

dends paid. As an instance he mentioned that timbering costs were cut in two years from 34 to 4 cents and later to 2½ cents per ton. And this was done, it was stated, with increased safety to the men. Views were shown of the town of Phoenix, shipping terminals, of underground workings showing stoping methods, the filling of stopes with waste, and electric shovel operations.

Nodulizing Copper Concentrate.

The preparation of copper concentrate for the market, stated Mr. Lachmund is a problem that confronts the British Columbia producer today, assuming that it is the intention ultimately to smelt all domestic copper ores within the Province.

The only market for such material was some outside reverberatory smelting plant as there were no such plant within the province. This meant high railroad freight charges owing to the high moisture content of the concentrate, or an appreciable loss of fines in transit if the product is dried before shipping, to say nothing of the additional cost of drying. He said that as there were several glass-furnace smelting-plants in British Columbia the logical method was to put the concentrate in proper physical condition for blast furnace practice. Three methods were suggested, namely, briquetting, sintering and nodulizing. The first he did not think very satisfactory as briquettes did not lend themselves to transportation. Sintering the sulphides in roasting pans or pots, he declared, made an undesirable product for British Columbia blast-furnace practice as far as retaining the sulphur is concerned, it bringing the percentage down as low as five.

Taking up nodulizing, that is getting the fines into round particles or nodules by passing the material through a revolving cylindrical furnace or kiln under application of heat, he said that it had been successfully carried out at several large plants.

He instanced the United States Metals Refining Company at Chrome, New Jersey, which had used the method on a large accumulation of flue dust, and later on flotation concentrate. The copper concentrate of the Braden Copper Company in Chili as well as the flotation product was being handled through the rotary kiln.

After quoting a number of authorities, Mr. Lachmund, said that it appeared that nodulizing the fine ores, flue dust and sulphide concentrate is the solution of the problem of preparing this material for the market where reverberatory furnaces are not available. In fact under average conditions smelting the nodules in the blast furnace can be done more cheaply.

He told of the series of experiments which he was called upon, recently, to supervise in British Columbia. For the preliminary work, a sheet iron tube 12 inches in diameter by about ten feet in length was used, and this was not lined with firebrick or other refractory material as only small lots of concentrate were tried at a time and each test was of short duration. The results indicated that a certain amount of the desirable products could be made in this way, but the apparatus was too small and crude, and fuel control too uncertain, to keep it up for any length of time, and no tests were made as to sulphur elimination, as the main object was to ascertain whether nodules could be made. Having determined this, the process was tried on a larger scale, the plant of an idle cement works being used. This consisted of a cylindrical revolving furnace 125 feet long by 7 feet in diameter inside the fire brick lining

and a coal crushing plant, the fuel used being powdered coal.

In telling of this experiment, Mr. Lachmund said that he had never heard of powdered coal being used for nodulizing copper-sulphate concentrate and consequently he and his associates were not very sure of themselves. It appeared to them that fuel oil was out of the question, the concentrate available being limited and the plant not being arranged for burning fuel oil. However, the former Superintendent of the works was familiar with coal dust firing and the experiments were initiated. It was discovered in the first place that the temperature required to be lower for making nodules from concentrate than it did in the dry process cement practice of calcining clinker. The burner was too large and the fuel feed difficult to control, the result was that there was produced everything from fine roasted dust to lumps of partially smelted material as large as a man's fist. However some good nodules were made which seemed to him to show that powdered coal could be used successfully as fuel providing that proper equipment is used. He said that coal dust firing was being used at reverberatory works and also under boilers of various types and that a similar arrangement no doubt could be worked out for a nodulizing kiln.

Dealing with costs he said it was impossible to obtain favourable working conditions always and the total expense could not be charged against the operation. An effort was made to obtain representative cost figures when the kiln was doing good work, but they were more or less estimates. Between 12 and 14 tons of concentrate were treated with one ton of coal. He figured the coal at \$5.00 per ton pulverized and in the bin, and thought the cost of concentrate nodulized should not exceed 50 cents. To these figures, however, would have to be added overhead and other expense items amounting to about 50 cents perhaps, and making a total of \$1.00 per ton. He said that the capacity of a kiln 125 feet long such as had been used in these experiments should be about 100 tons of concentrate a day.

In closing, Mr. Lachmund commented on the rapidly gaining popularity of powdered coal as fuel and asserted that this should result in making certain so-called semi-lignite coal of Western British Columbia of commercial value. He also surmised that any future discoveries of large copper deposits in this province probably would be of so low a grade as to require water concentration. It would therefore be necessary to ship the concentrate to a smelter and he did not think that anything could be more desirable than the installation of such a plant as would permit the driving of the moisture from the product and as much sulphur as was undesirable. Not only would this give the smelterman a very attractive material for his plant, but would save the operator substantial freight charges.

Consolidated Smelter Charges—Committee's Finding.

Mr. Fowler explained that, as Chairman of the Committee appointed to investigate the justice or injustice of the charges levied by the management of the Consolidated Mining & Smelting Company on custom ore treated at the Trail B.C., Smeltery, he had been asked to give a summary of the Report of the committees which had been forwarded to the Minister of Mines at Ottawa. He recalled the circumstances attending the appointment of the Committee which included James Anderson, of Kaslo, B.C., and Ivan DeLashmutt and himself. Something over a year ago the Consolidated Mining & Smelting Company announced that conditions made it essen-