PARK.

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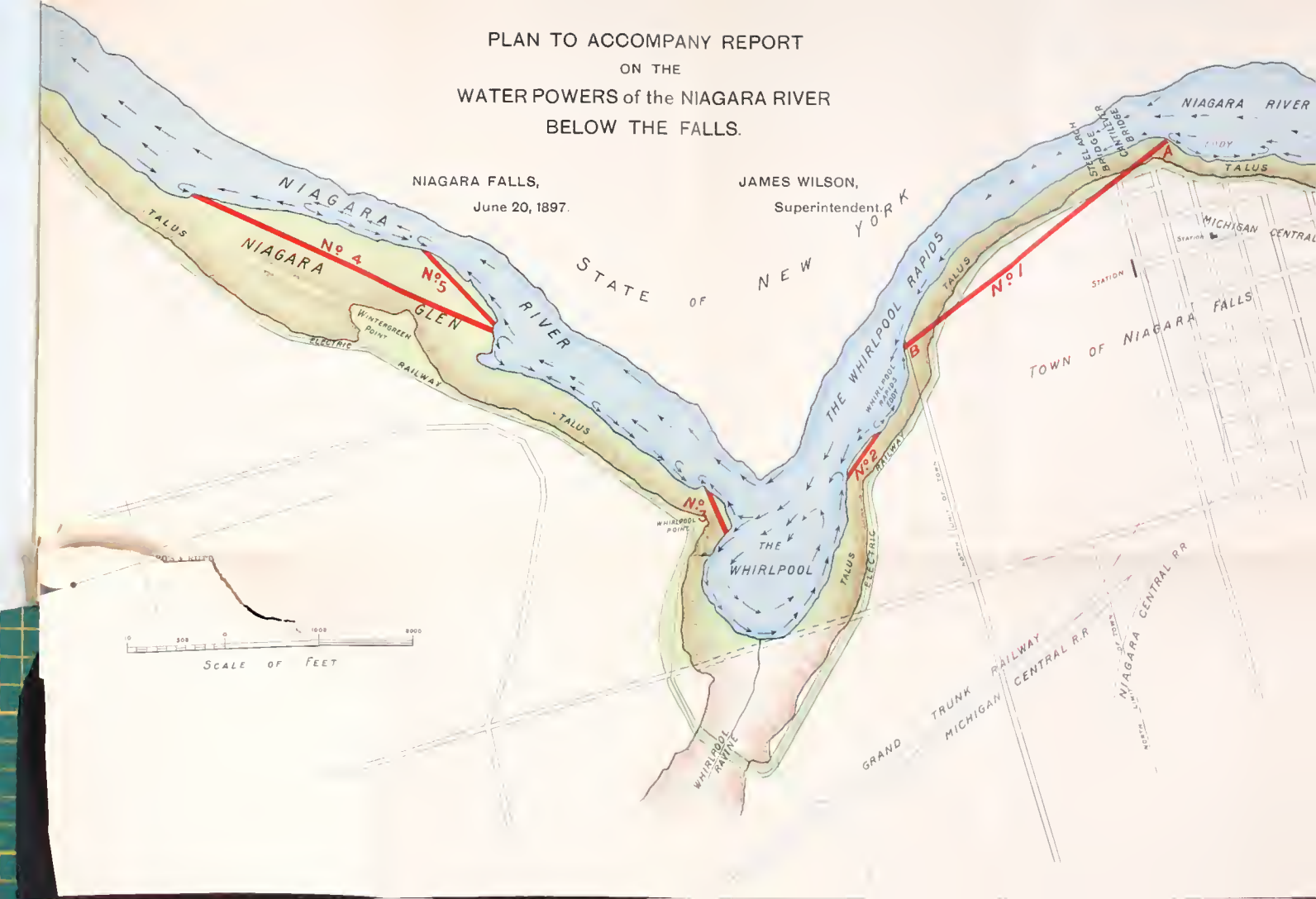
WARWICK BRO'S & RUTTER, PRINTERS &C., 68 AND 70 FRONT STREET WEST.
1898.

