

to 250,000 tons per year, United States producing about 70,000 tons. The margin between the selling price of ordinary nitric acid and the cost of synthetic azotic acid is large, according to Mr. Surveyer, and indicates that this industry can afford to pay even more than the nitrate plants for its electrical energy.

Calcium cyanamide requires electrical energy in its production. The world's output in 1913 was 226,000 tons. The Canadian plant of the American Cyanamide Co. at Niagara Falls began operation in 1910 with an output of 10,000 tons. The capacity has since been increased to 24,000 tons per year.

Electro-metallurgy.—In dealing with the industries to which hydro-electric power is applicable under this heading, the writer refers to aluminum, the first metal manufactured in a hydro-electric plant, as belonging to electro-chemistry on account of the electrolytic method employed and to electric metallurgy on account of the nature of the product. He traces the growth of its manufacture and the enormous reduction in price per pound which it has experienced. In 1912 the United States produced 18,000 tons of aluminum, France 13,000 tons and Canada 9,000 tons. The actual capacity at present of the plants of the Aluminum Company of America is 90,000 h.p. This company has recently signed a contract with the Cedars Rapids Power Manufacturing Co. for the purchase of 60,000 h.p. to be used at their Massena plant on the St. Lawrence. The Shawinigan plant is the property of the Northern Aluminum Company, and has a capacity of 20,000 h.p.

Nickel, zinc and copper are also referred to as minerals extracted from their ores by smelting in the electric furnace. There is a great field for development of the Canadian industry with respect to them.

The production in the electric furnace of pig iron, ferro-silicon, ferro-titanium, and of steel is lengthily considered. The world's production of pig iron by this method was approximately 25,000 tons in 1912. Extensive experiments have extended over the past several years in Sweden. In Scandinavia there are 20 furnaces absorbing over 36,000 h.p. The world's production of ferro-silicon is over 60,000 tons per year. Two Canadian companies are manufacturing it, the Lake Superior Power Co., at Sault Ste. Marie, with an electric furnace of 250 h.p., and the Electric Metals Co., at Welland, with 4 furnaces totalling 5,000 h.p. Ferro-titanium is worthy of interesting study on account of the large deposits of titanium ore in the province of Quebec.

In the production of electric furnace steel 120 furnaces turned out 175,000 tons in 1912. The electric furnace is also extensively used for melting steel for castings. (Although not mentioned in the paper, it is worthy of note that the Moffat-Irving Steel Works, Limited, Toronto, have a furnace now in operation for the direct production of steel castings or ingots. The furnace is of the 3-phase type, and of 300 kw. This furnace was described in *The Canadian Engineer* for October 23rd, 1913.)

The different industries enumerated by Mr. Surveyer absorb approximately 1,500,000 h.p. Canada's contribution to this enormous utilization of power is just about 3.5% of the total.

Some Foreign Opinions.—After giving a brief survey of the large field which is open and worthy of utmost diligence in study, the paper reverts to some opinions of foreign engineers respecting the future for these industries in Canada. The existing obstacles have been well sifted out, and are, in particular, (1) The severity of winter,

causing a low-water period; (2) Absence of adequate means of transportation; (3) Unlikelihood of enlarging Canadian Works around Niagara Falls, owing to movements on foot for conserving the beauty of the water power. While these criticisms are partly correct and while we are in a measure handicapped with economical, educational and physical obstacles to a rapid development of our water powers, it is inspiring to note the extensive studies that are being made by the Department of the Interior, Department of Public Works, Hydro-Electric Power Commission of Ontario, and the Quebec Streams Commission.

With respect to the attracting of foreign capital we quote the following from Mr. Surveyer's paper:—

"It is safe to say to-day, that through the lack of surveys, of discharge measurements and of gauge readings there are very few of our water falls which could be offered to oversea bankers. To convince these men we must be able to lay before their technical advisers, complete plans to enable them to make in their office a rough estimate of the first development costs; we must, moreover, show them discharge measurements and gauge readings covering a sufficient number of years to allow them to calculate with accuracy not only the minimum power available, but also the average power on which they could depend. The electro-chemical and electro-metallurgical industries require energy at such moderate rates that it would be impossible in most cases to bank on the lowest available power only. These industries must have the help of the periodical power to lower the average cost of the energy utilized during the year."

In concluding, the writer refers to the serious handicap which the development of our water powers has experienced owing to the difficulty of obtaining a clear title of ownership, and to the lack of commerciality of some of the clauses contained in government leases. He urges a separate water power policy for each province.

DUSTLESS STREET CLEANING.

Canada's climatic conditions, to a certain extent peculiar to herself, impose handicaps in the care of pavements which are hard to overcome.

The dust on business streets is the admitted cause of immense damage to stocks of merchandise and also is very disagreeable to the individual. This is especially so in early spring and late autumn, when the water sprinkled on the pavements freezes, resulting in accidents to horses and pedestrians.

Water used on pavements at such times is also the cause of serious damage to them, as it soaks into the crevices in the pavement, and freezing, causes the upheaval and disintegration of the pavement. This is especially noticeable along the curbs and street car lines.

Dustless street cleaners, operated on the combined vacuum and sweeper principle, are in use in a number of North American cities. It is claimed that their work is entirely satisfactory, that after cleaning, no sprinkling is necessary, as the dust has been thoroughly removed. The advantages of this system are numerous, including the absence of the dust nuisance, resulting in conservation of both health and property; the saving of water and a large percentage of the cost of sprinkling; the saving of labor in street cleaning, and the avoidance of damage done by water to pavements in frosty weather.