

hoisting and haulage, on account of this prominence, are entitled to distinction as the mechanical department.

Of course, the introduction of machinery in mining, as in other branches of industry, presumes the certainty of abundance of work, suitability for the work, and proper installation. Without these prerequisites, no installation would be warranted, or the results profitable. Nor does the fact that occasionally it is good business to install auxiliary units of machinery in a large plant to stand guard, as it were, in like manner as insurance is placed, alter this as a general rule.

The economic results obtained from the modern hoisting and haulage plant erected on the Le Roi under the design and supervision of the writer, goes to corroborate what has been said, and as this plant has many novel features, both of design and application, it is hoped that a description of it and the economies affected by its operation will prove interesting. In this description which follows, many incidental circumstances, apparently extraneous to the subject matter proper of this paper, will have to be narrated, in order to give a comprehensive grasp of the economic exigencies which created the necessity for this plant. It is also hoped that such extraneous matter will not be uninteresting, inasmuch as it constitutes a chapter in the history of one of the most prominent mines in this province, and deals with many of the peculiar conditions which are, to a more or less degree, characteristic of all mining enterprises.

*Historical.*—The Le Roi was located in the summer of 1890, and in November of the same year it was bonded to a syndicate of Spokane business men. This syndicate completed the purchase of the mine, and on the 23rd June, 1891, conveyed it to the Le Roi Mining Company, which they organized for the purpose of operating the mine. Under the auspices of this company the mine was developed into a paying property, and the company realized from its operations \$975,000.00 in dividends before selling it in 1898.

The ore which yielded these dividends was extracted from workings comparatively near the surface, where, owing to the concentrating action of meteoric agencies, the values, originally existing in the entire vein, were concentrated into a streak of varying width. The ore mined was sold to custom smelters, which made a direct charge of \$11.00 per ton for freight and treatment, besides making certain deductions from the metal values, which amounted to approximately \$5.00 per ton. Thus, the aggregate of the direct and indirect smelting charges was \$16.00 per ton.

But as depth was attained on the vein, it was found that the values were becoming more uniformly disseminated throughout the great width of vein matter, instead of being, as near the surface, concentrated into a comparatively narrow streak.

Thus, as the work of mining progressed in depth, the ore became too low-grade to stand the cost of freight and treatment formerly paid to the smelters and leave a satisfactory margin of profit.

This change in the character of the ore induced the company to build its own smelter, so that the profit of smelting the ore might be added to that of mining it.

A favorable site was selected at Northport, in the State of Washington, and a smelting plant of the capacity of 250 tons per day was built there in the fall of 1897.

In this enterprise the company associated with it to the extent of one-quarter interest, Mr. James Breen, a man of extensive experience in copper smelting. Mr. Breen's ownership of this interest made it necessary to operate the mine and smelter as separate concerns.

The smelter was operated under terms of an agreement made between Breen and the Le Roi Mining Company, which provided that all the ores produced by the Le Roi mine for a period of five years should be sold to the smelter on the following terms:—The gross val-

ues of the metals contained in the ore was to be paid for at New York market quotations, less \$8.75 per ton as direct charge for freight and treatment, and certain specified deductions from the gross metal values in the ore, which amounted to \$5.00 per ton additional. Thus the total charges, direct and indirect, for smelting the ore at the Northport smelter, amounted to \$13.75 per ton, a reduction of \$2.25 per ton under the price charged by outside smelters. This contract was, nevertheless, very profitable for the smelter, the profits earned being distributed, three-quarters to the company and one-quarter to Breen.

About this time the president of the Le Roi Mining Company (Col. I. N. Peyton) went to London for the purpose of selling the mining and smelting property of the company. The negotiations which Col. Peyton began, finally resulted in the purchase of all the assets of the company by the British America Corporation, Ltd. This corporation conveyed the property to the "Le Roi Mining Company, Limited," a new company, organized in London to take over and operate the mining and smelting property of the old Le Roi Company.

The mining and smelting operations of the new company were then conducted under the management of the new (London) company, Mr W. A. Carlyle being local manager until December, 1899, when that gentleman severed his connection with the company to accept the management of the Rio Tinto Copper Mines, in Spain.

At this time—on the 10th December, 1899—the writer was appointed general manager to fill the position made vacant by Carlyle's resignation. On accepting this position I was informed by the directors that no profit had been made by the company's operations and was instructed to examine the company's property and report as to what would be the probable result of future operation.

I immediately began the examination of the mine, the compilation of records of previous production and working costs, and a study of the commercial problems involved in the mining and smelting operations of the company.

The mine records showed that for the eight months ended June 30th, 1899 (the first eight months after the mine was taken over from the old company) there were 45,167 tons of ore shipped, having an average gross value of \$17.33 per ton; and that for the subsequent six months ended December 31st, 1899, there were 51,448 tons of ore shipped, having an average gross value of \$13.66 per ton, making a total of 96,615 tons of ore shipped during this period, having a total gross value of \$1,485,423.19. This made the average daily shipment about 250 tons, which, upon investigation, I found was the maximum which could possibly be obtained from the mine with the equipment and facilities it then possessed. To maintain even this, the miners were obliged to climb into and out of the mine to depths ranging to 900 feet so as not to interrupt the production, instead of being, as is usual, hoisted and lowered by the winding engine.

The general details of the costs of realization of the gross values per ton of ore for the period under review showed, without making deduction for depreciation of mine or plant, as under:

Costs of mining and development .....	\$5.55	per ton.
Railway transportation to smelter.....	.75	"
Cost of smelting to matte .....	5.59	"
Refining tolls and charges, and freight...	1.25	"
Breen's profit on smelting contract.....	2.00	"

\$15.14

Subtracting the costs of realization from the average gross value of the ore, the first eight months operations showed a profit of \$2.19 per ton on the production for that period, or a total of \$98,915.73, while the last six months showed a deficit of \$1.48 per ton, or a total deficit of \$76,202.24 on the production of that period, which brought the profits for the 14 months down to \$22,713.49