Another deposit owned by the Chemical & Pigment Co. of Oakland, Calif., is near the crest of the range about 4 miles southeast of Argenta Siding on the main line of the Southern Pacific Railroad. The last 3 miles of the road to the deposit is fairly steep, the ascent being about 1,400 feet in that distance. At the Argenta deposit the barite shows a bedded structure, the beds striking N. 15° E. and dipping about 25° easterly. Locally the beds are crumpled and broken. The material is broken by blasting and mined with power shovel into trucks, which haul it to the railroad siding. An open-cut shows that the barite is at least 60 feet thick. About 6,000 tons of barite were shipped during the summer of 1937. From the surface showings, this deposit is probably one of the largest in Nevada.

Barite also is found in the vicinity of Lewis Canyon; one deposit, covered by two claims owned by C. B. Lancaster and W. J. Caudle, is about 1 mile below the Dean camp. The barite occurs in a vein in a shale formation and is traceable on the surface for several thousand feet, in places showing a width up to 20 feet.

In the Star Grove mine, also in Lewis Canyon, barite is associated with silver-lead ores. In places there is as much as 10 feet of nearly pure barite.

No doubt with further prospecting other deposits of barite will be found in the north end of the Shoshone Range.

IZENHOOD DISTRICT

The Izenhood tin-bearing district is in the Sheep Creek Range in northern Lander County, 22 miles by automobile road north of Battle Mountain, a town on the Southern Pacific Railroad. Nuggets of wood-tin were discovered near the Izenhood ranch in 1914 by Ben Long while working for the Russell Cattle Co. Not recognizing the nuggets as tin, Long brought them to Battle Mountain, where they were tentatively identified by M. G. Thurston, a mining engineer, who had prospected tin veins in Mexico. This identification was confirmed by the University of California in the same year. After the presence of tin became known, a small boom ensued, and at least 150 lode and placer claims were located, principally by Battle Mountain residents. Several shallow shafts were sunk to prospect for lode and placer deposits; but after a short time interest in the district dwindled, and many of the claims reverted to the public domain. Early in 1938 the principal claims were taken over by Tasker L. Oddie of Reno, who made arrangements to prospect the placer ground. This work was under way in May 1938.

The principal group of claims in the tin-bearing area is owned by Mrs. R. R. Gamble, of Battle Mountain, and associates.

The nearest water supply consists of springs flowing several hundred gallons per minute at Warm Springs 1 mile distant; this water is used to irrigate the Izenhood ranch owned by the Russell Cattle Co. The district is not served by a public utility power company. There is no equipment on the property.

A report on the tin deposits was made by Adolph Knopf in 1916[12].

12/ Knopf, Adolph, Tin Ore in Northern Lander County, Nev: Geol. Survey Bull. 640-G, 1916, pp. 125-138.

Tin veins

The tin veins are on the west slope of the Sheep Range and extend from a point 1/2 mile north of the Izenhood ranch to a point 2-1/2 miles north 40° east. The Sheep Range extends nearly north and south and attains a maximum elevation of about 6,000 feet above sea level or nearly 1,500 feet above the floor of the subjacent Humboldt Valley.

The veins have been prospected by two shafts each 50 feet deep, an adit 20 feet in length, and several trenches.

The prevailing rock formation is a series of rhyolite flows of considerable thickness. From a distance the rhyolite resembles granite, but on closer inspection it shows distinctly its rhyolitic character. According to King,[13] the rhyolite area is roughly triangular and extends 50 miles south by 40 miles east and west, constituting one of the largest areas of rhyolite found in the Fortieth Parallel Survey. In the western part of the tin-bearing belt the rhyolite is capped by basalt.

The tin-bearing belt extends east and west along the crest of the range for about 2 miles. Along this belt the rhyolite has been rifted in an east-west direction, and in the fracture planes there are small stringers of tin-bearing material ranging in width from a fraction of an inch up to 6 inches. Along these stringers occasional kidneys of tin ore occur. No regularity in the occurrence of such seams or kidneys has been established, and not enough prospecting has been done to determine the width of the tin belt.

At the eastern end a vertical shaft has been sunk to a depth of 50 feet on several stringers filled chiefly with iron oxides and quartz. The shaft is untimbered and filled with rubble to a depth of 20 feet. The rhyolite in the vicinity is banded and stained with iron oxides. A grab sample of the fine vein material on the dump near the shaft was panned by the writer and estimated to contain more than 1 percent tin. A grab sample of the coarse hard material from the same dump yielded only 0.06 percent tin by assay. These samples were taken merely to determine whether or not tin was present and are only indicative. A small hand-operated dry washer near the dump suggests that an attempt had been made to concentrate the fines by dry washing, but the results must have been discouraging.

At the western end of the belt an inclined shaft had been sunk to a depth of 45 feet on a stringer zone in the rhyolite. Here the stanniferous material is associated chiefly with chalcedony, opal, specular hematite, and quartz. The stringers strike nearly east and west and dip 55° N. About 100 feet north of this shaft several small stringers are exposed in an open-cut. A 10-pound sample from a pile of sorted ore containing about 8 ton was taken by the writer, and it assayed 7.56 percent metallic tin. This was a selected sample of the vein material and it would by no means be representative of the average value of the material excavated from the shaft.

