mountains, only 12 miles away, and even at the low altitude of 1400 ft. snow commenced falling at the end of October last, and remained as a mantle covering the surface to a maximum depth of seven feet on the level. It was, though, not until late in December that the trail from Seward was good for travel with sleighs, then there was between four and five feet of snow on the property at which I was working. In order to keep a snow trail open under these conditions, continuous travel with at least one or two horses had to be kept up to establish a firm foundation before heavy loads could be hauled over it without breaking through the crust. Although in November the snow trail was good at camp, it was after Christmas before continuous hauling from Seward at sea-level to the camp with sleighs could be done.

About 1400 cu. yd. of slate had been excavated in a side hill affording an excellent millsite. Heavy hewed timbers were set in place for the foundations of the building and mortar. The grading had been done during November and the early portion of December despite prevailing snowstorms and other drawbacks. The end of December found all the foundations in place and everything in readiness for placing the heavy mortar weighing 5000 lb. and other machinery. This work was carried on during January when we were favored with about four weeks of clear dry cold weather, the thermometer ranging along about zero. By January 25, the plant was completed.

In the mill building itself, including the ore-bin, there were about 18,000 ft. (board measure) of lumber and hewed timbers. The total height of the building from the foundation to the eaves of the roof over the grizzly was about 42 ft., the front of the building over the plates being about 20 ft. The roof area was approximately 1000 sq. ft.; 50 ft. long by 20 ft. wide. About 70 tons in all was transported over the snow from Seward. This included machinery, lumber, hardware, camp supplies, hay and grain, rails, cable, hoist, and everything else necessary to keep the work going, all at a cost of about one-third of what it would have been during the summer, even if the season had been one of usual fair weather instead of being unusually wet. Any increase in cost for construction work, owing to snow and short period of daylight, was more than offset by the saving made on the cost for hauilng.

Operating in the Far North

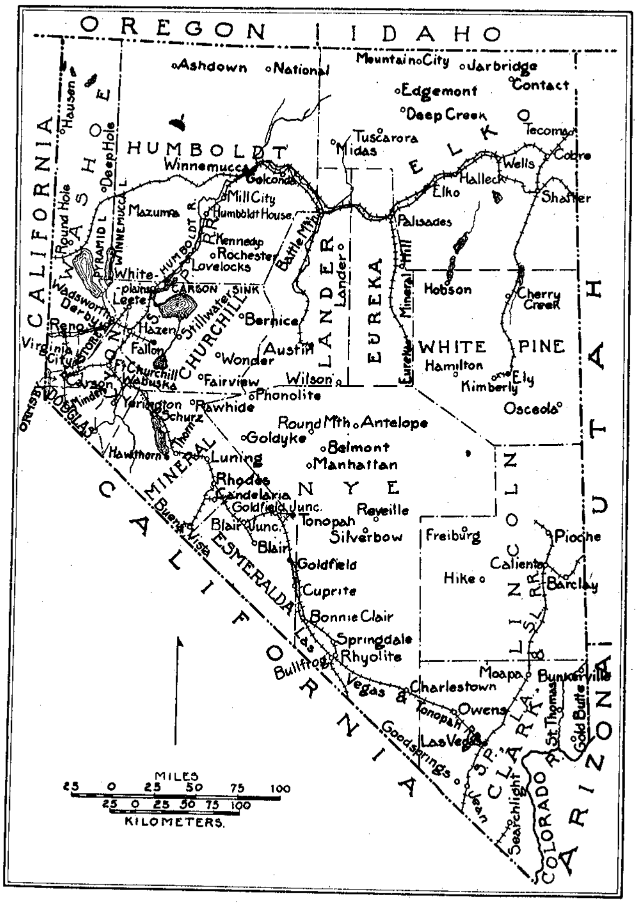
So far as mining operations are concerned, these can be carried on with equal efficiency during the winter months as during the summer. Indeed, this is nothing new, because as early as during the winters of 1901-2 at White Horse in the Yukon Territory, quartz mining was carried on, and considerable underground development accomplished with the thermometer ranging from 10 to 40° below zero. In fact more quartz mining has been done in that area during the winter months than during the summer. In summer it has always been difficult to obtain labor, for the reason that nearly every man wants to be out prospecting for placer ground.

In addition to the work I accomplished there were also gangs of miners doing underground development work on the property of the Kenai-Alaska Gold Co., also on the property known as the Skeen-Lechnor, both on Falls creek near the 25-mile station on the Alaska Northern railway, while at the last named property a sawmill was run and several tons of machinery hauled in over the snow, though no construction was attempted. During the past winter several stamp-mills in the Fairbanks district have been running continuously, therefore the idea that has hitherto been so prevalent that it was necessary to close down all quartz mining operations in the fall and not open again until the following summer, must be considered erroneous. It is no more difficult to operate quartz mines in Alaska during the winter than it is in Montana, Colorado, Utah, or any other mining state.

Geology of Rochester, Nevada

By J. Claude Jones

Rochester, a new and promising district in Nevada, is in the Humboldt mountains, about twelve miles east of Oreana, a station on the Southern Pacific railway just north of Lovelocks. Nenzel hill, in which lie the orebodies from which the greater part of the ore is now coming, is part of the divide



MAP OF NEVADA.

of the range and separates the drainage of American canyon to the east from that of Rochester canyon to the west. The towns of Rochester and East Rochester lie in the latter. The northern ridge bounding Rochester canyon culminates in Lincoln hill about two miles west of Nenzel hill.

