Instead of this they immediately vested all minerals in the grants issued between 1827 and 1858 except gold, silver, coal, lead, tin, copper, iron, and precious stones. This uncalled for benevolence would not have taken place had they had the benefit of proper professional advice. It was not until 1892 that the government of the province awoke to the fact that there were in addition to the minerals reserved in 1858, others of value, and capable of contributing to the public revenue. Since that date all minerals are reserved except limestone, gypsum, and building material.

The result of this variegated granting of minerals has been baneful in the private grants. In the case of the township, and other large consolidated individual grants, it would not have given rise to much difficulty had the grants been all divided and settled on. As many grantees did not occupy their lots, and vacant lands in the grants have been occupied by squatters and relocated under later grants the procury of title to minerals, the presumed property of the owner of the land is attended with much difficulty. Imperfect surveys and descriptions, non-division of property, squatters' titles, etc., all unite to make the task of searching titles one of much difficulty and doubt.

Legislation is needed to give investors proper titles from the Crown, while protecting any rights acquired by the ancient grantees.

Similar difficulties have arisen in the other older provinces of the Dominion. In Ontario these difficulties have been met with and have been more or less removed. The experience of Nova Scotia should however be of interest to the newer and future additions to the federation of the Dominion.

Full and careful expert advice should be taken and legislation so framed as to preserve to the Crown those minerals which may be of value. The system of Crown mineral leases secures in perpetuity the issue of good and unimpeachable titles. The title to minerals held by owners of the soil becomes in time as indefinite as the land titles. This is more specially felt in comparatively new countries, when small lots of land are granted to people, who in a few years are liable to move to more promising sections and leave titles that can be cleared only after much trouble.

The dimensions of grants in many cases do not coincide with the limits necessary for a proper mining investment. This can be effected most satisfactorily when the mineral title is controlled by only one authority or ownership.

The Canadian Copper Company's Plant at Copper Cliff, Ontario.*

The drawings shown herewith are plan and sectional elevations of a 1,000-ton smelter designed by the Engineering Company of America, New York, and erected at Copper Cliff, Ontario, for the Canadian Copper Company, a subsidiary corporation of the International Nickel Company of New York.

There were several objects that had to be borne in mind, among them the cheap handling of a large tonnage of ore, the storage during the winter months of materials, such as coke and coal, which can be received by boat during summer, the elimination of all needless manual labor, and the thorough efficiency of the power department. The plant was designed to be erected on two levels; the large amount of slag produced had to be taken into consideration, and the disposition of this slag was an important factor in determining the site. The plant, as it now stands, was built along the face of a cliff on the northern side of the deep valley in which the town of Copper Cliff stands.

The problem was to take the roasted pyrrhotite from roast heaps and convert it into 80 per cent. matte, the presence of nickel precluding the advisability of a higher concentration.

On the upper edge of the cliff a system of bins has been constructed for storage purposes. The smelter building proper is situated parallel to these bins with the power-house at the eastern end. A trestle was built on the grade level of the bottom of the bins, which is also the grade level of the charging floor connecting the charging floor with the bins and also with the power-house, making a circular track, without switches, running on both sides of the furnaces and passing the coal chute in front of the power-house, which leads directly into the boiler room.

The scheme of operation is as follows: Three miles from the plant is the largest mine. The ore is taken from this mine to the roasting-beds, which are about one-half mile from the smelter. After roasting, the ore is loaded into hopper-bottom cars and drawn up to the top of the bins. The track leading to the top of the trestle is on an easy grade all the way, and is also connected with the main track leading to the Canadian Pacific Railway.

All ore, flux, coke, coal, etc., is handled on these tracks and dumped directly into the bins. Running on the circular track underneath the bins and into the smelter building and past the power house is an electric railroad, with side-dumping cars drawn by electric locomotives. The ore, coke, etc., is loaded into these cars, weighed on the end of the trestle and dumped into the coal chute next to the power-house. All trains are kept moving in one direction, and there is no switching or cross-over.

As shown by the sectional elevations, the site consists of two levels with a difference of 35 ft. in elevation. The upper level is the same elevation as the feed-floor, and is occupied by a double-track pocket trestle 32 by 34 by 600 ft. The storage pockets were made to hold enough coal to last over the period of closed navigation; coal being received by boat at a near-by port on Georgian Bay, as well as coke, ore, silica and clay.

On the lower level are located the power-house, 156 by 102 ft.; the blast-furnace building, 84 by 283 ft.; the foundations for the trestle carrying the electric tramway, connecting the storage pockets with the feed floor; the coal-bins of the boiler-room; the dust chamber 16 ft. wide, 18 ft. high and 444 ft. long; the stack, 15 ft, inside diameter, 210 ft. high; together with the necessary slag tracks, sunken track for loading metal for shipment, tracks to storehouse, etc.

The power-house is equipped with two Nordberg Manufacturing Company's horizontal, cross-compound, condensing blowing engines with steam cylinders 13 in. and 24 in. by 42 in. and air cylinders 57 in. and 57 in. by 42 in. When operating under usual working conditions these engines will deliver 20,000 cu. ft. of free air per minute against a pressure of 40 oz. for use in the blast furnaces. One Nordberg Manufacturing Company's horizontal, cross-compound, condensing blowing engine, with steam cylinders 15 in. and 30 in. by 42 in. and air cylinders 40 in. and 40 in. by 42 in. This engine will deliver 10,000 cu. ft. of free air per minute against a pressure of 15 lb. for use in the converters. Two 13 in. and 26 in. by 20 in. horizontal compound condensing engines built by the Robb Engineering Company, to each of which is directly connected one 200 kw. 600-volt 3-phase alternating current generator built by the Canadian General Electric Company, each generator having its own exciter of 11 kw. capacity belt driven from generator shaft. The electrical energy thus generated is used for hoisting and pumping at the mines, operating the electric tramway for charging cars, turning the converters, and operating the traveling crane in furnace building. The station is also equipped with one 25 kw. motor driven generator set, for furnishing direct current to the electric locomotives. A travelling crane of ample capa-

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