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have run as high as 15,000 oz. of silver. The quartz vein 2 to 4 ft. wide, has given assays from $133 to $750 a ton. From the winze in tunnel No. 2 the ore is valuable as that it is mixed with a lower-grade ore as a matter of precaution. At present it could not be shipped by express.

The Nevada Hills Mining Company is capitalized for one million shares of par value of $5. Approximately 50,000 shares are out for the public, and the rest is being held closely by the owners. A dividend of 10c. a share on 750,000 shares, was paid in December. The mine has only been worked 8 months, and is 60 miles from the nearest railroad. The output was more than $70,000 for the month of September, and more than 10 carloads of ore are now piled up waiting an improved condition of the roads.

The Ida Mines Company

The Ida Mines Company's claims are passed on the right, by the road to the Nevada Hills, before reaching the foot of the Eagles Nest rock. This company has done considerable surface work. Long trenches 4 to 5 ft. deep, have been cut looking for the continuation of the Nevada Hills vein. A force of 8 or 10 men is employed and the open-cut work is being systematically and thoroughly done before any underground development is attempted. Several veins have been uncovered assaying from $30 to $70 a ton.

The large hog-back ridge on the property is generally believed to be the northwest extension of the Nevada Hills ledge and was one of the first properties to change hands.

A tunnel is now being driven on the Ida No. 3, to cut the intersection of the main ledge with another almost at right angles. It is expected to strike the ledge in a little more than 300 ft., and will give about 250 ft. vertical depth.

Passing on up the cañon in a northerly direction the road turns to the east, and again to the north. At the second turn a short branch road leads to the shaft house of the Fairview Eagle.

Fairview Eagle Mining Company

The Fairview Eagles Mining Company's ground is situated on the north and east of the Nevada hills, on the north side of the ridge of which Eagles Nest rock forms the summit. It owns the Boulder No. 2 and Boulder No. 3, Eagles Nest Nos. 2 and 4, and Fairview claims, comprising about 53 acres.

The main shaft is inclined, and is down about 185 ft. A 25-h.p. Fairbanks-Morse gasolene hoist has been installed. At the 70-ft. level a station has been cut. This is in an altered grayish andesite which carries values. There is a well defined streak of ore along the foot-wall, which gradually shades off into this altered hanging. The true hanging wall has not been cut.

Ore has ben sacked from a shaft on the vein a few hundred feet east of the main shaft. The strike of the vein is northeast and dip 70 deg. to the south. The vein material is quartz, with considerable manganese staining. No shipments have been made. Considerable pyrite shows in the altered hanging wall. Some of the sacked ore showed hornsilver. The Eagle vein is headed directly toward the Eagles Nest Fairview Mining Company's ground, and across a small gulch a shaft is being sunk.

Eagles Nest Fairview Mining Company

The Eagles Nest Fairview Mining Company's claims are directly northeast of the Fairview Eagle. A shaft has been sunk on the vein which enters the ground from the Eagle, and is down about 100 ft., so that work is no longer satisfactory with a windlass. A gasolene hoist will soon be installed. Ground is now being broken for the hoist house.

On the Eagles Nest drifting on the vein has begun from the bottom of the main shaft. On the Hailstone considerable trenching and surface development work has been done. The country rock on both properties is andesite.

The Animikie Iron Range

The report of the Ontario Bureau of Mines for 1906, which has just appeared, contains an interesting paper on the "Animikie Iron Range," by L. P. Silver, which embodies the results of a close examination of the country extending from Loon lake westward to Port Arthur, a distance of 30 miles. The Animikie iron-bearing series, which is the eastward extension of the Mesabi or upper Huronian series of Minnesota, is best developed east of Port Arthur. Within the last few years some systematic work has been done in test-pitting and drilling by Rinaldo McConnell, Wiley Bros. & Marks, T. Hogan and Flaherty & Knobell, of Port Arthur. As the Canadian Pacific Railway passes over the iron lands, the facilities for shipping ore to the furnace at Port Arthur are good. The writer's observations on the geology of the region are largely supplementary to the conclusions of Prof. C. K. Leith, N. H. Winchell and other predecessors in the field. The Animikie, or upper Huronian, is the formation in which the iron ore occurs, and is composed of several members in descending order as follows: (1) black slate; (2) upper iron formation; (3) slate; (4) semi-bedded impure limestones; (5) iron formation proper; (6) quartz conglomerate.

The iron formation proper is a ferriferous, cherty carbonate called taconite by Winchell; and this is the term by which it is generally known by miners. The taconite has a spotted appearance and is of various shades of gray, red or green. It may be said to consist of a ground mass of crypto-crystalline, chalcedonic or finely pheno-crystalline silica, evidently of secondary origin, and a precipitate from solution. Throughout this are distributed numerous rounded or subangular bodies of mineral, very slightly pleochroic and without distinct cleavage, which on analysis proved to be ferrous silicate. The banded taconite of the Animikie, which simulates the jasperlites of the other ranges, though not so distinctly banded, is really a fine-grained chert, containing the usual granules of the same composition as those of the ground mass, but the striping is due to iron oxide in evenly distributed particles.

The upper iron formation is somewhat more slaty than the lower, has less taconite in its composition, is higher in phosphorus and lower in iron. The iron ores of the Animikie range consist mainly of hematite and limonite, throughout which may be seen almost unaltered to very much altered lenses of siderite. This siderite is abundant throughout the ore of every pit and tunnel in the lower iron formation. Magnetite occurs in small quantities generally near intrusions, and is clearly a metamorphic product of the hematite. The ore has been concentrated along and near the fault zone, much of it being changed to carbonate. That the deposits in question are still in process of formation may be seen by the presence in the ore of lenses of the comparatively unaltered taconite and carbonate, which reduce the percentage of the otherwise high iron content of the ore.

Unlike the Mesabi and other iron regions south of Lake Superior, the deposits do not occur in pitching troughs, nor do they rest on an impervious basement. This may in part also account for the absence of the pure concentrations of iron ore so common to the south of the lake. The deposits here are, however, concentrations produced by meteoric waters, circulating along faults, and the best ore occurs along the best defined faults, becoming leaner at a distance from them, and gradually shading into little altered taconite.

Some analyses of the ore are given, showing metallic iron content varying from 27.64 to 40.45 per cent. It is explained that the iron content is somewhat higher than indicated by the figures, as the high percentage of carbon dioxide in the ore is soon driven off in the furnace, leaving the remaining ore of a higher iron value. The result of some experiments in concentration, made by Mr. Knobell, of Port Arthur, is also presented, showing in round figures that 70 per cent. of the top 10 ft. of the orebody will produce a grade of concentrate averaging 55 per cent. iron, 0.022 per cent. phosphorus, and 17 per cent. silica, and that 30 per cent. must be discarded as waste.