PLAN TO ACCOMPANY REPORT
ON THE
WATER POWERS of the NIAGARA RIVER
BELOW THE FALLS.

NIAGARA FALLS,
June 20, 1897.

JAMES WILSON,
Superintendent.



REPORT

OF THE

COMMISSIONERS

QUEEN VICTORIA NIAGARA FALLS PARK.

1897.

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:

WARWICK BRO'S & RUTTER, PRINTERS &C., 68 AND 70 FRONT STREET WEST.

1898.

TORONTO, 12th January, 1898.

SIR,—I have the honor to transmit herewith, for submission to His Honor the Lieutenant-Governor, the twelfth annual report of the Commissioners for the Queen Victoria Niagara Falls Park, being for the year ended 31st December, 1897

I have the honor to be,

Sir,

Your obedient servant,

J. W. LANGMUIR,
Chairman.

Hon. E. J. DAVIS, M.P.P.,
Provincial Secretary.

TWELFTH ANNUAL REPORT

OF THE

COMMISSIONERS

FOR

QUEEN VICTORIA NIAGARA FALLS PARK.

To the Honourable SIR OLIVER MOWAT, K.C.M.G.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOR:

The Commissioners for the Queen Victoria Niagara Falls Park beg to submit their twelfth annual report, together with a statement of the receipts and expenditures for the year ended 31st December, 1897.

Before entering on the record of their operations during the past year the Commissioners gladly avail themselves of the opportunity to express their great gratification in finding your Honor once more officially associated with the important work in which they are engaged. They can never forget that the establishment of the Park as a national heritage, under the control of the Government of Ontario, as well as its subsequent extension and maintenance, has from the first found in your Honor a warm friend and supporter.

In their last annual report the Commissioners referred at some length to the application made to them by the Canadian Niagara Power Company for an extension of the time stipulated in the agreement of April, 1892 (ratified by Statute of Ontario 55 Vic. c. chap. 8) for the commencement of the operations of that Company in the Park. The report fully sets out the reasons which led the Commissioners to recommend as they did that the time allowed the Company for the completion of the first section of the work should be extended for a period of eighteen months from 1st November, 1898. Although the Government could not see its way to sanction the recommendation for the extension of the time limit allowed the Company for this work, they came to the conclusion, after protracted negotiations and after giving the matter the fullest consideration, and having regard especially to the urgent demand for electrical power by various industries

located in the immediate neighborhood of the Falls, to grant permission, as the Commissioners recommended, to the Canadian Niagara Power Company to arrange with the Niagara Falls Park and River Railway Company for the utilizing of the surplus power which the latter Company had available for use in its power house in the Park. In accordance with this authority an agreement, authorized by the Lieutenant-Governor in Council, has been approved by the Commissioners, which will permit of a substantial supply of electricity for lighting and power purposes being furnished local users without delay. This arrangement does not in any way relieve the Canadian Niagara Power Company from its covenant in the original agreement as to the time for the commencement and completion of their proposed works within the Park.

The terms of this agreement are as follows :

This agreement made the twenty-seventh day of November, one thousand eight hundred and ninety-seven between the Canadian Niagara Power Company (hereinafter called the Power Company) of the first part and the Niagara Falls Park and River Railway Company (hereinafter called the Railway Company) of the second part, and the Commissioners for the Queen Victoria Niagara Falls Park acting herein on their own behalf as well as on behalf and with the approval of the Government of the Province of Ontario (and hereinafter called the Commissioners) of the third part.

The expression "statutory agreement" as hereinafter mentioned and applied to said Companies respectively shall be deemed to relate to the agreement and statutory enactments contained in the statutes respectively relating to the said Companies.

