

The "French" Treatment of Zinc-Lead Ores

Result of Important New Process Tried Out Successfully at the Standard Silver-Lead Mine Has Favorable Bearing on Zinc Mining in British Columbia.

(By a Metallurgical Engineer)

Considerable interest has been created among mining men by the trial of the "French" process by the Standard Silver-Lead Mining Company at Silverton. A quantity of their ore of a particularly difficult composition was treated and at the end of the trial, which terminated a few days ago, the management of the Standard company have expressed themselves as extremely well satisfied with the results. The thanks of the community are due to the Standard company for the public spirited way in which they have spent a considerable sum of money to afford a proof of the success of the process and the liberal way in which they have made the results known to all their neighbors.

The British and Canadian Governments are at present investigating the resources of Canada with a view to establishing a zinc smelter and to utilize the untold millions of tons of ore which abounds in this district. The difficulty of treating these ores, however, lies in their complexity and low content of zinc. There have been no large bodies of straight zinc ore opened up so far in the Kootenays and without very high grade ore such as exists in Missouri and other places in the United States to mix with the zinc concentrates produced here, it is impossible to smelt our zinc concentrates profitably. To establish a zinc smelting works here is out of the question, for zinc ores require at least twice their weight of coal to smelt and it is cheaper, therefore, to take the ore to the coalfields.

When all the deductions for duty, freight, penalty on iron, lime, lead, etc., are considered, the making of zinc concentrates is not a very profitable business. It may not be generally known that even in Missouri, where the ore is specially adapted to concentration, that only 50 per cent. of the zinc in the "mill feed" is obtained as metallic zinc by the smelter. To quote a recent report of the United States Bureau of Mines: "The average recovery of blende from ores in milling is about 60 to 65 per cent. The average loss, therefore, in the concentration of the zinc ores is 35 to 40 per cent. When the heavy losses in the smelting of zinc ores are included, the total loss in the production of zinc from the ore in the mine up to the commercial product reaches nearly 50 per cent."

Kootenay Ores Complex.

The Kootenay ores are much more difficult to concentrate and there are very few of the mines which can show a saving of over 50 per cent. of the zinc in their ores by concentration, not counting the 20 per cent. loss which is quite common in smelting. This, however, is not all. The zinc invariably contains silver in large quantity and its proportion is lost in the zinc in the tailings. As a matter of fact, after all deductions are made, the miner here is lucky if he gets the value of the silver in his concentrates and nothing at all for the zinc from the zinc smelter.

Ever since the introduction of the dynamo for the deposition of metals, endeavors have been made to deposit zinc electrolytically. All such endeavors until recently met

with failure except in one instance. The large alkali firm of Brunner, Mond & Co., in England, use an electrolytic process for the production of chlorine gas, in which they obtain zinc as a by-product. This process, however, is not applicable to the extraction of zinc from complex ores.

The reason for the failure of all previous processes is that there is no anode that can be employed commercially that will withstand the action of the electric current without being rapidly destroyed. Carbon or graphite anodes will not do, and with lead the action is similar to that in an accumulator cell; the lead rapidly becomes peroxidized and disintegrates. Zinc also is the most electro positive of all the common metals and therefore the most difficult to deposit in a pure condition. In consequence, most experimenters have obtained only a useless sludge of zinc on account of its contamination with other metals which deposit more readily than zinc. The current consumption is very large and generally the difficulties have been insuperable.

The "French" Process.

Briefly, the "French" process consists in the use of a solution of bisulphate of soda, which is a cheap waste product, and a small quantity of manganese—an ingredient which occurs with most zinc ores. Bisulphate of soda dissolves the zinc from the roasted ore almost instantaneously. Along with the manganese in solution it completely prevents the anodes from being affected and after years of constant use they are as good today as at the beginning. This solution also has very little resistance to the passage of the electric current in the electrolytic vats and the consumption of current is thus lowered. It has also the peculiarity of throwing out of solution practically all the impurities which usually contaminate the zinc.

Early in 1912 the Consolidated Mining & Smelting Company of Canada acquired the sole rights for the use of this process in Canada. It was only toward the end of last year that they had partially erected a plant of somewhat large dimensions, and after they had produced a few tons of zinc, the contract between French's company and them was cancelled on account of disagreement and alleged violation of contract.

Plant at Silverton.

A demonstrating plant was then erected by the Standard Silver-Lead Mining Company on a large enough scale to thoroughly prove that the process would work equally well on a very large scale. It comprised two completely equipped dissolving vats, each capable of dealing with 2,500 pounds of liquor at a time and about 1,000 pounds of ore. The zinc-depleted liquor containing bisulphate of soda from the electrolytic vat is pumped into the upper of these two vats. There are then added from 700 to 1,000 pounds of roasted ore from which the zinc has been partially extracted in a previous operation. In about an hour solution of the zinc is finished and when the liquor has settled for a short time it is allowed to run down into the second dissolver, placed at a lower level. The sludge remaining in the bottom of the dissolver is then pumped through a filter press to remove the water and the residue contains all the silver and lead.

As the sulphur to the extent of over 20 per cent. has been driven off in the roasting operation, and zinc to the amount of about 30 per cent. has been extracted, the residue of the ore, of which a large quantity was treated, only weighed about 45 per cent. of the original ore used. As it contained all the silver and lead originally in the roasted ore, the percentage of these metals was more than doubled.