Central Electric Drive for Collieries

The Central Power System Offers Advantages for Coal Mines and Coke-oven Plants Whether Steam or Gas Engines Are Used

BY FRANZ ERICH JUNGE*

I propose first to comment on the advantages which are to be derived by central electric drive irrespective of whether gas or steam prime movers are used in the power house, and compare them with what obtains with either direct gas or direct steam drive.

It is an undeniable fact, established in numerous cases of actual practice, that electric centralization enables a colliery, when working under normal conditions, to cover all outside power demands from the available coke-oven gases even when steam drive is adopted in the central station. Therefore, when laying out the power scheme for a new mine, regardless what be the character of the mineral or metallic ores to be produced, it is wise to give to the central electric drive the first consideration, also to reserve in the general lay-out provisions for future expansion and for the distribution of surplus power to neighboring districts and for the operation of electric railways throughout the commercial-distribution sphere of the works, which application might be projected later on.

Systems of Power Transmission Compared

Obviously the most economical method of power generation in the central plant will be of no value unless the planning of the transmission and distribution system and of the mode of application is done with proper care and with observing, in the layout, definite and predetermined principles, since otherwise the losses occurring in the application will annul the savings realized in the production. There are today five different systems of power transmision in vogue in combined iron-smelting plants and coal mines: Steam, compressed air, hydraulic, gas and electric transmission. They all have one feature in common, namely, that the area of cross section of the transmission line bears a definite economic relation to the pressure of transmission of the dynamic medium.

With steam it is the loss through condensation in the pipe lines that demands a smaller pipe cross section, which in turn necessitates the adoption of higher steam pressures. With compressed-air transmission, also, heat losses must be compensated for by a reduction of the radiating surface, viz., smaller diameter of pipes, which can only be had at the expense of higher air pressures. The larger the pipe cross section of hydraulic mains, the greater the danger of freezing, and the greater the difficulty to guard against leakage. With gas, conditions are much more favorable, because condensation losses are entirely absent, and the higher the calorific value or heat density of the available gas, the better will be the all-round economy of the system. Yet it would not pay at all to transmit the weak-power gases, such as blast-furnace gas, beyond the immediate proximity of the blast-furnace plant.

The above mentioned losses through leakage and condensation are entirely absent in the electric-transmission system, so that the efficiency of long-distance transmission is relatively high, from 95 to 98 per cent., provided that the voltage has been correctly proportioned to the respective distance. The losses which do occur in the electric-transmission system are pure tension losses, being dependent on total length, cross section and capacity of the conductor; but there are none due to changes in the form of energy. Of course insulation must be perfect, and here is where the main difficulty lies, as we shall see later on.

Direct versus Alternating Current

The economy of electric transmission depends on the proper selection of the mode of current and of its voltage. But since the determination of these factors does not to any great extent affect the economy of power generation proper, with which we are here chiefly concerned, it will suffice to say just a few explanatory words on this subject.

Speaking first of combined iron-smelting plants and coal mines, which combinations grow rapidly in number and extent owing to the general modern tendency to combine in order to be able to work with maximum industrial economy, direct current between 440 and 550 volts will be applicable for all purposes in or near the blast furnace, coke oven and power plant, also in rolling mills if closely located. For transmission over large distances, direct current is also preferred, so long as the places of usage fall within the commercial-distribution center (some 600 volts tension). Beyond that alternating (three-phase) current of 5000 volts and more must be chosen. F. Janssen-Berlin, in discussing this question, gives the following comparison of the respective advantages and disadvantages of direct current versus alternating curent.

Direct Current

Central Station—Possibility of equalizing load fluctuations to a large extent; "Puffers," storage batteries or other means for the accumulation of energy, therefore favorable conditions for efficient fuel conversion and utilization in the prime movers.

Transmission—Tension limited to 600 or 700 volts as a maximum, therefore distribution of electric energy over wide distances uneconomical or impossible.

Substation—Motors susceptible of control, with economical means for starting, braking and speed regulation; simplest conduction of current.

Alternating Current

Central Station—Bad load equalization, inefficient utilization of the dynamo. Therefore "puffer" or accumulator stations between generators and motors are necessary.

Transmission—High tension is possible; therefore also the distribution of electric energy over any distance practical and economical.

Substation—Motors are simple and can be connected directly to the high-tension net. They are best suited for working in one direction of rotation and at constant speed. (Ideal transmission motors.) They are less fit for reversible and such drives that must be capable of control (steel works, rolling mills), and for transportation purposes. Transformers and converters are necessary.

From the above it is seen that the realm of application of direct current is limited to blast-furnace plants, steel works, rolling mills, coke ovens and auxiliary drives. Moreover, it is necessary that the central station is located near the principal place of usage. Alternating current is best suited for such central stations which are to transmit the energy of waste gases over wide distances, for instance to neighboring blast-furnace plants and coal mines. Also for parallel operation of distant central stations. Further, for the distribution from some central plant of electric current to several industrial establishments (overland centrals), and for the transmission of energy over wide distances (electric railways).

A combination of both systems by the interposition of alternating-current direct-current converters as intermediary members, will obviously be suited to all conditions, the higher initial cost being counterbalanced by a number of other advantages.

Central versus Scattered Drive

Now, as to the superiority of electric centralization over scattered gas or steam

*Consulting engineer, No. 150 Nassau street, New York.

The Workings

Beginning at the northwest end of the vein, and south of the large Eagles Nest rock, a rich ore shoot has been opened up on the surface. The vein strikes about north 60 deg. west at this point, and dips to the south 70 to 80 deg. Tunnel No. 2 has been run in on the vein here giving about 40 ft. depth, and some high-grade ore has been shipped from the development work. The vein outcrops 1 to 2 ft. wide above this tunnel. In places it does not show. The country rock, both walls, is andesite.

A few feet south of the tunnel entrance is a light-colored dike about 12 to 15 ft. wide, probably rhyolite, striking nearly north; it appears to cut off the ore shoot on the northwest end. So far as now known on the Nevada Hills property no ore occurs on the northwest side of this dike. The continuation of the dike can be seen across the cañon on the opposite hill.

In tunnel No. 2 the high-grade shoot exposed along the foot-wall is 1 to 1½ ft. wide. It is a soft, dark vein material, which contains large quantities of horn-silver, in scales and ribbons, often holding two lumps of gangue together, as by a string. Greenish silver bromide and possibly silver iodide occur. No tests have been made with a mineral supposed to be iodyrite, and it is probable that this dark blue mineral is a rare color of horn-silver. Some free gold can be seen in this rich ore, which runs more than $2000 to the ton.