Whereas the Power Company and the Railway Company respectively derive their powers and rights under the Acts of the Legislature of the Province of Ontario passed in the fifty-fifth year of Her Majesty's reign and numbered chapters eight and ninety-six of 1892, whereby agreements made with the Commissioners are confirmed and declared to be binding on the parties hereto;

And whereas the Railway Company by its statutory agreement with the Commissioners obtains from the waters above the Falls at the point of intake now used water power to generate electricity for the purposes of working the railway and the machinery necessary to operate and light the railway.

And whereas the Railway Company has capable for development in its power-house by the means aforesaid hydraulic power in excess of its present needs for the above purposes (and as by the agreement limited) :

And whereas the Power Company until such time as it shall be prepared and ready to generate electricity or pneumatic power in terms of its statutory agreement with the Commissioners or as may be required thereby is desirous to supply the demand for immediate use of electricity for manufacturing purposes by local users of power within Ontario, provided such power can by consent of Commissioners be obtained :

And whereas the Railway Company and the Power Company, subject to the approval hereinafter mentioned, have agreed to develop electric power as hereinafter set forth by means of the said hydraulic power if duly licensed to deal with the same and the Commissioners have approved of their proposals to supply power for the purposes aforesaid and are willing to extend to the Railway Company power to use such surplus hydraulic power as may now be developed by the intake of water as now taken and used without further increasing the volume of water now taken at such point of intake and such concession to the Railway Company by the Commissioners being also made at the request of the Power

Company, such request being testified by being parties to these presents and for their advantage notwithstanding anything in the statutory agreement between the Commissioners and the Power Company contained:

These presents witness:

1. The Railway Company will without unnecessary delay, and at its own expense in its power house within the Park as now located and as the demand thereof may arise (but within the capacity of its plant), develop, generate and furnish to the Power Company hydraulic power upon a horizontal shaft attached to the shaft of the turbines and above the floor of the power house, and the Power Company will without unnecessary delay, and at its own expense, supply, instal and operate the necessary electrical machinery, apparatus and conductors to transmute such hydraulic power into electrical power, which electrical power the Power Company will transmit to points beyond the Park and supply the same to all persons, parties, or corporations desirous of using the same within a radius of four miles from the said power house in the Park, at prices and terms to be agreed upon between the Power Company and the Railway Company, the prices and terms not to exceed the prices charged for similar quantities and services supplied for similar purposes and at similar distances by the Niagara Falls Power Company on the American side for use on said American side. Provided always, that all works to be done and executed by the said Companies or either of them within the park or within the boundaries of the Park as such boundaries are now known shall be in accordance with the terms and conditions and subject to the approval of the Commissioners as by the statutory agreement between the Commissioners and the Power Company hereinbefore mentioned is stipulated, whether such terms and conditions relate to works of construction or works, wires and cables for the transmission of electricity or pneumatic power to points within or beyond the park, and the said Companies or either of them shall not execute works within the Park other than limited or specified by the said statutory agreement between the Commissioners and the Power Company and in accordance with the terms thereof and as provided and limited by these presents.

2. Annually during the continuance of this agreement, the Power Company shall pay to the Railway Company a sum of money equal to ten dollars per electrical horse power per annum for each electrical horse power furnished and sold under this agreement for lighting, heating or power purposes, excepting for the one hundred horse power referred to in the fourth clause of this agreement. Such payments shall be made within thirty days after the expiration of each three months during this agreement, and within ten days after the expiration of the said three months the treasurer of the Power Company shall make and deliver to the Railway Company a verified statement of the gross amount of its receipts from such sales for the preceding three months, and the books of the Power Company shall be open to inspection and examination by the treasurer of the Railway Company, for the purpose of verifying the correctness of such statement as to such gross receipts.

