Smelting and Labor at a Mexican Copper Mine

Clayey Ore Carrying Chalcocite Is Crushed, Mixed With Gypsum, Pulverized Coal, and Oil, Agglomerated, and Smelted. Labor Is Satisfactory and Welfare Work Is a Feature

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THE works of The Boleo Mining Co. are situated at Santa Rosalia, Lower California, on the opposite side of the Gulf of California from Guaymas, the nearest railroad town. The copper deposits were discovered in 1866, and the name Boleo arose from the fact that the ore particles were agglomerated as little balls of carbonate or oxychlorides of copper. When worked on a small scale, only ore carrying 20 to 25 per cent copper was mined; this was shipped to Europe for reduction. In 1884 The Boleo Mining Co. was organized and the mine put in condition. Even then, due to the low price of copper, only the richer ore continued to be shipped. To operate the mine successfully the company made radical changes in the methods of development and spent money freely for construction of adequate plants for the treatment of low-grade ore. Finally, the owners of the various adjacent mining claims combined their interests and formed a joint enterprise attractive to French capital.

The four groups of mines are operated through shafts. Hoisting, ventilating, and pumping are done by electric power. The ore is a clayey material carrying chalcocite. It is mainly sulfide, but of late the quantity of oxide ore is increasing. The ore occurs as flat blanket veins dipping about 15 degrees. They are 2 ft. wide, but the stopes are 5 ft. wide. Dilution of ore with waste is not serious. A typical analysis of the ore is: \(\text{H}_2\text{O}, 26\%\); \(\text{SiO}_2, 30\%\); \(\text{Al}_2\text{O}_3, 10\%\); \(\text{FeO}, 9\%\); \(\text{MnO}, 4\%\); \(\text{CaO}, 4\%\); \(\text{MgO}, 3\%\); \(\text{S}, 1\%\); and \(\text{Cu}, 4.6\%\). The volatile matter amounts to 8 per cent.

The ore is easily broken by swing-hammer crushers. It is then mixed with a flux consisting of crushed gypsum, 22 per cent of pulverized coal, and some fuel oil. The mixture is then passed through three revolving Allis-Chalmers oil-fired dryers, where the moisture of 26 or 28 per cent is reduced to 4 or 5 per cent. The pulverized coal reduces the gypsum, giving lime for slaging and sulfur for the matte. From the dryers the calcine goes to the feed hoppers, and from these, automatic feeders deliver it to trippers, thence to the reverberatory furnaces.

At the smelting works, formerly a blast-furnace plant, the ores are reduced in reverberatory furnaces. There are five of these, one 50 ft. long, the others 70 ft., and oil-fired. One of them has lately been remodelled after the Copper Queen type, having screw or side feeding. One barrel of fuel oil is burned per metric ton of charge. The matte carries 56 per cent copper and the slag, 0.50 per cent; the recovery is 90 per cent. These furnaces have Stirling waste-heat boilers, producing all the steam for the power plant, including all needed for the mines and the smelting plant.

The slag is granulated with sea water from Santa Rosalia harbor and is carried away in tow-boats and barges and dropped far away in the Gulf of California, thus effectively disposing of it.

For the treatment of the matte there are two Peirce-Smith horizontal converters. One of these converts the matte to blister assaying 69.2 per cent copper. This is transported to the Tacoma (Washington) plant of the American Smelting & Refining Co. for final refining. In 1928, the production of blister copper was 11,600 metric tons (25,566,400 pounds).

Approximately 3000 men are employed by The Boleo Mining Co. The workmen's village of Santa Rosalia at present shelters a population of upward of 12,000 and is a prosperous community. Common labor is paid $2.75 (Mexican) per 8-hr. day; the average wage is $3.50 (Mexican). The men get double pay for overtime. These payments increase with acquired skill. For men who work regularly during the month an additional 25 cents per day is given. Besides this premium there is a supplementary premium, dependent on the length of service, whereby workmen who have been 6 months steadily in the employ of the company receive an extra premium amounting to 8 per cent of their total wages; even this is increased to 15 per cent after a year of continued service. Native labor is content with little, and after a brief period desires to lay off; hence, the higher wage given those who are willing to work steadily.