A winze sunk on the vein from No. 2 tunnel level is down 85 ft. At 30 ft. it encountered the shoot exposed above. The shoot pitches to the east, and has changed over to the hanging-wall. Lumps of nearly pure hornsilver approximately 8 in. long by 5 in. wide, and 2 to 3 in. thick, which came from the ore shoot here were shown. These lumps are porous, give a metallic ring when struck with a knife, and are easily whittled. The walls of the vein at this point are clearly defined, and show evidence of movement. Above, between the high-grade shoot and the vein, which is about 3 ft. wide, is a horse which contains ruby silver in places. The vein widens out at this point and values occur in the hanging.

Nature of the Deposits

There appears to be three nearly parallel ledges, showing silicified andesite and quartz along the outcrop. Calling the one on which No. 2 tunnel is driven the main ledge, another lies above this, and still another near the top of the ridge. These follow nearly parallel for some distance and then swing sharply to the south and join the lower ledge. The outcrop east from No. 2 tunnel exposes a quartz vein averaging 2 ft. in width, but running anywhere from 1 to 4 ft. Frequent iron and manganese stains occur, and dark specks and stringers of silver sulphide show plainly in the white vein quartz.

The ore resembles that of Tonopah, and is a typical southern Nevada ore. The gangue is not always entirely quartz but sometimes a silicified andesite with quartz veinlets and disseminated gold and silver. Unless closely observed this rock does not appear of special value, though running $100 to $200 or more to the ton, and was undoubtedly passed over by prospectors many times. In places it contains vugs and cavities. Nearly always black disseminated silver sulphides are found with sometimes a little pyrite and some free gold.

The outcrop can be followed east 1300 ft. from No. 2 tunnel, and is rich nearly all the way. Silver sulphides are exposed in most places where a piece is knocked from the vein.

About 1000 ft. east of tunnel No. 2 a north-south fault cuts the ledge, and the west side of the fissure has moved about 40 ft. to the south. The fault seems to dip east, but is nearly vertical. Still farther east is a second fault, but with a smaller horizontal displacement. In this case the west side has moved north, or the block of ground between these two faults, with a portion of the vein, has moved to the north. A third fault of small displacement moves the west side to the south as in the first one mentioned.

The Knox Lease

In the saddle west of the Knox Lease is apparently another north-south fault. An open cut exposes a heavy gouge; a short distance west of here is a second open cut on the vein, from which a carload of ore running $212 has been shipped. The leasers have not yet found ore. On the Knox lease a diamond drill is in operation, and is drilling a hole dipping about 50 deg. north. At the depth of 263 ft. no ledge had been encountered. Tunnels Nos. 3 and 4 are about 70 ft. below tunnel No. 2, and are driven from a small gulch near the discovery. Tunnel No. 3 follows the north-south fault, and finds the continuation of the vein in a short distance. As shown on the surface the east side has moved north. Good ore with about 80 ft. of backs to the surface is cut here by a drift east on the vein; $200 rock is in the face.

Tunnel No. 4 is driven 140 ft. west parallel to the vein in the foot wall. Little pyrite was seen anywhere, except in this tunnel, where the foot wall appears to be mineralized.

Tunnel No. 5, on the east, has cut the ledge at the depth of about 60 ft. below tunnel No. 4, and runs $300 across the vein as against $200 above in No. 4 tunnel. Places here show 5 ft. of very rich ore with about 140 ft. of backs. Some $400 assays have been obtained.

NEVADA HILLS MINING COMPANY—PLACE OF DISCOVERY

Tunnel No. 1, driven from the lowest point to cut the vein at about 220 ft. depth, is in about 400 ft., and has cut the ledge. The shoot of high-grade ore exposed above in tunnel No. 2, pitches 30 to 40 deg. east, and could not be expected to be found at this point, which is too far to the northwest. A drift is being run southeast on the vein, and should strike the shoot inside of another 100 ft.

The average of the ore sacked is from $200 to $300 a ton. One shipment of 31 tons netted $209 a ton. Shipments of ore assaying $300 and $400 have been made, and one carload is said to have averaged more than $1000 a ton. From the rich shoot assays as high as $4627 have been obtained, 91.68 oz. of gold and 4298.5 oz. of silver, and assays of special samples

Fairview and several lawyers and doctors hang out signs. Beside these the town has a justice of the peace and a constable, who so far have had nothing to do. The climate is healthy though very hot in summer.

Freight coming in costs 1¼ to 1½c. per lb. from the railroad at Hazen, and from Fallon to Fairview 1c. per lb. Since Dec. 30 all freight from Hazen to Fallon has come by train.

The average freight rate on mining machinery is 1½c. per lb.; lumber, 1½ to 1¾c., and liquors 2¼c. per lb. Bulky material, furniture, etc., costs more. Freight from Fallon to Wonder varies from 2 to 2½c. per lb.

Ore is hauled from the Nevada Hills to the railroad for about $12.50 per ton by returning teams. It is hauled from the mine to the loading platform below, at $1.50 a ton.

Geology of the Region

The country rock is mostly andesite and this is cut by later rhyolite and andesite dikes. Strong fissuring has occured with silification of the andesite. Along these fissure zones, the rock outcrops prominently. North-south fissuring and faulting has taken place after the ore deposition; in several cases noted the displacement has not been great. The strongest mineral-bearing fissures strike northwest and dip to the south, though there are undoubtedly others. As far as observed little mineralization accompanies the faulting fissures. In the main ore-bearing zones the vein material is quartz, and silicified andesite with values often extending several feet into the hanging. Free gold, cerargyrite, and argentite carry most of the values. Ruby silver and some silver bromides occur in smaller amount. The gold is alloyed with silver and is sometimes of a white color. Roughly speaking, about one-fifth of the values are in gold.

It is probable that stephanite, tetrahedrite, polybasite and other silver minerals occur. Argentite, however, occurs in greatest quantity, and is found on the outcrops entirely inclosed in quartz. The rich float found before the mines were discovered, owed its high value mostly to argentite. Small amounts of copper staining are occasionally found; also limonite and hematite staining in considerable quantity, together with manganese staining accompanying the ore. Rich shoots containing large quantities of hornsilver occur near the surface, but values are in some cases uniformly distributed. Pyrite is not plentiful.