3. Six months after the receipt of written notice from the Power Company (served after 1st October, 1899) of its readiness to deliver power by means of works and plant constructed under and in pursuance of its statutory agreement with the Commissioners hereinbefore mentioned, the Railway Company agrees that the Power Company may take over such customers and contracts as it may then have for electric power to be supplied or sold under this agreement, and the Railway Company shall cease operations hereunder and the Power Company

shall thenceforth supply the same from its own works and plant, and thereupon this agreement and all rights of the Railway Company thereunder shall cease and terminate.

4. While the Power Company is constructing its proposed works within the Park, under and in pursuance of its statutory agreement with the Commissioners hereinbefore mentioned, the Railway Company shall during such construction allow the Power Company, out of such available surplus power free of charge and when and as called for at the Railway Company's power house in the Park, power for light and power purposes during such construction but not in excess of one hundred electrical horse power, provided that if at such time that amount of surplus electrical power be not available, the Railway Company may and will furnish in lieu thereof and free of charge power to that amount on the horizontal shaft attached to the shaft of the turbine above the floor of the power house and space within its power house sufficient for the operation of a dynamo providing such amount of power driven by the shafting from the turbines of the Railway Company, all of which shall be operated in the Railway Company's power house for the benefit of the Power Company during the construction of the first section of its works specified in clause ten of Power Company's said statutory agreement with the Commissioners, provided also that if during the term of this agreement the Power Company shall at no time have sold two hundred and fifty (250) horse power then the Railway Company shall not be obliged to furnish the Power Company any free power, anything in this clause to the contrary notwithstanding.

5. This agreement as between the Railway Company and the Power Company shall be operative for the term of three years from 1st October, 1897, but may be terminated by the Power Company at any date after 1st October, 1899, provided six months' written notice shall have been given to the Railway Company, as hereinbefore provided, and upon such termination the Power Company will, to the extent of the ability of its works then completed, assume and fulfil all contracts then outstanding for the sale of power which shall have been theretofore made by the Power Company, with the Railway Company's prior approval.

6. It is mutually agreed by and between all the parties hereto that neither the execution of this agreement, nor any operation thereunder, shall be construed as in any way constituting a waiver or suspension of any right of the Power Company or the Commissioners under the charter and statutory agreement between the company and its incorporators and the Commissioners, nor as conceding by the Government or by the Commissioners any extension of the rights of the Railway Company under its charter or its statutory agreement with the Commissioners, nor as in any way waiving the individual liability of any of the corporators of the Power Company named in its said charter and statutory agreement, nor as in any way affecting the terms and conditions of the statutory agreement heretofore made between the Commissioners and the Power Company or Railway Company (excepting the temporary right hereunder given by the Power Company to the Railway Company), nor as in any way extending the time of the Power Company or the contracting parties under the Power Company's charter or statutory agreement to begin and complete the works under the said statutory agreement with the Commissioners, nor as any delay or suspension of notice already given to proceed with such works, nor as any authority or excuse for any delay in the commencement, construction or completion of said works.

7. If this agreement is terminated by the Power Company either by notice, consent or effluxion of time, then upon such termination, and, provided the Power Company be not ready to assume and fulfil the contracts then outstanding as provided in the fifth clause of this agreement, the Commissioners shall have the right in their discretion to acquire from the Power Company the electrical machinery, fixtures and appliances, contracts and business operated hereunder, and the same shall, in case they shall be taken over, become vested in the Commissioners at the then value of such electrical machinery, fixtures and appliances as such without claim for compensation for such contracts or business as may (if the parties cannot agree) be determined by a commission to be appointed by the Lieutenant-Governor-in-Council. In such case the Railway Company undertake and agree, upon request of the Commissioners, to carry out the terms of this agreement upon their part upon the same terms as for the Power Company for such time as the Commissioners may desire. In the event of the Commissioners taking over the said machinery, fixtures and appliances, they shall have the same right to give notice terminating the agreement with the Railway Company as the Power Company has hereunder.

