

The platinum of the Dominion is found with the gold in the alluvial washings in British Columbia, from \$1,000 to \$2,000 worth being obtained annually.

Copper ore is known to occur at many localities in the Dominion, and copper last year ranked fifth in value among the products of our Canadian mines. It is, however, extensively worked in but three districts—about Sherbrooke in the province of Quebec, in the Sudbury region in the province of Ontario, and in British Columbia. The Quebec deposits are worked principally for the production of sulphuric acid, the copper being in a manner a by-product, while last year for the first time British Columbia figured as an exporter of copper ore.

The Sudbury deposits, however, are of special interest and importance because in them the copper is associated with the much more valuable metal nickel, these deposits having yielded last year over two million dollars worth of that metal. The ore occurs in what is known as the Huronian system, a series of rocks rich in mineral deposits wherever they have been discovered in the Dominion, and is found about the borders of the great diorite intrusions which break through the stratified rocks of the series. The ores are worked only at a few points where the Canadian Pacific railway cuts through the metalliferous belt, but as the Huronian rocks have been traced by the Geological Survey far up into our northern forests, there can be no doubt but that great nickel and copper deposits as yet unknown exist in this northern country, awaiting a time when they may be profitably developed. Many of these Sudbury deposits are so extensive that they could easily supply sufficient nickel to meet the demands of the whole world, and it is curious to note that their only important competitors are the nickel deposits of New Caledonia, a French penal settlement in the Southern Pacific ocean. The ore in the Sudbury district is roasted and then smelted at the mines; the resulting matte, in which the nickel and copper is concentrated, being shipped to England or the United States for further metallurgical treatment, by which the metallic nickel and metallic copper are obtained.

The nickel thus obtained is used for nickel plating, for the manufacture of German silver, etc., and large quantities have also been employed in recent years for the production of nickel steel, used for the armor plates of battle ships, it having been ascertained that a small amount of nickel when added to steel produces a metal which is not only hard but very tough, and which is thus eminently suited to resist the powerful projectiles of modern artillery.

(To be continued.)

WATERWAYS OF CANADA.

BY THOMAS MONRO, PRESIDENT CANADIAN SOCIETY OF CIVIL ENGINEERS, AN ADDRESS DELIVERED AT THE ANNUAL MEETING, 15TH JANUARY, 1896.

MR. PRESIDENT AND GENTLEMEN,—In vacating the presidential chair of this society, I shall follow the example of my immediate predecessors, and devote the short time at my disposal to a few remarks upon an engineering subject with which I have been for a long time connected, rather than attempt a *résumé* of the general progress of the profession, or even a description of the principal works begun or carried on in Canada during the year just closed.

A brief consideration of the St. Lawrence as the

great water route of our country, and its latest artificial improvements, may prove somewhat interesting at the present time, when there seems to be a revival in canals—at least in those of dimensions sufficiently large to enable them to compete, for the carriage of heavy freights, with the vastly improved railways of to-day.

It is not necessary, in discussing this question before such an audience, to give an historical sketch of the inception and progress, up to the period of Confederation, of the various works connected with navigation on the route in question. This has already been ably and fully done by several writers, some of whom are distinguished members of this society.

As, however, you are doubtless aware, a mixed commission was appointed by the Government in 1870—just a quarter of a century ago—to examine into the question of affording greatly increased facilities for commerce by our water routes, which were then found to be wholly inadequate to the wants of trade. In its report, dated 24th January, 1871, this commission recommended the adoption of a uniform size of lock for the Sault Ste. Marie, Welland, and St. Lawrence canals, the dimensions of which were fixed at 270' x 45' in the chamber, with 12 feet on the mitre sills. An estimate of the cost of these improvements was as follows:—

Sault Ste. Marie Canal	\$ 550,000
Welland Canal.....	6,550,000
St. Lawrence Canals	4,500,000
Upper St. Lawrence River	220,000
	<hr/> \$11,820,000

It is difficult to understand why a lock of such proportions was projected. As a matter of fact, "there begins our sadness." No valid reasons are given for it. It neither suited the shape of the large class of vessels then engaged in the trade of the upper lakes, nor any that have since been built. Unfortunately the Welland Canal was constructed on this plan. It was begun in 1873, and completed to 12 feet in 1881, at a cost of about fourteen millions of dollars. The additional two feet cost about two millions more, so that a change from a 10 to a 14-foot draught cost about sixteen millions of dollars. The canal was opened to the latter depth in the spring of 1887. Meanwhile the growth of the upper lake trade was enormous. The registered tonnage of vessels passing the Sault Ste. Marie Canal was in 1870, 690,826. In 1887 it was 4,879,598, while the freight actually carried was 5,494,649 tons. The increase in the size of vessels in this interval was so great that numbers of them could not pass through the enlarged Welland at all. Indeed, the short-sighted policy of 1870 prevented this link in the navigation being placed on a modern basis, and left it as much or more out of date in 1887 as it was when the works were begun, whereas a moderate increase in the length and depth of the locks would have enabled a large part of the lake fleet even of to-day to descend into Ontario instead of being penned up in Lake Erie, to the manifest disadvantage of the St. Lawrence route.

As far back as 1867, Colonel Blunt surveyed several lines for a canal between Lakes Erie and Ontario on the United States side of the Niagara River. His locks were 276 x 46 feet, with fourteen feet on the sills. In 1870, Congress made an appropriation for the improvements projected at Sault Ste. Marie, where the two locks then in existence, although 350 x 70 x 12, were to be changed for a single lock of 18 feet lift, the