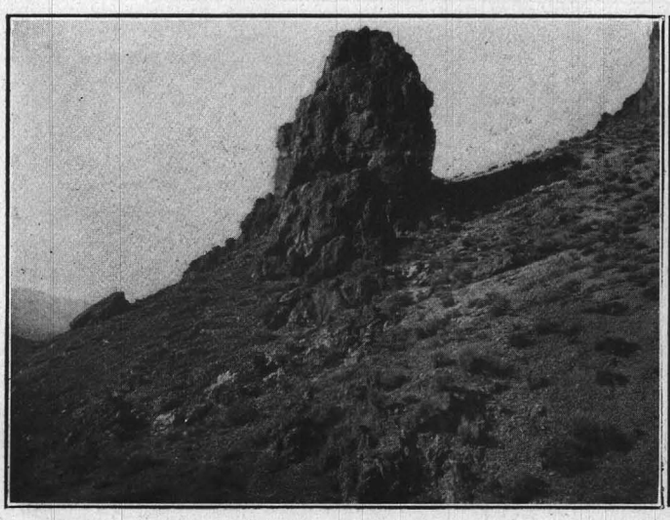
claim of the Nevada Hills Mining Company's property. The road from Fairview leads southeasterly up a wash to the foot of the Eagles Nest, passing the Ida Mines Company's claims on the right, and swings east through a sharp cañon to the Fairview Eagle, Eagles Nest, and Hailstone properties. The loading station for the Nevada Hills ore is at the turn of the road into the cañon; the sacked ore being piled on a large platform. A branch road from here leads up a steep grade to the mine.

The company owns the Boulder and Boulder No. 1 claims, and the Florence No. 4 and Pappais fractions, in all about 50 acres. The company also owns a controlling interest in three other properties.

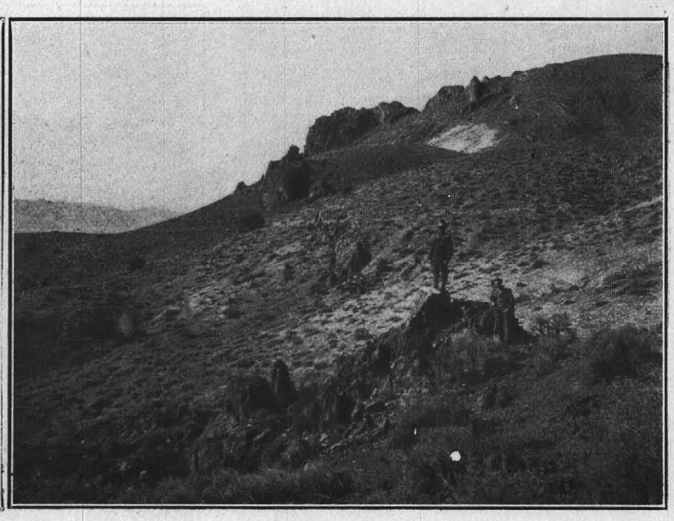
The Boulder claims were located by P. Langdell, in Jan., 1906. J. T. Hodson and W. H. Webber came into the district about two months later, and thoroughly prospected the strong outcrops which ran parallel to the large Eagles Nest ledge on the summit of the ridge. They bought the property for $5000.

Ore was first found on a fairly prominent andesite outcrop, to the west of a small north-south gulch caused by a fault. A quartz vein about 18 in. wide was exposed on this ledge, and on close examination was seen to contain fine black grains of silver sulphide disseminated through the quartz. After seeing the discovery it is not easy to understand why this property had not been located before, although crossed many times by prospectors and others.

The discovery is shown in one of the illustrations to the right, and above the pile of sacked ore. The dump is from tunnels Nos. 3 and 4, which are driven here. North-south fissures parallel to the fault can be seen cutting the outcrop near the point of discovery. Rich mineral has been opened up along this vein for a distance of more than 1300 ft., and five tunnels have been driven.



OUTCROPPING DIKES OF ANDESITE AND RHYOLITE



TOPOGRAPHY OF THE FAIRVIEW RANGE

Water and Supplies

Water costs $2.50 a bbl. Hotel Fairview hauls its own water from East Gate. It costs 25c. a bbl. at the well, and unloaded at the hotel costs them $1.65 a bbl. East Gate, 11 to 12 miles east of town, is an old silver camp. It furnishes water from three wells, 15 to 35 ft. deep. The water is good and contains no alkali. A well is being bored below Fairview on the flat, about 3 miles from town. The well is now down over 300 ft. with a 12-in. hole. They expect to strike water from 600 to 1000 ft. below the surface. If water is found a second hole will be bored about a mile nearer town, possibly also a third. A company has been organized to pipe water from Bench creek near Wonder.

Mining machinery if bought in Fairview costs from 20 to 30 per cent. more than if bought on the railroad. Wood costs $25 a cord; coal, more than $50 a ton; lumber, about $60 per M. Wages are $4 to $4.50 a day, and board can be obtained for $1.50.

Nevada Hills Mining Company

The mines are situated about two miles southeast of town in the foot hills north of Fairview peak. A prominent knob called the Eagles Nest, can be seen for some distance. This is on the Boulder

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The Mines of the Fairview District, Nevada

A New Silver-Gold Camp in Churchill County, Where the Chief Difficulties Are Lack of Water and a Long Haul to the Railroad

BY EDWARD R. ZALINSKI*

Reno, the largest and most important trade center in Nevada, is located on the main line of the Southern Pacific Railroad, in the foot hills of the Sierras. It is a short distance east of the Nevada-California State line, and is the natural center and outfitting point for the many camps in this region. Mining men bound for Tonopah, Goldfield, Fairview, Wonder, Ramsey, Olinghouse, the Walker river district, Yerrington, and other camps, find it convenient to stop off here either going or coming.

From Reno to Fairview

Fairview is situated in the south central part of Churchill county, about 120 miles southeast of Reno. Wonder is 18 miles north of Fairview. Leaving Reno at 8:20 a.m. on the Tonopah and Goldfield train, Hazen on the main line, is reached about 11 o'clock. The branch railroad to Tonopah turns off to the south at this point. A new branch of the Southern Pacific connects Hazen with Fallon, a distance of 16 miles. The regular passenger service is not in operation yet, and a stage makes the trip to Fallon daily. The the fare is $2.50.

The stage leaves Fallon at 7:30 in the morning for the 42-mile trip from Fallon to Fairview. The roads in the winter are poor. Fallon is in a farming district and the road for about 10 miles passes east through a flat country intersected by large irrigating canals and ditches. This low land lies south of the Carson sink and has been irrigated under Government supervision. A change of horses is made at a ranch about 12 miles out. From here on to the station where lunch is eaten, about half way to Fairview, the roads are hard and good.

The road swings southerly and follows the north side of Salt flat. Several large basalt flows extending out on the flat are crossed, and an old borax works is seen to the right. Before reaching Sand springs the road crosses a portion of the Salt flat and is soft and muddy. The wheels sink up to the hubs and freight wagons have much difficulty in getting through. Most teams are now compelled to take the longer road around the north end of the marsh.

