"silver stopes". The "dike" is a fault, consisting of intensely altered and crushed rhyolite. Concentrates from the pyrite in it give $2-4/ton in Au and Ag.

Outcrops. Croppings are very indefinite,not traceable for any distance. Rock and qtz have crumbled,covering surface with fragments. But no rich ore came from the outcrops. (p.125).

Veins. Ave.strike N35W (10-45).Ave.dip 38SW (25-55). The veins appear to steepen with depth. There are 10,20-80' apart;many however are offshoots from trunk veins such as the Hamilton and the 77.Widths 1-6',ave.3-4'. The walls are indistinct, especially where the veins are thick, and consist of alternating streaks of quartz and altered rhyolite. But in many places the veins are excellently defined,sharply separating the qtz from the rhy. The qtz. often contains angular CR inclusions. Where the veins abut against the Iron Dike the usually bend E.

Ore Shoots. Shoots have extended from near the surface to the 10th level (550' below the OC). The trended SE at gentle dips along the plane of the vein, and roughly following the dip of the Iron Dike.No shoot is more than a few hundred feet from this dike. Shoots generally about 300' long,1-30' thick(usually 1-6).



Boonville, Black Jack, Trade Dollar Vein

a-rich ore.
b-poor " ($18-20/t ,mainly Au
c-barren quartz.

Plan of Ore Distribution in Shoots.

Below the 10th level a barren zone has been encountered,now being explored to the 12th level down the dip of the ore body."The veins continue of good size, and apparently of the same general character as in the parts nearer the surface, but no considerable ore shoots have been developed. All the quartz contains some value;for instance, $1.20 in gold and 40 cents in silver per ton on the twelfth level, and occasionally higher values are met with." (p.127).

Ore. The gangue is all white quartz, with a peculiar laminated structure. The quartz is light, easily crushed, and made up of laminae crossing one another in all directions. (Septa). Both sides of each thin central plate are covered with a mass of minute quartz crystals. The quartz has replaced calcite or barite Metallic ore minerals are rarely visible;the sulphides, mainly pyrite and rich silver sulphides,make up less than 0.75% of the vein. Free gold occurs,very finely divided. The altered clayey rhyolite is apt to carry rich silver but rarely much gold. The ore in the silver stopes consists of ceragyrite, argentite, pyrargyrite.

Silver Stopes. Wherever the Wilson, Hamilton or 77 vein comes in contact with the overlying Iron Dike they are especially rich, and bunches of rich ore also occur in the seoarating country rock. In the crevices immediately adjacent to the Iron Dike are found nuggets of argentite and ruby silver embedded in clay,and small streaks of soft whitish kaolin strongly impregnated with argentite,also sometimes rich in gold. The Wilson and Hamilton veins carry no rich silver ore except along the dike.

Florida Mountain Veins.

Florida Mt. traversed by a number of long parallel veins, principally silver-bearing. Main vein is the Black Jack-Trade Dollar. Described from N to S.

Booneville Mine. Vein strikes NNW to N,dips 77W to 90 to steep E. 4-12' wide,carries abundant but low-grade ore. The country rock is light-gray rhyolite often banded,a normal felsophyre. Near the vein it is more or less pyritized and softened. No good croppings exceot in trenches,though surface debris along course of vein shows much sift aletered rhy and fragments of ferruginous comb qtz.

Underground the vein consists of altered and crushed rhyolite filled with seams and stringers of granular quartz and velencianite. The walls are not always well defined. (p.135). The ore consists of finely divided argentite, s.t. visible as dark spots in the white quartz;there is some gold. Sparse py cubes in the qtz. Occ. a little lamallar qtz,the septa covered with small valencianite crystals.

Black Jack Mine. Important producer. Au:Ag::1:80. Lower part of vein in granite;in that rock, but never in the rhy.,the vein persistently follows a black diabasic basalt dike,a few ft.wide;a feeder for the older basalt flow shown in the Vert.Long.Prof. This is why the vein does not follow the dike in the rhy. The upper part of the mine is in felsophyric rhy. The granite is only slightly altered near the vein:rarely it carries py and sericite. The basalt dike is often softened by pressure and partly converted to clay. It seldom

carries much pyrite,but is nearly always chlorite and epidote. The basalt occurring as surface flow near the vein is much altered, grayish green,fine-grained and contains much scattered pyrite. The rhyolite is somewhat altered near the vein throughout the mine, containing infiltrated quartz and often a little pyrite. In places the alterat ion is greater, the rhyolite becoming filled with fine chloritic material, doubtless derived from the underlying basalt. The dikes of rhyolite in granite are apparently fresh,though really far advanced in silicification.

