

1893 the value was \$238,200. There are over one hundred less in the Welland and Essex fields, and most of it is piped across the border to Buffalo and Detroit.

Salt was first discovered in Ontario when boring for oil at Goderich in 1865, and it has since been found at various points in south-western Ontario, from Goderich to Essex Co., where it has been obtained within the last few months. Practically all the salt produced in Canada comes from our province, the amount running from 30,000 to 60,000 tons, and the value from \$100,000 to \$230,000. No salt is mined in the province, all being made from brine pumped from wells and evaporated, but the amount is unlimited; beds of rock salt from six to one hundred feet thick having been proved to exist under hundreds, if not thousands, of square miles of territory. It is to be hoped that the attempts now being made on a small scale to develop the chemical industries dependent on salt as a raw material, may be successful. If we produced our own soda, soap, hydrochloric acid and bleaching powder, we should materially increase our home manufactures and add to the demand for Ontario salt.

Turning now to the metals, we need not refer specially to lead, which has been worked in an experimental way only at a few points in the Ottawa valley; some thousands of tons of ore having been produced in all, but very little of it smelted or marketed.

Iron is of much more importance. Ontario possesses deposits of all the chief ores of iron. The upper Laurentian of the Ottawa valley contains, especially near outcrops of crystalline limestone, many ore bodies, some of considerable dimensions, most of them magnetite, but some hematite. Southern Ontario has more or less extensive areas of bog ore, and Western Ontario can boast of immense beds of magnetic ore in the Atikokan and Greenwater Lake regions; and of still greater beds of hematite along the Mattawin River; while low grade siderite or carbonate of iron has been found to the east of Port Arthur. In the early days of the province iron ore was not only mined, but also smelted in furnaces of small and antiquated forms, but producing charcoal iron of excellent quality. A good account of those primitive operations may be found in the report of the Bureau of Mines for 1892, where we find that magnetite was used in the Marmora region and bog ore on Lake Erie. Some novelties were tried, such as the use of wood for smelting in a furnace at Madoc. The iron was usually cast into stoves, potash kettles, etc., and found a ready sale in the province. No iron has been smelted, I believe, since 1844 or 1845 though similar charcoal furnaces are working, apparently with good success, under quite similar conditions in the Province of Quebec. These old furnaces were, of course, immensely protected by the difficulty of transporting such a cheap and heavy metal before railways were available. Probably only a few hundred tons of iron were produced in all, since the furnaces were of very small capacity. Since those days a considerable amount of magnetite and also some hematite has been mined at various points in Hastings and counties to the east. Between 1859 and 1873 Ontario and Quebec together shipped 207,000 tons of ore to the United States, much the larger proportion being from Ontario. From 1873 to 1891 there were shipped 423,700 tons; and, in all, Ontario seems to have exported more than 600,000 tons; but since 1891 no work of importance has been done in our mines, the rich and cheaply worked deposits of Minnesota, and the imposition of duties in the United States, having driven our ores from the market. The main obstacle in the development of our iron mining industry has been the lack of mineral fuel for smelting; and it will be of much interest to see how the experiment at Hamilton of smelting Ontario ores with coke from the United States will turn out. It is probable that before long Ontario iron mining will again be of importance, especially in the region west of Port Arthur, where inexhaustible beds of hematite and magnetite form the Canadian extension of the wonderful Minnesota iron region, which now leads the world in production. There seems no good reason, except lack of capital and enterprise, why some point on the upper lakes, where ores, flux and fuel can be brought together cheaply by water, should not become a Canadian Cleveland with a great iron industry; and we may not unreasonably hope to see this in the future.