At Sand Springs horses are again changed. Sand Springs was a station on the old Overland trail. The road to Fairview follows approximately this route. A mountain of white sand about a mile to the north, gave the station its name. This is robably of aeolian origin.

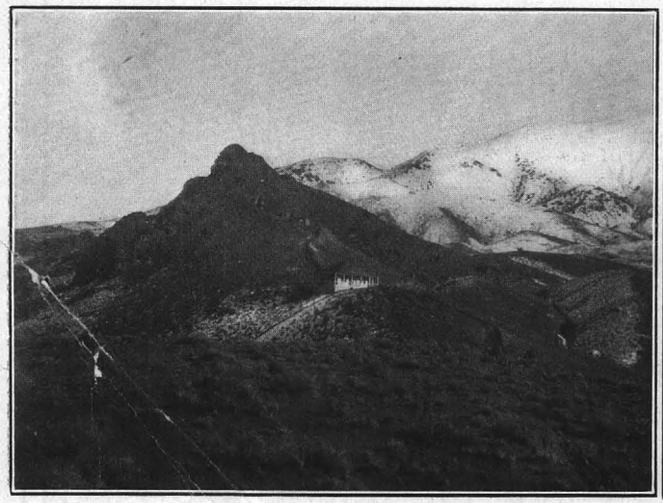
It is about 12 miles to Fairview, and the road is up-grade to the divide, which separates Fairview valley and Salt flat. Claim monuments are seen along the road on both sides of the pass, and a black shale is crossed which is cut by light-colored dikes. The summit is reached in 3 to 4 miles from the Sand Springs station. Fairview can be seen on the opposite side of the valley at the foot of Fairview peak. A gradual descent is made with a level stretch in the bottom of the flat and up grade on the Fairview side.

The stage pulls up in front of the Hotel Fairview about 6 o'clock in the evening. Automobiles can make the trip from Hazen to Fairview over dry roads, in 5 hours.

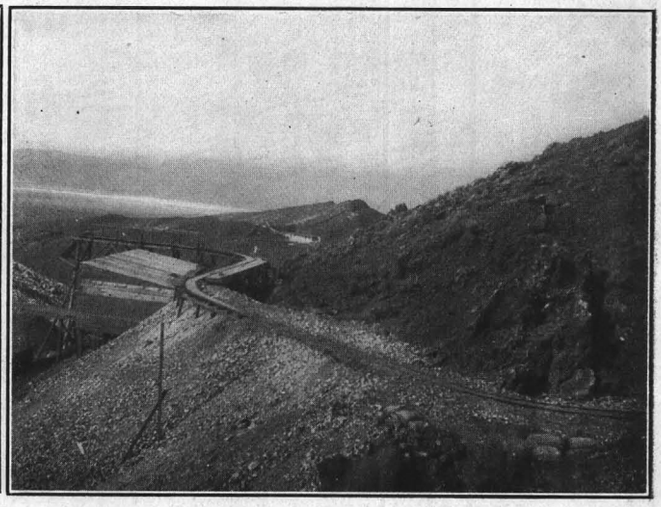
Fairview

The town of Fairview is built on a gentle slope leading from the foot hills north of Fairview peak to the valley. The situation is good, water only being lacking. The town has grown rapidly. It is only a few months since the townsite was laid out and frame buildings are already replacing tents. Lots are selling at good prices. The town has a population of more than 1000 and about 200 men are employed in the mines. There are several hotels and rooming houses, restaurants, saloons, and stores, also a post office, and two newspapers, *The Fairview Miner* and *The News*.

The town has stage-line connection with Wonder and Fallon, also telephone connections to points on the railroad. Three surveyors make headquarters in



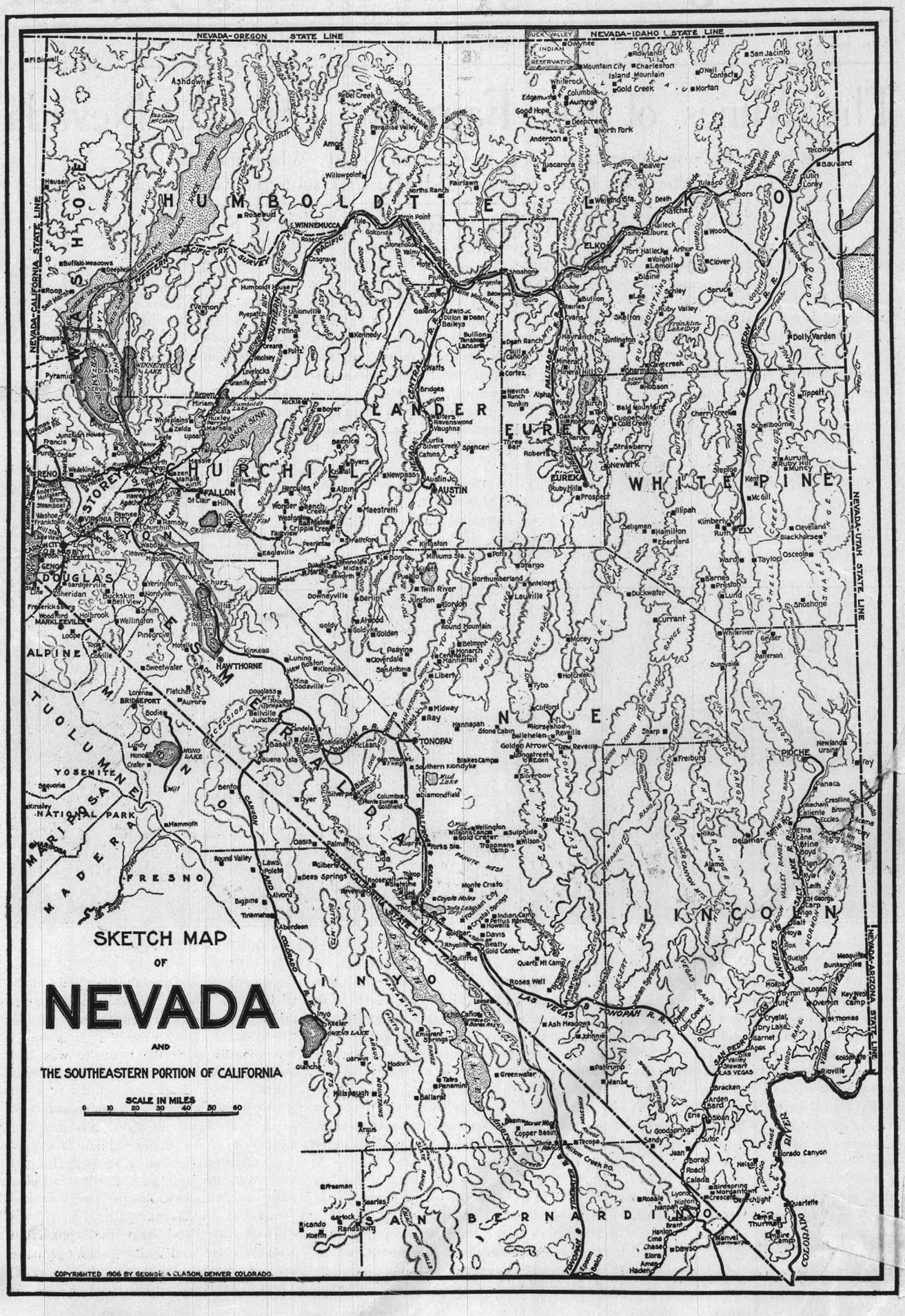
EAGLE'S NEST KNOB, BOULDER AND BOULDER NO. I CLAIMS



