GOLD IN BOLIVIAN WOLFRAMITE CONCENTRATES

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Most of the year of 1917 was spent by the writer in Bolivia, investigating the primary markets of tungsten-bearing ores and concentrates. At this time Bolivia was one of the largest producers of these products, exceeded in this respect only by Burma and the Shan States, and by the United States. Bolivian tungsten ores find their way into two market centers, the cities of Oruro and La Paz respectively, the former being by far the more important. Generally speaking, the ores coming into the market thru Oruro are the more desirable, particularly for direct smelting, because of their relative freedom from objectionable impurities, and their low manganese content, in this latter respect excelling, in many instances, the ferberites of Colorado.

Ores coming into the La Paz market are diversified in character, varying from almost pure huebnerites from the country about Saya, to copper-bearing wolframite-scheelite mixtures from the mines above the perpetual snow-line on the way over to the Yungas. Many lots of ore changing hands in La Paz are high in arsenic, present usually as arsenopyrite. The arsenopyrite does not appear to occur in actual admixture with the tungsten-bearing minerals, but in quartz stringers that seem to interlayer with them. It is not unusual to find free gold occurring with the arsenopyrite in these quartz layers.

One afternoon I was asked, by a prominent Bolivian tungsten miner, if gold could be readily and cheaply recovered from tungsten concentrates without detracting from the market value of the latter. It developed that he had been given a sample of concentrates that was claimed to assay 125 grams (4 ounces) in gold. This sample was given me and examination proved it to contain some 1400 grams (45 ounces) of gold (something over $900.00 U. S.) per ton, all free milling and consequently readily recoverable by pan-amalgamation or some similar process.

A few days later the property from which these concentrates had come was visited. In reaching the mines from La Paz we took advantage of almost every means of travel, ancient and modern, excepting aërial. The mines were stated to be near a small native village called La Joya (the jewel). It was, to my knowledge, the only tungsten producing property west of the

railroad extending between La Paz and Oruro. We left La Paz by train about 2 P.M., and arrived at Oruro something after 9 the same evening. Oruro sprawls out on the pampa at an altitude of about 4000 meters and is defenseless against the dust-laden winds that move at will (or without will) over these high, perfectly flat, treeless and almost vegetationless expanses.

The following morning, bright and early, we traveled back over the same railroad as far as a little station named Eucalyptus (just why no one knew). Here we found awaiting us a non-descript vehicle drawn by two flighty straw-burners (mules), which took us to the eastern bank of the river Desaguadero. We were ferried across this stream on a flat, home-made ferryboat guided by a wire and propelled by poles. A "camion" took us the rest of the way to the village of La Joya. This portion of the trip was made peculiarly interesting by a most pronounced and deceptive series of ever-changing mirages; houses and trees were distinctly seen where no houses nor trees existed, everything appearing to arise from a sheet of water. Reaching La Joya saddle-mules were provided for a portion of the remaining distance up-grade to the mines; and the last few hundred meters were covered on foot.

The property was a small producer, shipping an average of 30 quintales (about $1\frac{1}{2}$ tons) monthly of a good grade of wolframite concentrates, made by the most primitive methods imaginable. Any of these concentrates could be "panned," using an ordinary shovel, and strong gold color would develop. While these concentrates, on an average, may not have assayed as high in gold as the sample originally examined, there is no question that they did contain uniformly appreciable quantities of gold, which had gone to the market without separation or recovery and had probably found its way into ferrotungsten and, further along, into the high speed steel made therefrom.

One could not help wondering how much gold has been thus lost,—not thru failure to recover it from the output of this relatively insignificant producer of tungsten concentrates—but thru failure to examine Bolivian tungsten ores and concentrates in general, and, indeed, similar materials from other localities.

Is it not permissible, too, to indulge in a little speculative dreaming, and to wonder if such gold may not bear a similar relation to tungsten as the radio-active lead bears to the uranium with which it is found associated?