Between the two shafts is a stretch of ground nearly 2 miles long and perhaps several hundred feet wide on which chalcedony and opalized rhyolite

13/ King, Clarence, Systematic Geology: Geol. Explor. of 40th Par., vol. 1, 1878, p. 624.

float can be found. If trenching were done in the likely spots in this area, stanniferous stringers similar to those exposed in the shafts might be found. However, the finding of commercial deposits of tin ore depends largely on the occurrence of stringers rich and numerous enough to carry the intervening rhyolite, for it may be taken for granted that if there is any tin in the rhyolite itself it is finely disseminated and unlikely to be present in commercial quantities.

The tin occurs in the form of disseminated grains and as botryoidal nodules of "wood tin", so called by the mineralogists because of the resemblance of its fibrous concentric structure to that of exogenous wood. Associated minerals are hematite, both specular and ocherous varieties, chalcedony, opal, and quartz - a peculiar combination from a mineralogical viewpoint. Knopf also mentions tridymite and lussatite as common constituents. This association indicated that the mineralization resulted from the action of hot water. The minerals usually associated with stanniferous veins, such as topaz, tourmaline, fluorspar, wolframite, molybdenite, and others, are conspicuously absent.

Placer Tin

On the south side of the tin-bearing belt the mountain range is traversed by four steep ravines ranging from 1/2 to nearly 1 mile in length. In at least two of the ravines investigated by the writer the bedrock is exposed for nearly their entire lengths; weathering has occurred along the flow lines and joint planes of the rhyolite and formed a series of cracks and small potholes in which wood tin has been concentrated. Nuggets of wood tin ranging in size from a pea to a marble can be found in these concentrations. Due to the preciptitous nature of the ravines, the accumulation of detritus has been small; there has been no opportunity for the tin stone to concentrate in quantity, and the possibility of finding commercial deposits in the ravines themselves is remote. In former years attempts were made to placer-mine for tin in the ravines near the crest of the range, as evidenced by the remains of old rockers and sluice boxes. Water for such work was obtained from melting snow during the spring run-off. The amount of tin concentrate collected by this work could not be learned, but in all likelihood it was small.

The base of the range is skirted by an alluvial bench approximately 2 miles long and 1/4 to 1/2 mile in width. Here the alluvium consists of a heterogenous mass of sand, subangular pebbles, and boulders, the latter weighing up to 6 or 7 tons. Farther out, where the gradient is less, a flat is formed comprising an area of several thousand acres. Here the alluvium consists mainly of gravel covered with a mantle of soil about 20 feet thick, as shown by several shafts that have been sunk in this area. Two shafts, each 40 feet deep and a short distance east of Warm Springs did not reach bedrock. A large flow of water was found in sinking these shafts. According to report, this work was done by a company from British Burma. No information is available in regard to the amount of tin discovered. Not enough prospecting has been done in the placer area to determine whether tin occurs in commercial quantities. Since the mode of occurrence of the placer tin is analogous to that of placer gold in Nevada, it may be inferred that a uniform distribution

of tin from surface to bedrock is unlikely and that the best values will be found in nests or pockets near bedrock. This erratic distribution of the mineral is due to climatic conditions whereby the tin concentrations are the result of cloudburst action.

KINGSTON DISTRICT

The Kingston district, also known as the Bunker Hill or Summit, is in Kingston Canyon on the west flank of the Toiyabe Range on the southeast side of Bunker Hill Peak, the highest summit in Lander County; the altitude is 11,735 feet. The entrance to Kingston Canyon is from Smoky Valley. Bunker Hill Peak divides the canyon at its head from Big Creek Canyon, which drains westward into the Reese River Valley, the two canyons forming a line that crosses the Toiyabe Range from east to west. Kingston Creek, in the canyon of the same name, is one of the largest streams in the Toiyabe Range; it has a fall of nearly 800 feet per mile. The district is accessible by automobile over fair desert roads from Austin, 30 miles to the north.

The first mineral discoveries were made here in 1863, and shortly afterward at least four amalgamating mills were erected in Kingston Canyon. These mills were unsuccessful owing to inadequate equipment and the lack of knowledge concerning the treatment of the ore. Later, a number of other mills were built in this area, the largest of which was erected about 1911 at the mouth of Kingston Canyon. This mill was equipped with 30 stamps and employed the cyanide process. It operated only a short time. The most important properties in the early days were known as the Phoenician and the Victorine.

A report by Raymond[14] written in 1875 is as follows:

> The Victorine mine shows a very large ledge, and the ore can undoubtedly be produced cheaply; but the present developments do not warrant a judgment as to its future. The milling of the ores of the vicinity in these mills has not given satisfaction, and could not well do so, on account of the want of a treatment consistent with the character of the ore. It is thought that these mines might fully supply a large mill, but the process employed should be one similar to the Washoe process.

No reliable statistics are available on the early production, but it probably exceeded $100,000. In early 1938 the only property active in the district was the Kingston group of claims.

Kingston Group

The Kingston group, comprising six patented claims owned by Joseph H. and Bernice E. Muller of Palo Alto, Calif., is on the north side of Kingston Canyon at an altitude of about 8,000 feet. This property is one of the early locations, and it has been worked intermittently for many years. Several years ago the property was taken over under bond and lease by S. H. Linka of Austin, Nev. Linka has mined about 650 tons of gold-silver ore, the bulk of which was of shipping grade.

14/ Raymond, Rossiter W., Report on the Mineral Resources of the States and Territories West of the Rocky Mountains: 1875, p. 239.

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