

stand will carry a number of marble slabs or tablets (one for each generator), upon which will be mounted small controlling keys. These keys are arranged on the interlocking system, & they will operate, by means of local battery circuits, a series of compressed air valves & pistons. The latter will, in turn, control a series of 15 switching stands, one for each generator, equipped with the necessary cutouts & switches. The stand will be located under the raised platform, & approximately opposite its corresponding generator. Each stand will carry three-pole carbon shunt circuit breakers, in series with which will be three-pole double-throw switches. The circuit-breakers & switches are controlled by means of compressed air, as previously stated, from the central controlling stand operated by the engineer. Stands similar to the switching stands are provided for the different outgoing circuits. The operator thus has under his eye at every moment the huge generators themselves, their corresponding switches & indicating instruments, & in reach of his fingers are the electric buttons, by means of which the entire plant is regulated & controlled.

The current thus generated will be used for a variety of purposes. It is adapted for use in operating induction motors, which, because of their ideal simplicity of construction & operation, are coming widely into use in place of the more delicate & complicated direct current motor for general power service. It can be used for lighting & heating, & for electrolytic work, as well as in a great variety of electro-chemical processes, such as the manufacture of aluminium, calcium carbide & other products which have been made commercially available only through the application of electric power at extremely low cost, as furnished by such means as the Niagara & the St. Lawrence plants. For some of these purposes the high tension alternating current has to be transformed into low pressure direct current, & this is readily done with very small loss, by means of the modern rotary converter.

Massena is an unusually good centre for such a purpose, as its facilities for transportation are excellent. The Grand Trunk & New York Central lines intersect here, & the Vermont Central & the New York & Ottawa come within a short distance of the town. Large lake vessels may be admitted to the power company's canal, thus affording direct communication by water with the lake system. If necessary, in the future, a lock may be constructed which will pass vessels from the canal into the Grasse River, & thence back into the St. Lawrence River. Such a plant as this affords ideal facilities for the transmission of the electric current over great distances, as is done from the central power plant at Niagara, but it is not the intention of the St. Lawrence Co. to so transmit it; but rather to furnish the power at such low rates that manufacturing establishments will find a strong incentive to locate in the vicinity.

The Canals of Canada.

By Waldon Fawcett.

The tremendous commercial & industrial development which has lately been inaugurated in many different directions in the Dominion is chiefly & directly traceable to the opening of the system of enlarged canals, which has made possible the introduction of vessels of moderate draught in the trade of what is known as the St. Lawrence route. It has been realized for some years that Montreal & other points on the lower St. Lawrence River presented admirable facilities as export ports for grain, just as it has been appreciated that the iron industry of Canada needed little fostering to yield rich returns; but activity in both directions has been considerably retarded by inadequate facilities for water transportation.

That the importance of a waterway linking the Great Lakes & the Atlantic, & the benefit which it would confer, not alone upon Canada, but upon the entire region bordering on the Great Lakes, has been realized, is attested by the immense interest which has been mani-

course the Welland & St. Lawrence waterways. These two systems, together with those portions of the St. Lawrence River where no improvement has been necessary & the chain of Great Lakes & their connecting rivers, gives to Canada what is unquestionably the most remarkable uninterrupted course of inland water communication in the world, a stretch of almost 2,400 miles extending from the Straits of Belle Isle to the ports at the head of Lake Superior.

The project of a Canadian waterway of a uniform depth of 14 ft., extending from the Great Lakes to the Atlantic coast, was first seriously considered in 1872, & it is probably due largely to the fact that plans prepared about a quarter of a century ago have been carried out without alteration or amendment, that the canals just completed were not made somewhat deeper. At the time the scheme was first mapped out the immense, steel, freight-carrying steamers now in service on the lakes were unthought of, even as a remote possibility, & it was supposed that a channel capable of accommodating vessels drawing 13 or 14 ft. of water would meet all the requirements of any trade which might be developed