SOUTHWEST FROM THE KNOX LEASE

*Mining engineer, University Club, Salt Lake City, Utah.

Note—The sketch map which accompanies this article is published by permission of the Clason Map Company, Denver, Colo.


SKETCH MAP
OF
NEVADA
AND
THE SOUTHEASTERN PORTION OF CALIFORNIA
SCALE IN MILES
0 10 20 30 40 50 60
NEVADA-OREGON STATE LINE
NEVADA-IDAHO STATE LINE
NEVADA-CALIFORNIA STATE LINE
NEVADA-UTAH STATE LINE
NEVADA-ARIZONA STATE LINE
HUMBOLDT
LANDER
EUREKA
WHITE PINE
ELKO
WINNEMUCCA
CHURCHILL
STOREY
DOUGLAS
ALPINE
MINERAL
NYE
LINCOLN
CLARK
ESMERALDA
MONO
TUOLUMNE
MARIPOSA
MADERA
FRESNO
INYO
SAN BERNARDINO
YOSEMITE NATIONAL PARK
RENO
FALLON
AUSTIN
EUREKA
ELY
HAWTHORNE
TONOPAH
PIOCHE
LAS VEGAS
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Geology of Fairview, Nevada,
James O. Greenan, EM 4-18-1914.

Location. Churchill Co., 120 miles E of Reno. RR station Fallon, 45 mi. W.

General Geology. Series of mt. ranges trend N and S in this region, with arid valleys between. Fairview Peak is an isolated peak on a minor range between the Desatoya and Stillwater ranges. Fairview district on W slope of Fairview Peak. Basement complex of pre-Tertiary crystalline schists and limestones, intruded by granite. Superjacent series of volcanics, Older to younger, dacite tuff, earlier andesite, later andesite, tuff and rhyolite. The dacite tuff consists of a thick series of ash-beds and conglomerates, varying in character. Adjacent to the basement is a coarse, unstratified tuff with granite boulders. Then a coarser layer, then a series of fine, well-strtaified ash beds of lake origin. Earlier andesite contains the important veins. Greenish porphyry, generally pyritized. Weathers light gray or yellow. Intruded into the older tuff beds as a large irregular mass. Later andesite was a surface flow. Abundant hornblende. Weathers purple. Overlain by a second series of tuffs and agglomerates. Coarse, contains large granite boulders and boulders of the earlier volcanics. All of these formations intruded by a light gray rhyolite, seen on Rhyolite Hill as a volcanic plug, with an arm to the south. A dike of the same rhyolite occurs half a mile further west. It cuts two of the most important veins.

Ore Deposits. Largest vein is the Blout vein, on the SW contact of the lode andesite (earlier) with the dacite tuff. A few to 60' wide. Gradation from unaltered andesite through silicified andesite to pure quartz. Vuggy in center. Barren, except for a few isolated patches of sulphides. The Nevada Hills vein, main producer, runs nearly parallel to the Blout, and dips steeply south. Blout dips steeply N, and the Nevada Hills vein joins the Blout at depth, the Blout apparently continuing. Nevada Hills vein in the lode andesite. The Nevada Hills vein is weak near the junction, not reaching its full strength for 25' away from the junction. It appears to be a blind fissure.

Width of Nevada Hills vein varies from 1' to over 15'. Gangue is quartz, partly replaced andesite, calcite, and minor pyrolusite and rhodochrosite. Metallic minerals are argentite, stephanite, ruby silver, horn silver, pyrite, ccpy, galena, tetrahedrite, sphalerite, silver and gold. Ore in western segment primary, with small rich sceondary pockets. At the eastern end, strike faulting has caused much secondary enrichment. Mosttly on FW. Stronger mineralization on the HW side of the strike fault gouge, even where latter leaves the rtue FW and reaches into the vein. Au:Ag ratio 1:100; proportion decreases as grade of ore increases

Eagle vein, parallel to Nevada Hills, 1100' away, dips same, 70° S. Band structure: seams of dark sulphides separated by pink calcite and rhodochrosite. Strike faulting produced secondary enrichment. Depth of oxidation 300'.

Faults strike NE-SW, dip E or W 50-75°. Normal displacements, max. 200-300'. Veins uniformly larger and richer on the E side of the Main fault than on the W. Strongest mineralization right next to fault.

Later andesite at least 700' thick. At least 750' of erosion since its eruption.

BELL MOUNTAIN, CHURCHILL CO. Reno Sheet

Source: Unpublished report on the Carson Sink Area, Nevada. F.C. Schrader. Field work 1911-1920.

135. 6 miles airline SE of Fairview. 5 miles SE of Nevada Hills mine. Elevation 6200'.

136. Country rock is silicified light colored Tertiary volcanics. Fragmental-tuffs, flow-breccias. Composition probably from rhyolite to dacite or quartz-latite. Intense hydrothermal alteration.

Dominant sheeting N75E, dip 80N. Another set, N25 W, 70 E.

137. Bell Mt. vein or lode. Fig. 45. Strikes N 70E, dip 50 S. Associated with a fault 10' to over 50' wide. Known vertical range 650'. Does not crop out priminently-explored by cross trenching. The vein is in part coarsely banded; much has been crushed and recemented with silica. Walls, which are partly smooth, carry no gouge. The ore is irregularly distributed but tends to occur in parallel bands, some of which have considerable continuity.

The vein consists of greenish-gray quartz, calcite and partly replacedfragments of country rock. At one point on the lode, here 160' wide, there are alternating bands of vein matter and country rock, each 3-5' wide. On the S or hanging wall side 4' of quartz replaces the country rock; this is said to pan $5/ton. The sulfide zone may be 600' below the surface. Good ore goes with Mn stain; the best values are toward the footwall.