8. And for greater certainty it is hereby agreed by and between the Commissioners and the said parties severally as follows:—

(*a*) By the Power Company, its corporators and promoters in the Act of Incorporation named, and any or either of them, that neither these presents nor any other act, matter or thing herein or hereby contained, nor any matter or thing done in pursuance hereof shall be taken or held to be any acknowledgment or recognition by the Commissioners that the Power Company has been properly or fully organized or formed within the terms of the Act or statutory agreement, nor shall the said corporators or promoters, or any or either of them, be deemed to have been freed or released from their individual liability, if any, to the Commissioners in respect to the said Act and statutory agreement.

And the Power Company, its corporators and promoters as aforesaid covenant with the Commissioners that if at any time prior to the termination of this agreement, said Power Company, its corporators and promoters, in order to terminate the statutory agreement and lease of 7th April, 1892, with the Commissioners, shall give three months' notice in writing required by clause five thereof, or if at any time during the continuance of this agreement, the Power Company, its corporators and promoters, shall fail to pay the annual rental reserved under the terms of said statutory agreement of April 7th, 1892, as therein provided, then and in either such case the Power Company will surrender its rights under this agreement, and this agreement shall terminate and cease and the Commissioners shall have the privilege of exercising the right granted them under the seventh clause of this agreement in the case of its termination by notice, consent or effluxion of time.

And the Power Company, its corporators and promoters, covenant with the Commissioners, that up to and including the 1st of November, 1898, the Power Company will pay the Commissioners the rental agreed to be paid half-yearly, notwithstanding anything in the statutory agreement provided.

(*b*) By the Railway Company: That nothing in this agreement contained shall be taken to confer upon the Railway Company any powers or rights save those hereby expressly conferred, or permit the Railway

Company to use or supply more water or enlarge or extend the capacity race flume or intake of water without the consent in writing of the Commissioners to be first approved by the Lieutenant-Governor-in-Council.

9. And the Commissioners, parties to the third part hereto, hereby grant to the Railway Company the right to use the surplus power to be derived from the Niagara river as hereinbefore described for their behoof and advantage, and the Commissioners do also grant the same to the Power Company in so far as such is capable of being developed and extended by the Power Company in accordance with the terms of these presents, and such grants to the said Companies are upon the conditions and are accepted by such Companies as subject to the conditions that such Companies do observe and perform towards the Commissioners all duties and obligations towards the said Commissioners in these presents contained, and upon breach of any of the said duties, obligations and conditions herein agreed to be done and performed by the said Companies, or either of them, it shall be optional with the Commissioners to withdraw and cancel such grants, rights and privileges to either or both of the said Companies.

10. It is hereby agreed by and between the Power Company and the said parties respectively, and these presents are upon this express condition that the said Power Company shall, within fifteen days after the execution hereof, enter into contracts for the supply of the machinery necessary to the generation of power as hereinbefore mentioned, and shall further be prepared to provide electric power as herein agreed upon within a period not exceeding five months from the date of the execution of the said agreement.

In witness whereof the parties hereto have duly executed these presents.

Signed, sealed and delivered in the presence of

FRANCIS U. WILCOX.

Attest as to the signatures of N. F. P. and R. Ry. Co. and Commissioners,

WALLACE NESBITT.

EDWARD B. OSLER,
President.
R. A. SMITH,
Secretary.

The Canadian Niagara Power Company.

ALBERT D. SHAW,
President.
W. B. RANKINE,
Secretary.
J. W. LANGMUIR,
Chairman.

While it is a matter of regret to the Commissioners that the carrying out of its undertaking should have been so long delayed by the Power Company, and that the benefits to the locality which have been so eagerly looked forward to have thus been deferred, yet the Commissioners are of opinion that the experience gained in the construction of the very extensive generating plant on the American side will be of very great advantage to the Company in establishing its works in Canada on a sound basis from the beginning. This will especially hold true in respect to the transmission of electrical energy to distant points, the successful accomplishment of which will, without doubt, be one of the chief inducements to

generate power on a large scale at this place. The knowledge now being gained by the actual working of the Niagara Falls, Buffalo and other long distance transmission lines, cannot but greatly add to the ultimate success, in a broad and comprehensive manner, of the Canadian Niagara Power Company's plant in the Park.

