

1,000 tons per month. This mine is only 28 miles from the coast, with which it is connected by a railway. Besides this several small mines are being exploited. The freight on ore from New Caledonia to Glasgow is 20 shillings per ton. There were, therefore, on the wharves in New Caledonia a surplus of ore containing 8,100 tons of nickel, independent of current production, waiting a market, or equal to two years' consumption of the whole world. The mines more recently developed by Mr. Higgins are reported to be still richer and more extensive than any in operation on the island, and he is only waiting a market for the ore.

#### NICKEL IN NORWAY.

In Norway great deposits of nickel-bearing pyrrhotite have been opened, but they are low-grade. Prof. Voght, an eminent authority, states that "metal assaying 98 to 99.50 nickel can be produced in Norway at 40.2c. per kg.," equal to 18½ cts. per pound.

Some richer deposits have been opened, running from 3 to 6 per cent. nickel, and have been secured by a New York gentleman. I am asked to examine some other properties there next month, with a view to purchasing them and supplying the English as well as the American markets. Mr. Rothwell reports a discovery of ore in British Columbia assaying 7 per cent. nickel and another one near Bowrie, South Australia, assaying 19 and 26 per cent. Extensive masses of pyrrhotite, carrying nickel and copper, are found near St. Stephen, N.B., and are being exploited. According to Mr. Thos. Macfarlane, F.R.C.S., the ore carries nearly 3 per cent. Cu and Ni, which is equal in value to many of the mines in this district. Mr. Macfarlane is an accomplished metallurgist and has had many years' experience in Norway in charge of nickel and cobalt mines and works.

#### THE YEARLY CONSUMPTION.

In the annual report of the Geological Survey of Canada for 1897, the most recent issue, it is stated: "It would thus appear that the world's requirements of nickel are from 4,500 to 5,000 tons per annum, of which amount Canada supplies from 30 to 40 per cent., and that the sources of supply at present worked are more than capable of taking care of the demands made upon them." Page 145 S. The consumption of nickel in the United States is calculated to be about 800 tons a year, and this principally in the shape of nickel oxide.

These figures condemn the theory—the misleading and perilous illusion that Canada controls the nickel markets of the world. I may add that I know that a cargo of New Caledonia ore was offered to the Orford Copper Company delivered in New York at the same price as Sudbury matte. The ore can be smelted and refined more cheaply than the Sudbury alloy, which is composed of copper, nickel, iron, sulphur, arsenic, etc. The cost of mining in New Caledonia is very low. French convicts and native labor are employed by contract at a few cents per day, with board, but are under the direction of free European foremen. About Sudbury surface men are paid \$1.25 to \$1.40 per day, miners \$1.50 to \$2, and mechanics \$2 to \$2.50. In Norway excellent labor can be obtained at half these rates.

Freight from New Caledonia to Glasgow averages about \$5 a ton, from Sudbury to New York the rate is \$7. Therefore, both in cost of production and freight to market, the Canadian miner is at a disadvantage.

#### TREATMENT OF ORE.

The metallurgical treatment of the ore from an economic point of view is quite as important as the mining. The methods in use previous to the discovery of nickel ore in New Caledonia were not suited to its nature and a new process was devised and patented by Mons. Garnier, after whom both the ore and the process are named. The hydro-silicates are smelted with alkali waste from the chemical

works, and the nickel separated as an oxide. This method was tried unsuccessfully on the Sudbury matte, which is a complex alloy of copper, nickel, iron, sulphur, arsenic, etc. The Orford Copper Company, originally an Eastern Townships organization, bought the first shipments of ore made from this district as copper ore, but soon discovered that it carried a notable quantity of nickel, and promptly informed the Canadian Copper Company of the fact. The difficulty of saving the nickel economically soon became manifest, but the Orford Company undertook a series of experiments, at great cost and extending over a period of more than two years, which resulted in the development of a method thoroughly successful and which is now known as the Orford process. Until this point had been reached the Canadian Copper Company could not find a market for its product, and had an accumulation of 6,000 to 7,000 tons of matte at Copper Cliff, a photograph of which is given in the Geological report (Dr. Bell's), 1890, at page 55 F. The Orford Copper Company added to its plant cupola, calcining and reverberatory furnaces capable of treating all of the matte produced by the Canadian Copper Company. For the refined product, principally nickel oxide, it was necessary to find a market. To this Mr. R. M. Thompson, President of the Orford Company, devoted his time, and interviewed every large consumer of nickel in Europe, and succeeded in establishing a market and a reputation for Canadian nickel. He has visited Europe three or four times a year, and is there now on this very business. The Rothschilds and their friends are the owners of the producing New Caledonia mines, and the fight for a market has been severe; the price having been forced down from 60c. to 25c. At this low figure operations have only been made possible by the present excellent and economical management of the Canadian Copper Company and the reduced cost of separating and refining the metals, effected by the improved methods of the Orford Copper Company.

#### NICKEL MARKET LIMITED.

It will be seen that the nickel market is a very limited one, and cannot be forced. The principal demand is for alloying steel for armour plates, but in this it is being replaced to some extent by chromium. Ferro-chromium and chrome, nickel, containing about 75 per cent. of chromium and 25 per cent. of nickel, are now used by the most successful makers of armour plates. The value of nickel ore is much over-rated. An ore yielding 4 per cent. pure copper is worth more to the metallurgist than one carrying 2 per cent. nickel and 2 per cent. copper, which is more than the average yield of the ores of this district. The drawback to our nickel is the cost of separating it from copper, and other associated metals and metalloids, which are practically impurities. A very small percentage of copper or sulphur in steel is ruinous.

But Canada produces from 2,000 to 3,000 tons of chrome iron yearly, which is shipped principally to Pittsburg and Philadelphia. Why not place an export duty on that as well as upon nickel-copper matte? It has not been asked for simply because through it Mr. S. J. Ritchie, the chief agitator in this export duty matter, cannot assail the interests of the Canadian Copper Company.

Coming to the cry of monopoly, which has been reiterated *ad nauseam*, why will those who write on the subject not make themselves acquainted with the facts? The Canadian Copper Company has no monopoly nor anything approaching a monopoly of mines, mineral lands or smelting works. It is true that it is at present the only company mining and smelting copper-nickel ores in Canada. When it was brought to the verge of financial ruin by the incompetence of its first management, the directors, being men of wealth, advanced and became responsible for several hundred thousand dollars, which enabled the company to continue operations and meet