138. Most of the ore contains much calcite, some of which has been replaced by quartz. The green ish quartz goes with the best ore. It pans silver sulfide and gold. Adularia occurs; druses are common.

The vein has been explored to a depth of 360'; there are 2000' of workings, mainly on the adit (110')level, and on the winze or 360' level.

The ore averages $4 in gold and silver. The E portion of the vein has been explored only by trenches.

REGIONAL SETTING

Structure: Unknown

Production Belts: Near center of National-Mina high-production belt.

Lithology: Volcanics not shown here on Tectonic Map of U.S.

CONCLUSIONS

Favorable factors: strong structure; adularia, quartz relaecing calcite; intramineral fault movements. Unfavorable: relatively large amount of exploration; low grade of ore, although much of the silver may have been leached in the oxide zone. Area seems worth a look; the Bell Mt. lode should be accurately located, with res pect to the volcanic field in which it lies, and the topography.

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FAIRVIEW, CHURCHILL CO. Reno Sheet

Sources: E.R.Zalinsky,1907, The mines of the Fairview district,Nev. Engr.Min.Jour.vol.83,699-703

C.T.Rice,1906,Gold and silver at Fairview,Nevada. Engr. Min.Jour.vol.82,729-730

J.O.Greenan,1914, Geology of Fairview,Nev. Engr.Min.Jour. vol.97,791-793

W.O.Vanderburg,1940, Reconn.of mining districts in Churchill Co.,Nev. USBM Inc.Circ.7093, 23.

REGIONAL SETTING

Structure: Unknown.

Production Belts: In National-Mina high-production belt.

Lithology: Volcanics not shown in this area on Tectonic Map of U.S.

LOCAL GEOLOGY

Stratigraphic Section:

Tuff and rhyolite
Later andesite
Earlier andesite
Dacite tuff
x x x x x x
Pre-Tertiary crystalline schists and limestone, intruded by granite.

Petrology: Tuff and rhyolite: the "tuff" is a tuffaceous coarse agglomerate,containing granite boulders and those of the earlier volcanics. This and older formations intruded by a light gray rhyolite (exposed on Rhyolite hill),as a plug,with an arm to the S. A dike off the rhyolite mass occurs half a mile to W,which cuts two of the most important veins.

Later andesite: a flow.Hornblende andesite;weathers purple.

Earlier andesite: intrusive into dacite tuff. Greenish,porphyritic, pyritized.Large irregular mass;weathers light gray or yellow.

Dacite tuff: thick series of ash beds and conglomerates.Next to base, acoarse untratifued tuff with granite boulders.Above,a series of fine-grained,stratified ash beds,lake origin.

~~Note:~~ District lies within the Fairview Peak small N-S range. Main mine,the Nevada Hills,lies on W slope at elevation 5500';crestpf range about 8000'. If entire range consists of volcanics,there is an area

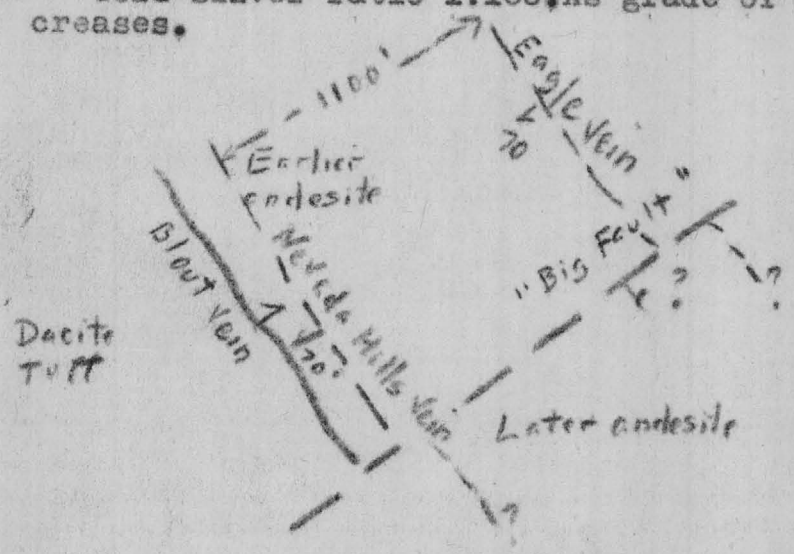
toward its crest of about 10 square miles where the surface of the volcanics is 1000' + above elevation of surface at the mine.

ORE DEPOSITS

The important veins are in the earlier andesite.

Mineralogy; vein structure: Gangue is quartz, calcite, minor rhodochrosite and pyrolusite, partly replaced andesite. Metallic minerals: argenttite, stephanite, "ruby silver", hornsilver, pyrite, chalcopyrite, galena, tetrahedrite, sphalerite, silver, gold.

Gold-silver ratio 1:100. As grade of ore increases, % of gold increases.



Blout vein varies from a few ft. to 60' in width; barren except for a few sulfide patches. Nevada Hills vein, main producer, joins Blout at depth; Blout seems to prevail below the junction. Apparently the Nevada Hills vein did not crop out.

Width of Nevada Hills vein, 1-15'. Eagle vein, second in importance, is 16' wide.

According to my abstract of Greenan, veins are larger and richer on E side of Big fault than on W; strongest mineralization next the fault. According to Vanderburg, the reverse is true. The Big fault and other NE faults may be premineral; or the Big fault may be post-mineral, in which case, accepting Vanerburg's version, there may be faulted segments of the veins, carrying ore, as yet undiscovered E of the Big fault, under the later andesite cover.

Production: Vanderburg: $4,171,000, mainly in silver and gold. Univ. Nev. Bull., No. 37, $3,816,000. At present metal prices the respective figure would be about $7,650,000 and $7,000,000. Average grade of ore, following Bull. 37, $21.80 per ton at present prices.

CONCLUSIONS

Fairview, a known district with considerable production, may not fall within the scope of the present project. However, if the extent of the volcanic field is as large as suggested above, with 10 square miles of volcanics at a higher horizon than that of the ore, the district would be worth a look.

FAIRVIEW-ADDENDUM

Source: Unpublished Report on the Carson Sink Area, Nevada. F.C. Schrader. Field work 1911-1920.

65. Elevation 5700'. Country rock andesite.

74. Stratigraphic Column

Fairview Peak dacite (youngest)
" " andesite
Pyramid tuff
Rhyolite (intrusive neck).
Aztec fault
Grade formation (tuff)
Unconformity
Miocene Later andesite
Lode andesite porphyry. Contains all important veins. Intrudes dacite tuff as a large irregular stock.
Dacite tuff.