Reference was made in last year's report to the desirability of securing the thirty-three or thirty-four acres comprising the remainder of the ordnance lands at Queenston Heights, in order that these outlying parts of this territory might be embodied in the Park and be cared for conjointly with the lands now under Park control. While there is every reason to believe that the Government of Canada favors this proposal, the Commissioners have not up to the present been put in possession of these lands. With reference to the several petitions from public bodies presented to the Governments of Ontario and Canada proposing to transfer to the jurisdiction of the Commissioners the lands forming the ordnance reserves at Fort Erie and Niagara-on-the-Lake, no further steps have been taken, as the funds at the disposal of the Commissioners will not permit of their undertaking additional burdens without substantial assistance.

The Commissioners regret to learn that the work of spoliation in connection with the historic remains at Fort Erie, which was referred to in the special report of the Park Superintendent of August, 1896, is still going on.

During the past season application was made on behalf of several gentlemen, at Toronto, for certain privileges in connection with the developing of the water power of the Niagara river below the Falls, the specific requests being for rights at the outlet of the Whirlpool and at Niagara Glen. In order that the Commissioners might be able to consider these applications intelligently, instructions were given to the Park Superintendent to make a survey of the river levels and to report to the board on the possibility of utilizing the rapids of the river between the Cantilever Bridge and Queenston for the purpose of power development, together with a plan showing the various sections of the river where power could with advantage be obtained, and the approximate relative cost and importance of each separate development. The Superintendent carried out his instructions with all practicable despatch, and submitted the following report on this important subject to the Board :—

J. W. Langmuir, Esq.,

Chairman.

Dear Sir :—In compliance with the instruction of the Board, I beg to make the following report upon the practicability of developing power for commercial purposes at various points along the west shore of the Niagara river between the Cantilever Bridge and the Village of Queenston.

According to the surveys made from time to time by the United States geological and lake surveyors, there appears to be a total mean difference of level between the waters of the Niagara river at the base of the Horse Shoe Fall and the waters of Lake Ontario of 110 feet. Of this total about two feet is found in the navigable reach of the river from Lake Ontario to Queenston, and about sixteen feet from the base of the Horse Shoe Fall to the beginning of the rapids, a short distance south of the Cantilever Bridge, leaving some ninety-two feet for the fall accomplished in the rapids above and below the Whirlpool. The total distance covered by the rapids, if measured along the centre of the river, is about five miles.

The inclination of the surface of the river, in the portions covered by the rapids, does not by any means present a uniform cross-section, owing to the contracted width of the stream at some points and the very broken nature of the waterway. For instance, the part of the river locally known as the Whirlpool Rapids has a magnificent and resistless sweep all the way from the Cantilever Bridge down to the most northerly extremity of the Whirlpool, but on either shore, owing to the obstructions caused by immense boulders and masses of rock projecting well into the stream, the onward flow of the water is interfered with, numerous eddies or counter currents are formed, and the inclination of the surface of the water at the shore line is made very irregular, and at some points is much below the central elevation of the stream. A short distance south of the Whirlpool the shore line on the Canadian side recedes considerably, forming a long shallow bay, called on the plan, "The Whirlpool Rapids Eddy," in which there is a strong current flowing up stream along the shore for the whole length of the bay. Precisely the same condition holds with respect to the Whirlpool itself, where the sweep of the current after crossing to the northerly extremity or the head of the pool is deflected to the left and northwards, and flows swiftly along the Canadian shore, and against the direction of the main stream, to the southerly extremity of the Whirlpool, a distance of over half a mile. At other points along the river, especially at either end of Niagara Glen, the same conditions prevail; and where the changes are well defined and are a permanent characteristic of the stream, the difference of level between the adjacent counter currents indicates, in each case, the head which may be obtained, and the direction of the shore eddies, above and below the rapids, defines clearly on the ground the distance which will have to be overcome by means of a conduit or otherwise in order to obtain the greatest advantage from the head of water at the point in question.