The copper mining of Ontario is naturally divided into two periods, an earlier one when the Lake Huron mines were operated, and the present when copper is obtained from the Sudbury ores as nickel-copper matte. The product of the Bruce, Wellington, and other Lake Huron mines, between 1846, when they commenced, and, 1876, when they ceased work, is valued in the Report on the Mineral Resources of Ontario at \$3,300,000. In 1886 we find copper once more quoted in our statistics, 164,000 lbs. having been produced; in 1892 there were 1,936 tons; in 1893, 1,431 tons. This copper is in reality only a by-product of the ore worked

for nickel. There is some chance that the Mamainse deposits, which are really an extension of the famous Michigan region, may be worked before long, but the immediate prospects of copper mining as distinguished from nickel mining are not very bright, as the price of the metal discourages fresh ventures. The C.P.R. penetrated the wilds of Northern Ontario in 1882, disclosing the great masses of copper pyrites and magnetic pyrites in what is now the Murray mine, near Sudbury. Before long these ores, first valued for their copper, were found to contain the more valuable metal. Nickel is first mentioned in our statistics in 1889, but the amount produced is not given, since the Canadian Copper Company, the only producer, refused to make its returns public. In 1890, 713 tons of the metal are reported; in 1891, 2,303; in 1892, 2,082; in 1893, 1,642, and in 1894, 2,570½ tons. We have only one important rival as a producer of this metal, the French island of New Caledonia in the Southern Pacific, which provides an output about one-third greater than ours. The New Caledonia ores are of a totally different character from ours, consisting of garnierite, a green magnesian silicate, while ours are sulphides, chiefly pyrrhotite and pentlandite. There seems no doubt that our ore exists in unlimited quantities, and the only question to be considered is the amount of the metal which the world can consume. At present the supply seems to equal the demand, and, since the initial plant is costly, there is no object in new companies going into the mining of nickel. The price has been steadily falling, and, as satisfactory methods of refining it are perfected, this splendid new metal must take a more important place in the world. The use of nickel steel comes slowly into favor, and the great saving in weight for a given strength should bring this alloy into use for structural purposes, especially in shipbuilding. If the British Government could only be convinced of its value in armor plates, we should soon have a boom in nickel mining. With refined nickel quoted at 45 and 47 cents per pound, one would suppose there ought to be a market for solid nickel table-ware and kitchen utensils. It is most desirable, however, that we should refine at least a part of our nickel in Ontario, instead of shipping all the matte to the United States or the old world.

The history of silver mining in Ontario is one of the most interesting and romantic in our mining annals. Silver was first found by Peter McKellar, in 1866, at what was afterwards the Thunder Bay mine; but much more important was the discovery, two years later, of the most famous mine in the Province, the Silver Islet mine. Close to the stormy north shore of Lake Superior, just east of Thunder Bay, a small islet, about 70x40 feet in dimensions, yielded to one or two blasts, silver to the value of \$1,200. The next season 10 men secured over \$16,000 worth of native silver in not more than 14 days of actual work. In 1870 the Montreal Mining Co. sold out to American capitalists and development was begun in earnest. The little islet was enlarged by crib work and filling until there was room for seven buildings with some space besides; while shafts were sunk to the depth of 1,230 feet. Some of this sinking was through rock tightly bound together with wiry native silver, which, with a number of rich silver bearing minerals, some new to science, formed the chief ore. To treat the ore a fifty-stamp mill was erected on the mainland, and the now widely-used Frue vanner was invented by Mr. Frue, the mine captain. The total production up to the end of 1884, when the pumping engines were obliged to shut down for want of coal, and the mine filled with water, amounted in value to \$3,250,000, by far the largest return from any single mine yet recorded in the Province. The product of other mines to the west of Port Arthur brings up the total value of silver from the region to about \$4,300,000, according to the Survey Reports. Since 1881, however, the amount of silver obtained has been trifling, and at present no mining is going on in the Thunder Bay district. The mines, other than that at Silver Islet, seem to be shallow and very pockety. Nevertheless, if silver should again reach its old price, it is probable that several of them could work at a profit.

In August, 1866, two prospectors in the township of Madoc found flakes of a yellow metal like copper, which could be beaten out into thin leaves. They were informed by the geologist, Vennor, that the metal was gold. This find was on what was afterwards named the Richardson mine. Other discoveries in the same and neighboring townships followed, and caused a violent attack of the gold fever in the towns to the south. Probably less than \$100,000 worth of gold was obtained in all from the region, and five times as much was sunk in useless plant. The failure seems to have been due partly to the pockety nature of the deposits, partly to the refractory character of the ore, for instance, near D'loro, where it is arsenical pyrites; but largely to ignorant and extravagant management. In 1871 gold was found by the McKellar in the western part of the province at the Huronian mine; since then