

handicap the operations, and the returns of the railway, some thirty miles long, from general traffic, will, judging from railway experience in Cape Breton during the past two years, not go far toward paying expenses.

### Nickel Metallurgy.

Perhaps the most exhaustive as well as comprehensive and eminently practical treatise on Nickel and the progress in the metallurgy of this rare and precious metal, is to be found in a memoir recently published by a celebrated French engineer, Mons. David Levat, late Director General of the Society "Le Nickel," of Paris, France. This publication contains nearly one hundred pages of a report giving the mode of occurrence and methods of extracting the ore, and its roasting for the matte. It deals with the ores of nickel found in New Caledonia and in Canada. The first chapter has special reference to the New Caledonia ores; their origin, cost and mode of working, cobbing and washing; output of the quarries; transportation; treatment; fusion; reduction in Europe; and sums up also the ores of Canada, in the Sudbury district, giving their exact situation, mode of occurrence, composition and nature; poor outcrops; extraction of the ore in blocks as if from quarry; rich finds; underground work; transportation; calculations as to the revenue, etc.; roasting, the V method so-called; the fusion of roasted ores and the Herreshoff oven; the consumption of the metal; cost and revenue from reducing, etc.

The second chapter deals essentially with the metal as an alloy. Its reduction is discussed by the *dry method* and the separation of the iron, reduction in the reverberatory furnace and reducing furnace; also with the direct refining of the pigs. Then the chapter goes on to discuss the roasting of the reduced matte; the moulding and drying process in the oxide of the ore; reduction in crucibles; in 'mouffes'; in gas producing ovens; then the polishing-off process and the mercantile product itself.

Then there is a description of the *wet process*, the separating of the copper and the application of electrolytic reagents. The methods carried on at the works of Saint Denis. Impurities in the nickel often result from the wet method; these are also discussed whilst the Herrenschildt process is described.

The third chapter deals with the metal in its pure state and the process of fusion for lamination. Properties of the metal are then discussed, how it can be tempered, nickel plating on iron, nickeling, polished nickel and flowing nickel, after which the Powell process is noted together with other new methods of treating nickel.

Then comes perhaps one of the most interesting sections of the report bearing on the alloys of nickel.

The first nickel alloy or combination of nickel with some other metal which M. Levat presents is nickel with copper—in which there is given

a classified list of the various combinations of these two metals producing good results.

How Mailliehort, Silverine, Argentin and other alloys are manufactured, their lamination and subsequent firing. The binary alloy (20 p.c. of nickel and 80 p.c. of copper) of copper and nickel is the one which is being adopted all over Europe for their new armour plates. The various properties of this alloy, offering enormous resistance and high tenacity, are noted, whilst the *coefficient ductibility remains very high*.

The manufacture of hearths for locomotives, of covers, nickel coins, French coins, coins from Mexico also receive a goodly share of notice.

The alliance or combination of nickel with iron and steel comes next. Their application in the case of plates for cruisers; experiments at Annapolis; experiments at Indian Head; the properties of nickel steel; the Mercadier method, and illustrations by Mr. J. Ritez are given and followed by experiments in traction, torsion, etc. The non-oxidizing influences and characters of these alloys is followed up by the available statistics on the output and production of nickel giving also the price of that metal, which is fast becoming so useful in the affairs of every day life throughout the world

### Iron Mining in Ontario.

The man who attempts to write about iron mining in Ontario emulates that distinguished historian whose chapter on the snakes of Ireland consisted of the words, "there are no snakes in Ireland." Whether this statement holds true at the present time when there is a prospect of wigs on the green in the Emerald Isle, may be left to the friends of Mr. Gladstone's Home Rule Bill—or its enemies. But neither of these classes nor any other would deny the truth of the allegation that there is no iron mining in Ontario. The iron mines in this province may or may not rival Solomon's temple of old in point of richness, but they certainly resemble that edifice in the fact that they are strangers to any sound of hammer or tool. The stagnation is complete. There once was a fair amount of activity in the iron districts of Ontario when ore was raised and shipped to the United States markets, but the glowing prophecies made twenty-five or thirty years ago of the probable expansion of the iron mining business in this province contrast strongly with the pitiful performances of to-day. A collapse as complete as that which befel the workers on the tower of Babel has overtaken our iron mines, no one under existing conditions ventures to predict a genuine resumption of activity in any thing like the near future. Owners of caved-in shafts and holes in the ground filled with water may find some satisfaction in knowing that the ore is still on their property and that when the turn of the tide comes their long-deferred hopes of prosperity may stand some chance of fulfilment, but it is hard to live in hope, and to grow fat on it is simply impossible.

What is the cause of this state of affairs? Why is it that with abundant supplies of iron ore, ranging in quality from bad to best, but with plenty and to spare of all grades, with a population growing in wealth, increasing in output of manufactures and advancing in all departments of industrial activity, there was not a single ton of iron raised in Ontario last year? Why is it that there are no blast furnaces in the province? We have endless supplies of ore, mountains of limestone and forests of wood, yet every pound of iron that goes into the steam engines, agricultural implements, mill machinery and the thousand and one products of our foundries and machine shops is smelted beyond the boundaries of Ontario, and not one pound of it is from Ontario ore. We talk of the progress we are making in the arts of civilization and peace, but if our production of pig iron or even of iron ore be taken as the standard of judgment, we shall have to hide our diminished heads in shame. In the vast development which has characterized the business of iron manufacture in the United States, Great Britain and most other civilized countries during the closing half of the nineteenth century, it must be confessed that we have had but little share, and so far as the smelting of the ore itself is concerned, we have had no share at all. We have been content to refine the pig and re-melt the scrap of other lands, but have done nothing to add to the world's stock of the metal. We have not been backward in adopting the improvements and inventions which have been made in the domain of machinery and iron manufacturing generally, but so far as actual production of the metal itself is concerned, while the civilized world has been living in the iron age, we have been living in the stone age.

Comparing ourselves with our neighbors, we find that we are far outstripped by our partners in the Confederation, small even as the total production of iron and iron ore in the Dominion is. Quebec in 1892 raised 28,090 net tons of ore and smelted into pig 36,540 tons, while Nova Scotia raised 75,000 tons; Ontario neither raised nor smelted any. In 1891 the total production in the Dominion of iron was 23,891 (net) tons, and of iron ore 68,979 tons, of which quantity Ontario contributed as her share a total of some 200 tons of iron ore. Contrast this with the 5,856,169 (long) tons of iron ore raised in Michigan in 1890, or the 6,127,701 tons mined there in 1891! The progress made in the iron mining industry in the State of Michigan is in truth something phenomenal, even in these days when advances in trade and commerce are made by leaps and bounds. In 1850, when Ontario was beginning to congratulate herself on the bright prospects ahead of her iron mines, the production of Michigan was only 2,700 tons of ore, in 1891 it had risen, as stated above, to the enormous figure of 6,127,701 tons, while that of Ontario had dwindled to an amount scarcely visible to the naked eye. The marvellous development in the production of the iron mines of Lake Superior, in Michigan, Wisconsin and Minnesota, during the last ten