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OPERATIONS IN INDIVIDUAL DISTRICTS by Benjamin L. Miller and Joseph T. Singewald, Jr. Huayni-Potosi.—During 1915 Huet Brothers were actively engaged in mining at several points about 25 kilometers north of La Paz near the foot of Mt. Huayni-Potosi. At Milluni they were operating in a series of approximately parallel ore-bodies, some of which were quartz-pyrite-cassiterite veins, others were sphalerite-siderite-quartz-cassiterite veins rich in silver, and still others shattered zones in which quartz, pyrite, and cassiterite had been deposited in the spaces between the shattered rock fragments. The veins are all narrow and the mining primitive. From some of the mines the ore is carried out in cow-hide bags by Indian boys and women. From the mine openings on the steep slopes the ore in leather pouches is transported to the mill by means of a wire tram.

The Carmen mine located near La Union mill was most actively worked during the year, mainly on account of the native bismuth and bismuthinite which the tin ore contains, although the tin barrilla shipped from this mine was also considerable.

Although the firm of Huet Brothers have a great number of promising small mines in the region most of them are imperfectly developed, probably due mainly to the fact that the senior member was absent serving in the French army. The district is also handicapped by the lack of railway facilities.

The Vilaque tin placer deposits in the same region, owned by English capital, were idle during 1915. The company sent a representative out from England to re-examine the property and plan for its development.

Oruro.—In the Oruro district two companies, the *Compania Minera de Oruro* and the *San Jose Company*, continued to operate. The former company has been greatly extending its operations and during the past 6 years has paid off its indebtedness, installed new machinery, built a new mill at Machacamarca, 24 kilometers south of Oruro and paid substantial dividends. Although the company has considerable reserve oxidized ores they have been sinking deeper in the sulphide ore-bodies until now the mine is the second deepest mine in Bolivia, the deepest being the Pulucayo.

The ores contain considerable silver which adds much to their value. In the mine the ore is broken in overhead stopes by means of hand drills during the day when the power, furnished by Diesel engines, is needed for hoisting, while electric drills are used at night. The broken ore is trammed to the shafts by hand and hoisted to the surface in cars, buckets, or cowhide bags. At the surface Cholo women break the ore and sort it into three piles, the barren pyrite which is discarded, the very high-grade ore, "guia," which is shipped direct, and the medium grade ore which is transported by aerial tram to the cars in Oruro for shipment to the mill at Machacamarca. At the mill the ore is roasted with salts and then leached to obtain the silver and the residue crushed and treated by jigs and tables. More than one-half of the tin is recovered by the jigs, which make a 70 per cent. barrilla product.

Unica.—The *Salvadora* mine at Unica was operated extensively during 1915 and many improvements made in both mine and mill, particularly the mill. This mine continues to hold its place as the largest and richest tin mine in Bolivia.

The *Llallagua* mine is on the opposite side of the mountain from the *Salvadora* and, in part, the two companies are working the same veins. The warfare between these two companies which continued for several years has ended and they are coöperating in the construction of a deep tunnel more than 2 kilometers in length which will drain the deeper levels of the two mines. The ore from the *Salvadora* mine is sorted by Cholo women who pick out the high grade ore for direct shipment. During 1915 the company shipped about 50 tons of guia monthly and about 900 tons of barrilla. When the new mill is completed the company hopes to produce 1200 to 1500 tons of concentrates a month.

The railroad which Patiño has been building was operated during 1915 to within 30 kilometers of Unica and part of the remaining distance the grading has been completed. The war interfered with its completion. At present all supplies must be brought in and the barrilla taken out on the back of llamas. It costs about \$9.00 a ton to transport the barrilla from the mine to the railroad.

Considerable work was done on the placer tin deposits below the towns of Uncia and Llallagua during 1915, with satisfactory results. The Uncia gravels are very thick, up to 90 feet, and as the cassiterite is mainly at the bottom, the deposit is being worked by shafts. In the main, the cassiterite pebbles are coarse, many composed of practically pure cassiterite being several inches in diameter although the majority are less than 1 inch in their greatest diameter.

Huanuni.—Three years ago Simon I. Patiño bought out all the mines of Huanuni with the exception of one small one and ended the bloody fights that previously had taken place at frequent intervals between the workmen of the two rival companies. During 1915 the mines were in continuous operation but with a reduced force, while the grade of ore was considerably less than in the previous year. The average content of tin in the ore milled was about 3 per cent. but in addition there was a monthly production of 5 to 7 tons of *guia* containing about 65 per cent. Sn. This was sorted by Cholo women at the mouth of the mine where all the ore is dumped for sorting.

Both oxidized and sulphide ores were mined from several different veins. The principal work of the year was in the line of exploration in order to determine the extent and characteristics of the ore-bodies. The Patiño tunnel which is being driven near the base of the hill for the purpose of cutting the veins at a lower level and also to drain the mine was extended but no important veins were encountered. Some small ones were found and on one of these a winze was sunk which yielded considerable ore of average grade.

The old mill had been practically dismantled and a new one was in process of construction but not completed. Awaiting its completion, large quantities of middlings and tailings were stored awaiting further concentration.

Potosi.—During 1915 three large companies operated in the Cerro Rica de Potosi—Luis Soux, The Royal Silver Mines Co., Ltd., and Bebin Brothers. Soux is the principal operator in the region and due to the peculiar law that applies to the mines of Potosi, is rapidly gaining further control and limiting the operations of other workers. The law in question grants, through the prefect of the district, permission to start a tunnel in the hill at a point not previously worked but does not specify where the tunnel must be run except that it must not break into the workings of other miners. The hill contains a number of veins and when one company has succeeded in cutting a vein ahead of the other company the right to further work is acquired while the former company may be cut out.

During the year Soux operated through a number of tunnels at differ-

ent levels and transported his own ore to his concentrating mill in the lower part of the town by means of an aerial tram. Soux's production is steadily increasing, the monthly production during 1915 amounting to about 200 tons of barrilla containing 60 per cent. Sn.

The Royal Silver Mines, Ltd., has done a minimum amount of work since the outbreak of the European war, yet the mines were in operation all year.

Bebin Brothers operated several mines on the northwest side of the mountain and transported the ore to their mill in Potosi by means of llamas.

The tin placers along the river below Potosi were actively worked. These are largely controlled by Senor Mendieta of Potosi who has concessions for the greater portion of the stream gravels to a distance of 20 kilometers below Potosi. From these he produced about 30 tons of barrilla a month during the year, somewhat less than in former years.

The Mendoza Company also operated placer mines during the year with a production of about 10 tons of barrilla a month.

Porco.—The revival of the oldest mining district in Bolivia was an item of considerable importance in Bolivian mining circles. The early Spanish worked the Porco mines for silver and paid no attention to the tin, while the present company, the Porco Tin Mines, Ltd., expect to make their greatest profit from the tin ores. The new mill, which is well equipped, is located along the line of the Potosi branch railroad, a short distance from Agua Castilla. It was completed and one-half put in operation in June, 1915. The ore is brought to the mill from the mines by means of a well-constructed aerial tram.

In the development of the mines the company has been disappointed to find that the ore averages only about $2\frac{1}{2}$ per cent. Sn. On the other hand it has been proved that their ore reserves are much larger than supposed and the company is confident that they can work the mines with profit. If so, it will be the lowest grade tin mine operated in Bolivia.