Total thickness over 3000'+; lower limit not reach at bottom of mines. Almost all the volcanics are fragmental. Rhyolite dikes are mentioned (p. 84)

81. Three or more periods of mineralization:

1. Barren quartz
2. Ore-bearing quartz, in cracks and fissures in (1)
3. Ore in and near veins of the 2nd period after they had been reopened by strike faulting.

82. Ore minerals: argentite, polybasite, pyragyrite, stephanite, tetrahedrite, chalcopyrite, electrum, galena, gold, pyrite, silver, sphalerite, ~~XXXXXXX~~ chalcocite, stibnite.

Gangue: Adularia, calcite, chalcedony, rhodochrosite, rhodonite, fluorite

83 Largely replacement veins; intramineral strike faulting. Strike N50W.

79 Faults: Strike NNE; dip steep, mainly SE but some NW. Normal movement. Easternmost fault is the Aztec, 200-1000' E of Main fault. Biggest break in the area. Dip very steep Elmovement down dip to E; throw 600', with the E or down dropped side heaved a little to the N, like the movement on the Main fault. W of the fault nearly all the Later andesite has been reoved; to the E, 700' of this andesite remains. Aztec fault is younger than the Grade and older than the intrusive rhyolite.

80. Main Fault: Movement down on E 300'; east side heaved 130' to N. Fault displaces all important veins; shoot on Eagle vein dragged. The throw and the heave on the Nevada Hills vein each about 300'.

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The oldest faults of economic importance are strike faults trending NW with the veins. This faulting probably antedates in part the intrusion of the Lode porphyry, although most of it accompanied or followed the intrusion. This faulting determined the position of the barren quartz veins and perhaps other veins. It initiated the stage of mineralization during which nearly all the ore deposits were formed.

81. The veins are largely in the Lode porphyry on or near its contacts with other rocks, mainly the Dacite tuff. They tend to comform in strike and dip with thecontact.

In general, espacially E of the Main fault, vein walls converge upward.

83. Veins were larger and richer on E side of Main fault than on W side; they are most strongly mineralized next to the fault.

84. Veins strike N50W; barren veins dip NE, ore veins to SW.

Barren Veins: "Blout" veins-see map, p.2. These carry minor chalcopyrite, galena, sphalerite etc. Locally they contain ore running $10/ton in silver and gold. Schrader says Eagle is one of the barren veins, but this hardly checks with statement given above that ore shoot on Eagle was dragged by the Main fault.

85. The Blout or Big vein lies along the SW contact of the Lode porphyry. The largest vein in the district, width from a few to 80'. Dips steeply NE, cutting the monoclinal beds of dacite tuff at acute angles:

The vein lies within a shear zone, showing brecciation and sheeting. The zone is mostly in the Lode porphyry but partly in the Dacite tuff or along the contact.

Vein matter is mainly dense hornlike quartz replacing wall rock and grading into it.

87. Primary Ore Veins: Second period of mineralization. These lie in the Lode andesite along narrow parallel fissures; they converge on dip and end at the Big vein. Where the ore veins bottom on the Big vein the latter is shattered and pentrated by weak stringers or bunnhes of ore vein quartz.

Vein matter of the ore veins consists of massive, fine-grained ore-bearing quartz filling fractures in, and partly replacing brecciated Lode andesite wall rock. Quartz encloses fragments of the latter. Resemble Tonopah veins.

Nearly all the outcrops lie W of the main fault; Eagle vein is the only ore vein cropping out E of the fault. (This checks statement that veins narrow upward).

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88. Veins of Third Period: The primary ore veins (2nd period) were reopned by a series of strike faults;this started the 3rd period. The fissures and other cavities produced were filled with banded quartz,calcite, rhodonite,rhodochrosite. Vein minerals grew inward from the walls of the reopend fissures.Ore minerals were enriched by solutiins from the primary ore bodies nearby.

Fourth Period: Barren white quartz and coarse-grained calcite, filling openings in the ore veins.

89. Ore bodies occurred where the wall rock is most strongly silicified. They were also localized opposite (NE of) thick parts of the barren vein. In the ore veins,the wider the vein,the better the grade of ore.

The ore bodies were formed at practically the same elevation (Ore zone). Probably relation to former ground water level.

E of the Main fault the walls of the Nevada Hills vein converge upward;W of the fault,slso,most veins seem to pinch upward.

Main ore minerals seem to be argentite,stephanite,hornsilver.
90 Gangue is quartz,calcite,barite (?).rhodonite,rhodochrosite.Much of the quartz has replaced calcite. Small vugs are common.

91. Nevada Hills Vein:The most productive.The outcrop lies 200' NE of the Big Vein outcrop.Total known length 2200'-1200' NW of Main fault,1000' SE,to a rhyolite dike.E of Main fault droppings are scant. As staed above,displacement on Main fault is 300' horizontal and 300' vertical.

Vein is 1-8' wide;dip 70 SW. In the segment W of Main fault ore was continuous;values favored NE (footwall) side. Ore was best where dips are low-poor or absent where dip is vertical:

Reverse faulting

W of the Main fault,down to the 200' level,the vein yielded a fair tonnage. On the E side of the fault,at 500' depth,there was considerable low-grade ore,but the 800' level was barren.

On the far NW the vein ramifies into small stringers.It conerges with the Big vein at depth. Ore pinched 15-30' above the line of junction.

95. Eagle Vein: This lies 1200' NE of the Nevada Hills vein. Vein strikes nearly westward.It lies mostly in the Lode porphyry,between the Tunnel fault (on the NW) and the Main fault. The segment between thr Main and the Aztec fault is imporrant.The only vein of the district that crops out E of the Main fault. The outcrop extends 500' W of Main fault.400' E of it. Width, 2-40'+.Dip is 40-80 SW. Gouge occurs on the footwall.

The vein contains much more calcite than the other veins;also rhodonite, rhodochrosite and manganese oxide in greater quantity. Ore minerals occur in the calcite and the quartz. Ore belongs to the 2nd period of mineralization.

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CONCLUSIONS

Probaly Fairview is more valuable to us as furnishing a series of ore guides than as a prospect for more ore. Underground exploration has been extensive. About the only chance for more ore in the district would be E of the Aztec fault, beneath the 700' of Later andesite.

<u>Ore Guides</u>: Thick volcanic section
Complex history: unconformity, intrusion, deformation by tilting.
Strong fracture pattern; veins probably on faults.
Favorable gangue minerals: adularia, rhodonite, rhodochrosite, fluorite; quartz replacing calcite.
Intramineral fault movements.
Definite ore horizon or ore zone.

A detail geologic map accompanies the Schrader report.

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