

value everywhere of the quartz veins was so low as to be prohibitory. The only mass of quartz with gold in paying quantities was one my father paid a reward to Pere Paulin of \$500 for finding. It was an ingeniously manufactured sample.

But copper mining in the Province of Quebec soon over-shadowed the interest in gold mining. Attention was first drawn to the copper deposits by Sir William Logan in his report for 1847-48, as Director of the Canadian Geological Survey. The first active operations were almost immediately afterwards commenced in the township of Inverness, but the adjacent township of Leeds was the scene of the most active efforts to mine the small gash veins and the large beds of low grade ore in the slates of the Quebec group. The history of the three or four companies that have succeeded one another in attempting vainly to extract money out of the Harvey Hill deposits is not an encouraging inducement to a fifth company to undertake such a forlorn task. Yet at the same time, now that there is railroad connection with the mine, and ores of as low grade, though in more favourable rocks, for mining, are being profitably exploited in the West, with very high labour cost, it is possible that money might be made where money formerly was lost. The operations at Harvey Hill, under the English and Canadian Mining Co., were sufficiently attractive to induce almost innumerable other mines being opened, principally on smaller deposits in the Quebec Group of rocks. Dr. A. W. J. Wilson, in 1909, spoke of his being recently commissioned to examine 525 places in the Province in which some of

the minerals carrying copper have been found at some time or other. During the same early days a famous mine at Acton was opened on limestone, probably of Cambrian age. It was an extremely rich mass of what to-day we would call secondary ores, which cropped out at surface, and was for a time very productive and very profitable, according to the standards of those days. The rich ores being exhausted, work was abandoned, but with the knowledge we now have of copper in limestones and shales in some of the Arizona copper districts, the rocks carrying this mysterious and once famous deposit should be carefully studied.

The only mine still working of these hundreds of failures is the sulphur-bearing Eustice mine near Sherbrooke. It was opened under a different name in those early days, where there were three companies operating on these sulphur deposits. The two mines most energetically worked were—one owned by the Hon. George Drummond, and the other by a Hartford company. At that time the ores were roasted in heaps and matted in small brick furnaces, whose life was about a week or ten days; and if a furnace could put through ten tons a day, it was looked on as a phenomenon. The general manager of the Hartford, however, appreciated the necessity of utilizing the sulphur, and small acid works were erected at St. Joseph, opposite Quebec, and acid there first made out of the Capelton ores and the residues leached for copper. There was, however, no market for the acid, and this progressive action in the right direction failed, like so many others, because premature—a negative lesson in conservation.

MICA MINING IN THE PROVINCE OF QUEBEC*

Hugh. S. de Schmid, M. E.

The majority of the mica mines operated in Quebec Province (as also in other parts of Canada), are concerned with the extraction of phlogopite or amber mica. Few muscovite or white mica mines have ever been worked in Canada, and such have, as a rule, also produced feldspar as a by-product.

Muscovite.

The muscovite-bearing pegmatite dykes are found cutting (as a general rule conformably) normal gneiss at localities as far apart as the coast of Labrador and the Yellow Head Pass in the Rocky Mountains. Scarcely more than a dozen muscovite mines have ever been operated in Canada, and of these the two largest are located in the eastern portion of the Quebec amber mica area, in the townships of Buckingham and Villeneuve, in Ottawa county. They are now both owned by O'Brien & Fowler, of Ottawa. The general occurrence of muscovite is, in the main, similar in all parts of the world; that is to say, the mineral is always found in pegmatite, or coarse, granitic dykes, the mass of which is composed of feldspar and quartz in varying proportions, and in which the mica crystals occur disseminated. Mining at the above-mentioned localities has been carried on in an intermittent fashion since the early eighties, and considerable quantities of mica, feldspar, and quartz have been shipped.

Pegmatite dykes have almost always well-defined contact with the enclosing country rock, and the mica not infrequently occurs in greatest quantity along or adjacent

to such contact, affording a ready indication as to the direction to be followed in mining.

All the muscovite mines in this Province are operated openwork in the readiest and simplest manner. An open cut is driven into the side of the hill traversed by the mica-bearing dyke, and as a rule adjacent to one or other of its contacts with the enclosing gneiss; or, if the deposit is located on the summit of a ridge or hill, the contact is excavated by a series of pits at intervals along it. The mining of such deposits calls for only ordinary methods, such as would be employed in quarrying—the mines being, in effect, open quarries. The following of the mica crystals presents the main difficulty and for this there is no rule, the locating of sufficient mineral to pay expenses being purely a matter of chance. It is almost always necessary, in extracting a relatively small amount of mica, to break a very large quantity of ground, and the removal of this waste constitutes one of the principal drawbacks to mining. Where the feldspar and quartz enclosing the mica crystals occur in a sufficiently pure and non-intergrown state, both these minerals can sometimes be saved as by-products—the feldspar to be used for the manufacture of porcelain and the quartz in electric smelting, the manufacture of ferro-silicon, etc. The feldspar thus saved at the Quebec muscovite mines is shipped to the potteries at Trenton, N. J., and the quartz to Welland, Ont. In addition to the quality of spar sufficient for the porcelain industry, there occurs at the Villeneuve mine a very pure microcline feldspar, which is

*Published with the permission of the Director Mines.