Vein strikes N15W,in S part of mine N30W.Ave.dip 80W,dip often 90. Little or no croppings;veins traced by cuts, tunnels. Usually but little qtz.,rock crumbling soon masks vein. Where shown in trenches,vein shows only small streaks of qtz and valencianite with comb structure,stained and encrusted by limonite and hematite and embedded in soft brownish hematite,often with masses of kaolin-like clay.

Underground, the gangue is quartz and valencianite ;granular normal vein quartz, perhaps more translucent than usual;often as crusts of projecting crystals. The valencianite forms granular masses of milky white color mixed with quartz, or crusts showing characteristic wedge-shaped crystals. The valencianite occurs all through the vein,in rhyolite and basalt as well as in granite, often equals or exceeds qtz. in amount. Minor violet fluorite occurs; calcite is absent.

The ore minerals consist of finely divided argentite and ccpy and a little galena, also in small grains. Little or no py. Argentite also as thin sheets. Rare native gold. Ave.value,1893-6: Au,oz/t 0.55 Ag.,40 oz/t. Gold thought to be in the ccpy. Concentrates run not over 1 $, but $2500/t.

Note: This would seem to indicate the precious metals came in with the sulphides. How could they select such minute grains by any process of post-sulphide, intramineral fracturing?

Vein Structure. Rhyolite. Here the vein is wider than in the granite:4'; but values in yhe rhyolite tend to be spotty. The vein consists of altered rhyolite traversed by many stringers traversed by qtz. and valencianite,very different from the regular character of the same vein in ganite. The ore however is entirely similar to that in the granite,and as a whole the same values prevail. Pay chiefly in the stringers.

Granite. Here the vein structure is intimately connected with the basalt dike. Width of the dike,which is vertical or dips steeply W,is 2"-4',ave.2'. Often soft and clayey, its walls are often sharp,and separated from granite or vein by thin seams of clay. The vein may be on the FW or HW of the dike, or on both. Ave. wodth of vein 10". A sharp clay gouge contact separates the vein from the dike,but the gangue is often frozen to the granite. Especially where the granite is pegmatitic it is much broken near the vein and has nests and veinlets of qtz and valencianite. Where the dike is soft and clayey, ore is generally found.

Note: The tendency for fissures to reopen in granite along dikes differing in texture radically from the granite has been pointed out in Geologic Parallels: Hog Mt. and Paracale.

In the Black Jack mine,a rhyolite dikes occurs intermittently on the HW of the basalt dike. Inclusions of granite occur both in the quartz and in the basalt dike, but only one case was seen of an inclusion of basalt in the quartz

Trade Dollar Mine: Here the vein has more silver, less gold than in the Black Jack. 0.25 oz.Au/t, 40 oz.Ag/t. The sulphides are finely distributed. Granite fragments in the vein are often coated with a layer of rich sulphides, then with comb quartz.

In the basalt, the vein is usually well-defined but narrow, with good walls and frequent comb structure. In the rhyolite the vein is also well-defined and with good walls, and usually wider than in the basalt. But the vein is best in the granite,followed gy the faithful 2' basalt dike,usually crushed and clayey.

The formational contacts cut by the vein give a good chance for obtaining the vein-fault displacement. Striae (uncommon) are usually horizontal. (p.144), The granite-basalt contact in the Blaine tunnel has been displaced horizontally 125', west side north. In the Black Jack mine the throw is less than 100', same sense. Lindgren concludes that the HW has moved (relative to the FW) 40' down and to the N,at 40°-60° from the horizontal.

War Eagle Mt. Veins.

Important producers in the old days.

The vein crossing the Quartz No.2 claim (see map), vertial to 75° E,carried a considerable OB near the S end of that claim. Vein seems to be "formal" in the granite,up to 3' qtz.,in part massive,in part with excellent comb structure. In the granite porphyry dike shown,however,the rock is extensively brecciated by qtz,and many small veinlets follow jointing in the porphyry;jointing strikes N40W and dips steeply north or south.

