

branch canals or tunnels from this main feeder discharging into wheel pits along its length, but the use of turbines under a head of more than 100 feet, and the great cost of the work, staggered the courage of the promoters for the time, until the marked advance of electrical science showed how power might be utilized not only on the spot, but conveyed to distant points. Upon the plans of Mr. Evershed the Niagara Falls Power Co. was formed by citizens of Niagara Falls, but enough capital could not be raised, and the promoters had to look to the larger cities. At length the Cataract Construction Co., the present corporation, was formed, the leading men in which are Frank W. Hawley, of Rochester; F. L. Stetson, E. A. Wickes and W. B. Rankine, of New York. In July, 1889, a contract was made between the two companies for the construction of the works. They have now built a tunnel 7,000 ft. long, with a raceway sufficient for an intake of 100,000 horse-power. At the power house there are now nearly completed three wheel-pits with turbines of 5,000 horse-power each, though the plans provide for an early extension so that ten turbines providing 50,000 horse-power can be built. The wheel pits are 186 ft. deep and the shafts each 120 ft. long. These wheels have a balancing arrangement, by means of which there is only a difference of 2,000 lbs. weight between a full load and no load. The wheels are after a Swiss design, there being a double wheel on each shaft and the water entering from beneath, so that the wheel is lightened by the pressure of water, and when there is no load on, the weight of the shaft is held by a thrust bearing. No water falls on the shaft anywhere. The wheels are the most powerful ever built, the revolving parts weighing 70 tons each. The supply canal at its head is 300 feet wide and narrows down to 120 feet at the power house. The canal has gateways for twenty wheels. The tunnel into which the water discharges is horse-shoe shaped—as shown in the cut—and is 21 ft. high and 18 ft. 10 in. in its widest part. It has a downward slope of 4 ft. to 7 ft. in 1,000 ft., and the water rushes through it into the Niagara below the falls at the rate of $26\frac{1}{2}$ ft. per second, or nearly 20 miles an hour. Actual work was begun in 1890, and from 300 to 1,500 men have been employed since. Nearly 345,000 tons of rock were removed, and debris has been used to fill up marshy land which can be utilized by the company.

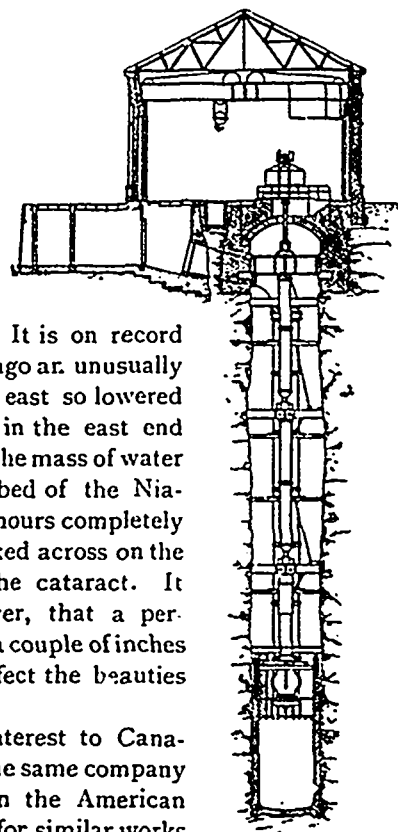
As our readers know, the company propose to supply the city of Buffalo with light, power and heat, and as soon as the transmission to that city is in successful operation they intend to convey electricity to Rochester, 60 miles away. This will be the longest distance to which the electric current will have been conveyed on a commercial scale, and the demonstration of its feasibility will at once settle the question as to whether electric power can be conveyed on a large scale to Hamilton and Toronto from the Canadian side of Niagara.

The dynamos by which electrical power will be generated from the water are the largest yet built. The dynamo for the Intramural Railway Co. at the late World's Fair generated 2,100 h.p., and was the most powerful till then built, but each of these machines will generate 5,000 h.p. They are of the Westinghouse type. The current will be generated at 2,000 volts and at the power house will be transformed to a voltage of 10,000 for transmission to Buffalo, a distance of 22 miles, where it will transform by step-down transform-

ers to any lower voltage required. The conductor will be a copper cable $\frac{3}{8}$ in. in diameter, and it is estimated that the loss by transmission to Buffalo will not be more than ten per cent. The method of transmission will be by overhead wires, but it is contemplated later on to transmit through a subway. In fact an experiment is being made in this direction now. A subway of concrete has been constructed for the Pittsburgh Reduction Company, the next largest concern after the Niagara Falls Paper Company to build on the Power Company's property, and the subtle fluid will be carried through this tiny tunnel 2,500 feet to the point where needed. This subway is five feet in diameter and is a novelty in its way. The heavily-charged wires are strung upon brackets along the sides of the subway, out of the way of anyone passing through. The enormous voltage carried renders them very dangerous to the touch, and they are, therefore, guarded by strong screens.

The effect which the diversion of so much water will have on the beauty of Niagara Falls has created more or less alarm throughout Canada, but Mr. May states that the full amount of the water his company propose to divert would only lower the falls by $1\frac{1}{8}$ inches, while a continuous east wind blowing up Lake Erie will sometimes lower the Niagara 6 inches. It is on record that 40 or 50 years ago an unusually heavy gale from the east so lowered the volume of water in the east end of the lake, blowing the mass of water westward, that the bed of the Niagara was for several hours completely dry, and people walked across on the bed rocks above the cataract. It would seem, however, that a permanent lowering of a couple of inches would not visibly affect the beauties of the falls.

It is of special interest to Canadians to know that the same company owning the works on the American side have a charter for similar works on the Canadian side, upon which they propose to begin construction work in the coming spring. The charter granted to the Canadian Niagara Power Co. (under which title they will operate on this side) in 1892 confirms the 100 years lease granted by the Queen Victoria Niagara Falls Park Commission. Under this charter they are bound to produce power within three years. Nature better favors the construction of a tunnel on the Canadian side, and more is the pity that this franchise was not entirely in the hands of Canadian and English capitalists. At present a few minor stockholders give a native flavor to the Canadian scheme, but one cannot but admire the pluck of the Americans who have conceived and are so energetically carrying out so vast an enterprise. On the Canadian side the tunnel will require to be only 800 feet long, as against 7,000 feet on the American, while on the Canadian side they can also easily build two tunnels side by side, each



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