Besides these wages, the workman and his family obtain from the company gratuitously water, medical attention, medicines, hospital service, and school instruction. Furthermore, the company gives its workers an increase dependent on the price of copper, when over 15 cents per pound, the same increasing to less than 30 centavos per 8 hours of work. Miners working under contract get $4 (Mexican) per day, an increase of 8 per cent of the regular wage.

The company has put in a sewerage system at Santa Rosalia and supplies electric light for domestic use and for street lighting.

Primary schools are maintained at each of the groups of mines at Providencia, Purgatorio, Santa Marta, and Santa Rosalia. At the last mentioned place the school building is of modern construction with well furnished rooms and equipped with bathrooms, gardens, gymnasium apparatus, children's library, lavatory and other hygienic departments. Six to seven hundred pupils of both sexes attend this school. Here, in addition to the primary and advanced courses of study, provision has been made for manual training. The director of these schools has under him five principals and sixteen teachers paid from a maximum of $350 to a minimum of $80 per month, depending on the character of service rendered. The total school attendance is as high as 980 with an average of 854 pupils.

The medical service and hospital is in charge of four physicians, one chief surgeon at Santa Rosalia and

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three auxiliary physicians, one at each group of mines. At Santa Rosalia there is a hospital, including a first-aid station, in charge of a director having a staff of two nurses, two drug clerks, two hospital attendants, a cook, and a laundress. This department also operates a drug-store, a consultation office and examination room, and a practising department used also for minor operations. Besides this, sterilization and anesthetics are provided for. The sick wards are comfortably arranged. There are store-rooms for medical supplies and baths. At each group of mines there is a small drug-store, consultation department and operating room in charge of a physician with the druggist and another employee. At the hospital not only are accidents attended to but general surgery, gynecology, and even maternity cases. From 52 to 130 patients are annually treated with an average of 25 needing medical treatment and 35 coming for consultation. Patients are also attended to at their homes. Many outside residents of Lower California come to this institution because of its efficiency and complete equipment.

The information given in this article has been partly taken from “Baja California al dia 1924” by Aurelia de Vivanco, and is partly from recent (1929) information received from company officials at Santa Rosalia and at headquarters at 58 Rue de Provence, Paris.

Notwithstanding critical conditions, due to periods of revolution, operations of the company have never been suspended, even when industrial activities throughout the country have been disturbed.

Blast-Furnace Investigation in England

COMMITTEE No. 2 of the Iron and Steel Institute of Great Britain has presented its first report, of 27 printed pages, on blast-furnace plant and practice. This report outlines the various features of modern blast-furnace practice with brief comments thereon, and with references to some of the more recent methods devised for applying the principles and attaining the purposes aimed at under these headings. In general, the trend in the United States is in the direction of larger and larger furnaces with ever increasing capacity from which, with improved details in methods and equipment, and attention to details of management, considerable progress in economy of production has been attained, in fuel consumption and in other items of production cost. In Germany, the attainment of similar ends has been sought by careful attention to the selection and preparation of materials, by sizing and sintering their ores, and sizing and screening limestone and coke, thus obtaining through the greater permeability of the furnace charge and consequent economical increase in rate and efficiency of operation, improved economy of production and increased output per unit of hearth area. Most of these features have been referred to in the publications of technical societies or in the technical press. The Committee therefore finds some difficulty in its search for any novel advance or general improvement in blast-furnace practice and plant, and if information is required regarding unpublished improvements, if any, a small body of qualified investigators should be authorized to visit the more advanced iron-producing districts, in England and abroad.

In the Squaw Creek District, British Columbia

For the following notes and pictures we are indebted to Sumner S. Smith of Oakland, California:

Gold was discovered on Squaw Creek in the fall of 1927 by an Indian named “Paddy Duncan,” and most of the stream was staked by natives. This stream is about 12 miles in length and flows into the east fork of the Alsek River, 10 to 15 miles below the old Dalton Post in British Columbia, near the international bound-

Placering and transportation in the Squaw Creek district

ary with Alaska. Bedrock is 6 to 12 ft. in depth above discovery and consists mainly of schist and slate, with some limestone. The gold is coarse. Fig. 1 shows No. 3 above on Squaw Creek. Fig. 2 shows how the natives travel with a team of dogs and Fig. 3 shows details of a load. A good dog can carry about 50 lb. which, as Mr. Smith says, is better than putting it on one’s own back.