SOME HISTORICAL NOTES ON THE DEVELOPMENT OF WATER POWER*

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UTILIZATION of the power to be derived from rivers in their flow towards the sea antedates history. We know, however, that the Chinese and the Egyptians used crude float wheels, driven directly by the current, to raise water, grind corn and for other ordinary purposes. In the last part of the 16th century, London city had a pumping plant operated by a float wheel. One hundred years later, a most elaborate pumping plant driven by undershot water wheels was established on the Seine River near Saint-Germain.

In Canada, the first water-operated grist-mill was erected at Montreal in 1668, at the foot of the St. Mary's Rapids, and the first water-driven saw-mill was constructed along the Niagara River by the French in 1725, to furnish lumber for Fort Niagara.

Many of the English textile mills of the latter part of the eighteenth century were hydraulically operated. In the American colonies, the development of water falls was forbidden; but later, after the separation, their utilization was an important factor in the growth of the textile industry of the New England States.

With a few exceptions, however, such developments were comparatively unimportant and did not apply to very high heads. The harnessing of the higher and more important water falls is a modern conquest, begun in the last fifty years, and achieved in the last twenty-five years. The principal factors in this conquest were the superseding of old water wheels by the modern turbines, and the numerous discoveries in the field of applied electricity.

It is interesting to note, at this particular time, the prominent part played by the French engineers in the advancement of the modern water power industry. The first rational data for the design and construction of turbines were brought forth towards 1826 by Burdin, Fourneyron and Poncelet. Later Jonval, Fontaine and Girard introduced new types of wheels; then came the Francis turbine, and finally the "American" turbine. About 1830, both Girard and Fourneyron had already operated, though with indifferent success, turbines under heads varying from 300 to 500 feet. These were notable achievements, if we consider the constructional difficulties involved in such developments. However, Aristide Berges is considered by his countrymen to be the father of the "white coal" industry. In 1869, he successfully operated in his pulp and paper mill at Lancey, a wood pulp grinder driven by a turbine operating under a 650 ft. head. Four years later, he installed, in the same factory, another wheel working under a head of 1,640 ft.

The necessity of utilizing the hydraulic power almost at the point of production was, at that stage, a great handicap to the growing exploitation of water powers. True, energy was being transmitted at Schaffhausen, over a distance of half a mile by teledynamic cables, and also by water under pressure, at Geneva and Munich; nevertheless, it was only after several discoveries in the applications of electricity had made possible the distant mobilization of energy under this new form, that the hydro-electric enterprises received the impetus which caused it to become one of the most important factors in modern industry and to revolutionize many social conditions.

The invention of the electric ring dynamo, by the Belgian electrician Gramme, was the beginning of an industrial movement comparable in importance to the introduction of steam. It was shortly after Gramme had discovered the reversibility of the electric dynamo, and the possibility of using it either to generate electricity, when driven by some other motor, or to act as a motor, when connected by wires to another electric dynamo, that a French engineer, Marcel Deprez, successfully conducted a series of experiments on the transmission of electricity, on a line eight miles in length running between the town of Vizille and the city of Grenoble. In 1882, Gaulard and Gibbs perfected, in England, the electric transformer, thus increasing the economical distance of power transmission.

In the first hydro-electric plant built at Lauffen, Germany, in 1891, the energy was generated at 50 volts, then raised to 13,000 volts and transmitted to the Frankfort Exhibition 75 miles away. The improvements in the insulators now permit the use of voltages higher than 150,000 volts, and power has been transmitted over distances exceeding 250 miles.

*Excerpt from an article in "The Montreal Daily Star."

GEODETIC SURVEY ACTIVE DURING THE WAR

Carried Out Wire Drag Survey to Make Certain Waters Available as Naval Base—Projection of Arc of Primary Triangulation Along B.C. Coast

DURING the past year, the Geodetic Survey Branch of the Department of the Interior had the pleasure of co-operation of an international character in war service of some importance, says the "Canadian Official Record."

At the request of the United States Coast and Geodetic Survey, a party was detailed for triangulation work on the Atlantic Coast. A wire drag survey was carried on by the United States organization to make certain waters available as a naval base for allied fleets, and the positions of numerous points and lighthouses to control the accuracy of this survey were furnished by the operations of the Canadian party.

It is interesting also to note that at the commencement of the war, when the presence of German cruisers was feared in the North Pacific, a Geodetic Survey party in Dixon Entrance and Hecate Strait was able to render some assistance to the naval authorities at Prince Rupert. As the Survey had parties on prominent points on the outlying islands, the connecting of these points with Prince Rupert was of great importance in keeping the authorities there acquainted with what might be transpiring in the nearby waters.

Work for Militia Department

The activities of the Geodetic Survey of Canada during the past season have been confined to work of strictly economic importance. Besides the operations mentioned above, triangulation surveys were extended in New Brunswick eastward towards Nova Scotia to fulfil requests made by the Militia Department for the geographic position of points to control the accuracy of their topographic maps in the Halifax vicinity.

Reconnaissance surveys were also extended in the direction of Sydney, C.B., at the request of the same Department. Smaller surveys were undertaken in the St. John, N.B., and Moncton, N.B., vicinities at the request of the Topographic Division of the Geological Survey.

On the lower St. Lawrence River, one party was engaged on primary triangulation, determining also the position of lighthouses and church spires, used in connection with the mapping operations of the Hydrographic Survey of the Naval Department.

In British Columbia

In British Columbia there is another example of international geodetic co-operation. The engineers of the Geodetic Survey of Canada last season continued the projection of an arc of primary triangulation along the British Columbia Coast from the Juan de Fuca strait to Dixon Entrance. The United States Coast and Geodetic Survey having undertaken an extension of this work to the head of Lynn Canal, the Canadian surveys are now contemplating the continuance of the primary triangulation along the Yukon River to the point of crossing of the 141st meridian of longitude.

This work, when completed, and taken in conjunction with the extension contemplated by the United States Coast and Geodetic Survey of their triangulation in the vicinity of Tacoma, Washington, to the Canadian triangulation in the Juan de Fuca strait, will constitute a geodetic arc of over twenty-five degrees of latitude and will connect Alaska, Yukon Territory and British Columbia with the recently adopted North American Datum.