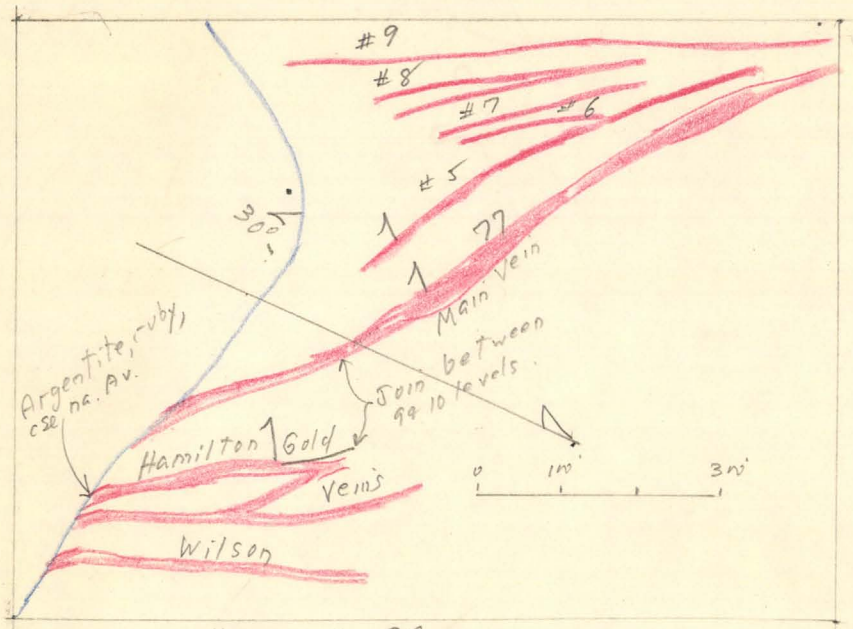
The Oro Fino vein produced $2,000,000. 80° E,several veins,in granite. Surface stopes. Vein 1-5',surface stopes average 2'. Dump specimens show vein follows basaltic dike, completely shattered in places by quartz seams. Much of qtz lamellar,pseudomorphic after barite. Ore had free gold and arg. Au:Ag::1:4. $17-28/t.

The Ida Elmore produced $1,300,000 plus. Shaft on dip 1150',but ore did not extend that far,probably less than 960'. OB apparently of Tertiary type: longer strike than dip extent. Vein said to be 3'. 1885 1:4 gold-silver ratio. $40/t.

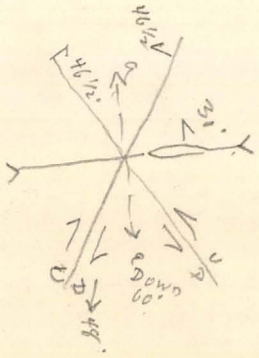
Golden Chariot produced about $2,000,000. High grade. Depth 1000' (ore)

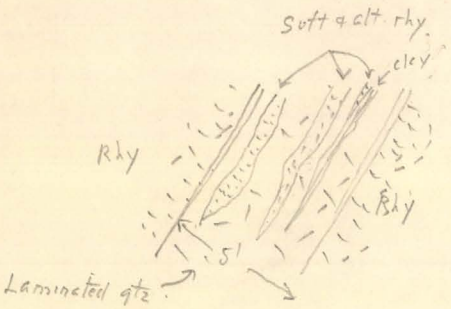
Vertical range of ore on Mahogany vein 1000' plus (outcropped).

Cumberland dips 60E;granite as usual is almost fresh close up to the vein. Vein sharply defined,usually frozen to the walls,1-12";laminated qtz. Crusts of rich ore on FW and around included granite fragments-slivers parallel to vein walls. Qtz has argentite,Au na.,ZnS-/ High grade.Ratio 1:4 to 1:50.



#4 Level Elev.