The rocks exposed in the area were mapped by the Fortieth Parallel Survey as the Koipato formation of Triassic age. The boundary of the overlying Star Peak formation was drawn as passing through Nenzel hill, but actually occurs somewhat farther to the east. At the time of the earlier survey the Koipato was supposed to consist of silicified sedimentary rocks, but, as was noted by F. L. Ransome[1] in his reconnaissance of the area in 1909, they are largely devitrified and altered volcanics.

Composition of Nenzel Hill

Nenzel hill is composed of a series of rhyolitic tuffs, obsidians, and rhyolites, now devitrified and silicified, but retaining enough of their original character to be recognizable in the field. The obsidian and tuffs near the top of the hill occur in thin alternating beds dipping approximately 20° to the east. Lower down on the west slope the rocks are better crystallized and are true rhyolites, though usually with a glassy groundmass. For the most part the rocks are characteristically light colored, breaking into angular fragments, and where tuffaceous or with spherulites, they mimic quartzitic sandstones and conglomerates to a remarkable degree. In thin sections the obsidians disclose a microcrystalline groundmass with an occasional phenocryst of quartz and spot of iron oxide with a rude resemblance to the outline of the original ferromagnesian mineral. The tuffs are quite similar with the addition of phenocrysts of orthoclase and angular fragments of pumaceous glass.

All of the rocks are at least partly silicified, the secondary quartz appearing in veinlets, and in irregular blotches where it has completely replaced both groundmass and phenocrysts. The original quartz phenocrysts are usually surrounded by a fringe of the secondary silica and show the characteristic undulatory extinction resulting from strain. The orthoclase is often partly replaced by quartz and has irregular patches of sericite developed in the crystals. Similar rocks found in Cottonwood canyon several miles to the north were analyzed for the Fortieth Parallel Survey, and the following analysis[2] is taken as indicating the general composition of the rocks in this area.

The silicification of the rocks increases as the orebodies are approached and grades into a complete replacement where the ore is found. This is illustrated by the following incomplete analysis of a specimen taken from the hanging wall a few feet from the ore in the Codd lease.[3]

The sulphur found comes from a small amount of pyrite disseminated through the rock in perfect minute striated cubes and pyritohedrons. It is found indiscriminately through the areas of silicification and devitrification, and was introduced by different solutions from those that caused the silicification.

The orebodies are typical replacement veins following two sets of fracture planes, the one striking nearly due north and south, the other about 30° east of north. The larger orebody follows a fracture of the latter system and is intersected at several points by smaller ones on the former system. Both systems dip steeply to the west. In the Causten, Codd, and Big Four leases at the southern end of the hill the ore zone extends through a width of from 10 to 30 ft., with alternating stringers of quartz and partly replaced country rock. Among these is a quartz stringer 4 to 8 ft. wide that carries silver in amounts said to average from \$30 to \$40 per ton. All of the stringers carry silver, and the entire zone is said to average \$10 to \$15 per ton. The ore minerals are irregularly disseminated in dark spots and minute crystals through the fine-grained replacement quartz, and are occasionally segregated in small vuggs. The only silver minerals recognized were pyrargyrite and possibly native silver, although it is possible that other sulphantimonides of silver are present. There is little or no evidence of vein filling, the solutions evidently having been only directed in their general course by the joint cracks, and having worked out through the rock, replacing it to varying distances on either side. As a result, the walls, while rather sharply defined, undulate, and the orebodies pinch and swell to some extent. The chief development of the Nenzel hill orebodies is in the three leases mentioned where adits have been driven in to the ore, giving approximately 100-ft. backs. A hundred thousand tons or more of ore is said to be in sight.

Lincoln Hill Orebodies

On traveling west toward Lincoln hill along the ridge forming the north slope of Rochester canyon, the rocks become more metamorphosed, culminating in a mica-tourmaline schist on the west slope of Lincoln hill. Many veins of quartz and black tourmaline are found on Lincoln hill, and in the property of which Mr. Borland is one of the owners, a similar vein contained considerable visible free gold. The veins of Lincoln hill are more of the type of filled fissures in distinction from the Nenzel hill orebodies. The tourmaline in the schist is a pink variety or rubellite, but the predominating alkali is soda rather than the usual lithium. The mica that is associated with it also seems to be the rare soda mica, paragonite. Tourmaline is usually rather closely associated with intrusive rocks, and it is not improbable that the granodiorite that appears near Rye Patch, to the north, underlies the area and the more intense metamorphism of the rocks and the quartz tourmaline veins of Lincoln hill is due to its influence.

Replacements Following Intrusions.

The origin of the ores of Nenzel hill could not be determined in the hasty examination given them, but it is certain that they were formed later than the general devitrification of the Koipato. The disseminated pyrite and sericite in and near the orebodies suggest hydrothermal solutions, but whether they were connected with the intrusion of the granodiorite during the late Cretaceous time or came at a later time, must be left for future determination.

[1]Ransome, F. L., U. S. Geol. Surv. Bull. No. 414, p. 32, 1909.

[2]King, Clarence, 'Geology of the Fortieth Parallel,' Vol. 2, p. 722, 1877. SiO_2, 74.74%; Al_2O_3, 14.14; Fe_2O_3, 0.79; CaO, 1.51; MgO, 0.39; Na_2O, 0.92; K_2O, 5.29; ignition, 1.88; total, 99.66 per cent.

[3]Analysis by W. S. Palmer, Mackay School of Mines. SiO_2, 87%; Al_2O_3, 9.6; Fe_2O_3, 1.2; CaO, none; MgO, trace; S, 0.2; total, 98 per cent.