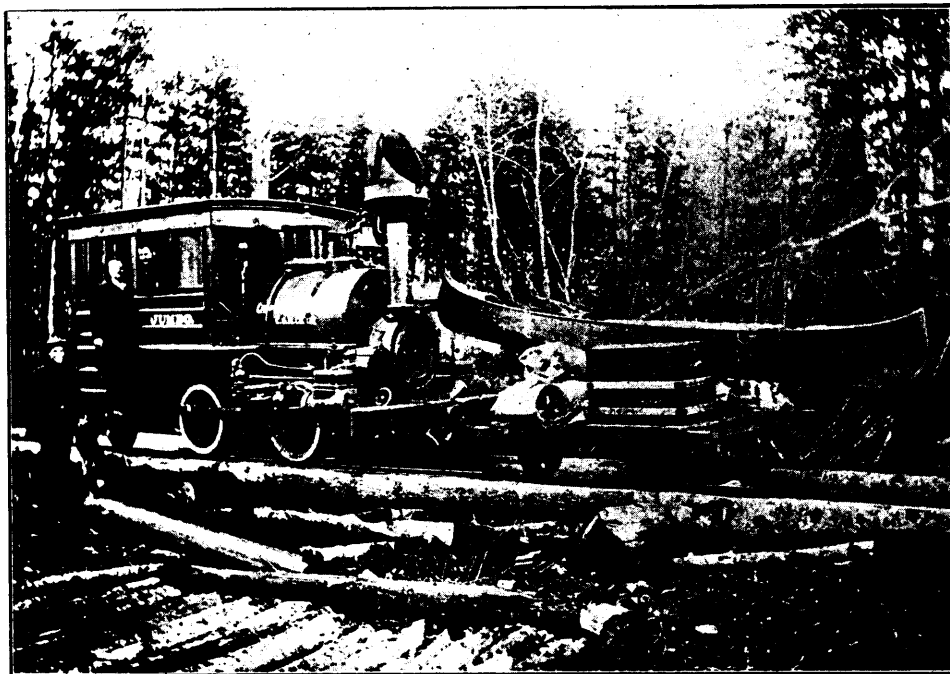
in this part of the continent. Long before the system was completed the mistake was discovered, but it would have been manifestly useless to make the new canals deeper unless a like improvement could be introduced in those first constructed, & so the original uniform depth was adhered to.

The St. Lawrence system proper consists of six canals, ranging in length from one to 14 miles. With the Welland Canal, which goes to make up the seven artificial waterways between Lake Erie & the sea, the canals have an aggregate length of over 70 miles. In this distance there are 53 locks, overcoming a height of 533 ft. To bring the locks to their present uniform dimensions of 270 ft.

in length and 45 ft. in width, more or less extensive alterations had to be made on each one; nor did a single one of the locks have, originally, the desired depth.

The canal system of the St. Lawrence River is necessary to enable vessels to make the ascent of 207 ft. from the level of the river at Montreal to Lake Ontario & to avoid the dangerous rapids which are found at various points. The menace which these have constituted to navigation interests has been well illustrated by experiences during the interval when the improvements on the canals were uncompleted. Upon occasions when the demand for lake-built craft for Atlantic coast service was urgent, the Standard Oil Co. & other interests allowed several vessels which were of too great draught to pass through the canals to "shoot the rapids." This proved an extremely hazardous proceeding, & several of the craft were either lost or seriously damaged.

The largest, the most lately completed, & decidedly the most interesting canal of the St. Lawrence system is the Soulanges, which in the details of design and construction may be



THE COMBINED GOLD MINING CO.'S RAILWAY IN NORTHWESTERN ONTARIO.

fest in the investigations of the Deep Waterways Commission appointed by the U. S. Congress a few years ago to compare the advantages of the various routes exclusively in U.S. territory, for a navigable channel from fresh to salt water. Canada has felt the necessity of such an avenue of communication far more keenly than the U.S., for not only has she practically no shipping on the Great Lakes, but almost the only outlet for the product of the grain fields of Manitoba—one day to become the greatest cereal-producing region in the world—has been found in rail lines. On the other hand, however, Canada had what the U.S. with its immense lake fleet & network of railroads had not, a natural waterway to the coast, which with a moderate expenditure could be adapted to the traffic of ships of fair size throughout its entire length.

Although the Canadian system of canals has only just been brought to the point where it is proving a factor in the utilization of the natural resources of the country, the Dominion Government has, since Confederation in 1867, spent more than \$75,000,000 on the various canal systems, the backbone of which is of