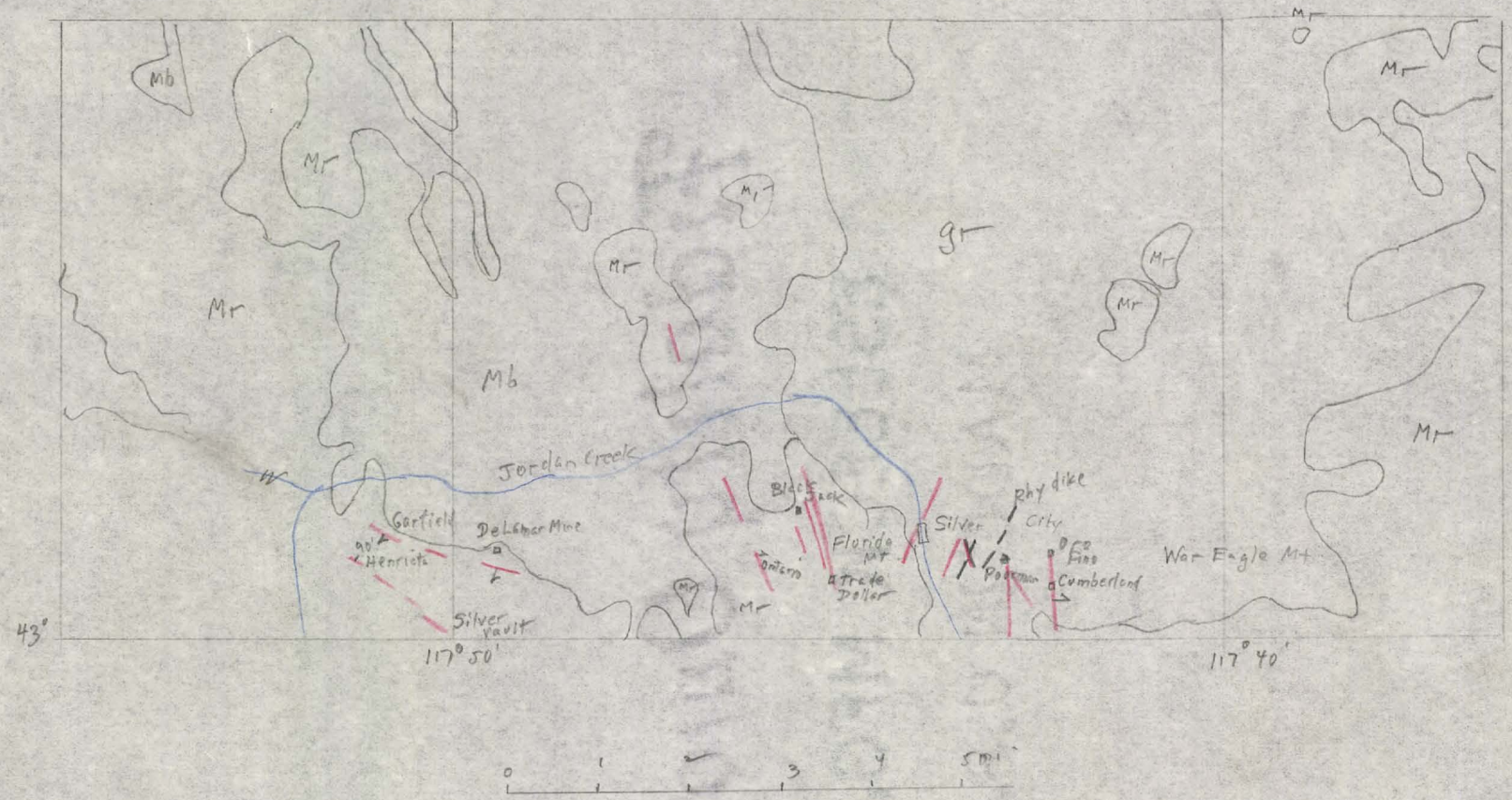




Hamilton Vein, 6th Lev., De Lamar Mine.

Poorman Vein System. Imp. early producer. $3,000,000.

Undiff. gneiss, slate, mica schist pre-€ to Cret
Hamilton
Red Lion
(Georgetown)
Hebo
Newsome
Elk City
Orogrande
Buffalo Hump
Florence
White Bird
Slate Creek
E. Montana
Gibbonsville
Shoup
Warren
Salmon
Leesburg
Devils
Sparks
Yellowjacket
Casto
Idaho Batholith
Salubria
Challis
Custer
Bonanza
Stanley Basin
Weiser
Grimes Pass
Quartzburg
Pioneerville
Centerville
Banner
Germania
Galena
E. Fork
Mackay
Hailey quad. (Wood River)
Ketchum
Hailey
Idaho City
Atlanta
Boise
Rocky Bar
Neal
Camas
Snake River
Wood River
Shoshone
De Lamar
Silver City
Flint
South Mt.
S. Mt. Pb
OWYHEE
W Central Idaho
1" = 40 mi
Nl Mio Pli Lake Beds
Nb Pli Snake River Basalts
Nc Mi Col. Lava Basalts with Some rhy.
gr Post Carb. pre-Neocene granite
CS Carb? Devils Series slate, ls, schist, old eruptives
CW Ca-b Wood River Form ls, qtzite, shale
gr
Red
Orange
AZ



Mb = Miocene Basalt
Mr = " rhyolite
gr = Pre-Neocene granite

See Lindgren, An. Rep. USGS 1900, 188 187-187

Lindgren & Drake USGS Folio 104 1904.

De Lamar, Idaho.

From "Some Gold Deposits of the Northwest" by Francis Church Lincoln, EMJ 8-26-11.

Location. SW Idaho, Owyhee range, 5 miles W of Silver City. Owyhee range is the most northerly of the Great Basin groups. De Lamar just west of the highest peaks of the range; its elev is 5500'; veins outcrop on a ridge S of town, at 6000'.

General Geology. Owyhee range has a granite cores, post-Carboniferous? Early Tertiary, granite formed a steep narrow ridge with same general trend as present mts. Miocene, volcanic vents opened near summit of this range, poured forth much basalt and then equal amount of rhy. (Contemp. with Columbia river basalt to the west). After the rhy, probably in the Pliocene, a small flow of basalt occurred. From then to date, erosion.

In post-Miocene time, rocks of Owyhee range fissured; fissures often closely followed the lines of older dikes. Veins formed in these fissures. Silver veins of Silver City in all three country rks, but gold veins of De Lamar confined to the rhy.

Mineralization. Two stages at De Lamar. 1. Calcite and barite; 2. these replaced by auriferous qtz.

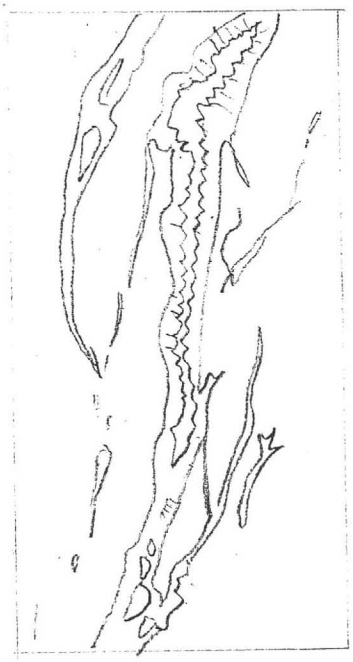
Veins fork and join to form a linked system; 10 veins, 20 to 80' apart. Veins 1-6' wide. Ave strike N35W, ave dip 38 SW. Veins confined to FW side of a body of decomposed rhyolite known as the "Iron Dike". This is a mass of compact pyritiferous clay dipping S or SE 30° or less, with frequent rolls and curls. Altho veins st abutt against the iron dike, it does not appear to fault them, but to be pre-ore, and to have absorbed the fissure-forming forces so that they became inoperative above it.

The filled fissures are usually sharply separated from the rhy country, of which they contain angular frags. Filling has a laminated structure: thin tabular peices of qtz cross one another in every direction, and are encrusted on both sides by minute qtz crystals. This qtz is evidently pseudomorphic after the calcite or barite which constituted the orgginal vein filling. Altered walls contain pyrite, marcasite and a little sericite. They are usually well silicified.

Gold in the friable qtz; silicified rhy barren. Kaolinized rhy, tho low in gold, may have enough silver to be ore. Ave. grade of ore is $14 in gold and $2 in silver. 61% of gold free-milling. Concentrates, while averaging $476 in gold make up only 0.75% of the ore.

Main producing zone from a little below the surface down to the 10th lev, following dip of iron dike, with dimensions of 600 x 400 x 700'. Within this zone nearly all of the veins contain oreshoots. Clay of iron dike dammed back solutions; best gold just below it. Oreshoots never more than a few hundred ft from the decomposed rhy. They pitch 25° SE. 1-30' wide, 200' long, some extend from near surface to 10th lev.

Qtz main gangue; a little barite; in one case valencianite. Ore min rarely visible; py most common. Na Au, argentite, pyrargyrite; rare marc Cerargyrite only sec. min. Gold yellow irregular flakes. Finely divided.



Trade Dollar Vein in Basalt. Cavities between qtz combs sometimes filled with clay.

Geologic Map of Silver City, Idaho
(From Piper and Laney)