By a reference to the plan accompanying this report it will be seen that there are four or five principal points at which it would, in my opinion, be entirely feasible to take advantage of the difference of the shore levels of the river to develop substantial water-power plants, and by the aid of electricity or other means of transmission to points above the cliff, make them available for commercial purposes generally at a reasonable outlay.

These several divisions or distinct water-powers may for convenience be referred to by numbers, as on the plan, and will be considered separately.

No. 1. From the head of the rapids near the Cantilever Bridge at "A" on plan to the head of the Whirlpool Rapids eddy at "B," in a distance of some 3,400 feet there is a continuous rapid with a fall at mean water level of about forty-four feet.

No. 2. From the northern extremity of the Whirlpool Rapids eddy across the projecting point which separates it from the Whirlpool proper in a distance of about 500 feet there is a mean fall of seven and one-half feet.

No. 3. At the exit of the Whirlpool there is another decline of nearly seven feet in a distance of less than 300 feet.

No. 4. Niagara Glen has a frontage of 4,000 feet measured along the margin of the river, with a difference of level between the north and south ends of twenty feet, but in a direct line a waterway to secure the total head would not measure over 3,500 feet.

No. 5. At the head of Niagara Glen in a distance of 1,000 feet a fall of about fourteen feet is found.

Below the eddy at the foot of Niagara Glen the river is very swift for over two miles: unquestionably the difference in head at one or two points could be made to yield water-powers, but the facilities for development are not nearly so favorable as at the other points indicated, and consideration of their merits may well be deferred for the present.

The conditions under which these several powers can be best developed are not at all uniform. Nos. 1 and 4 are large units and can only be developed at considerable cost, while Nos. 2, 3 and 5 are comparatively small units and will not require so large an outlay to obtain in each case remunerative developments.

In the case of No. 1 a conduit or tunnel of large dimensions could be constructed as a head race, and the development of the water into electric or other form of transmitted power be made in suitable erections placed at "B" on the plan, where a space can be had at the margin of the river sufficient for that purpose by suitable excavations in the talus or sloping bank of the river under the cliff.

Assuming the head race to be a circular wood-lined conduit of twenty feet internal diameter, and with a loss of head of fourteen feet in the entire length of 3,400 feet, a total water power capacity of from 22,000 to 24,000 horse power could be obtained under an available head on the water wheels of thirty feet. The cost of such a conduit (wood-lined) with suitable terminal works and buildings should not be over $450,000; and the total capital outlay required to equip the works complete with water wheels, generators, etc., etc., and distribute the energy at convenient points on the high bank above would probably not exceed $60 to $65 per electrical horse power, and the effective output of power available for consumers, after allowing for loss in machines, etc., etc., would be about 15,000 or 16,000 horse power. This proposition will, I think, compare favorably with any of the large schemes for the development of power projected in or around Niagara Falls.

By using a head race of still larger dimensions a much greater power could be obtained at a less outlay per unit. Thus a conduit of twenty-four feet internal diameter laid to the same grade would afford fully forty per cent. more power, while the cost of terminals of the raceway, buildings, inclines, etc., would be nearly the same in either case.

No. 2 is a comparatively small power, but very compact and conveniently situated in the immediate vicinity of the town, and therefore very suitable for local users. It could be most readily developed by an open cutting in the rock across the point separating the Whirlpool Rapids eddy from the Whirlpool proper, or by a flume sunk in the talus at the water's edge. In either case the cost would approximately be the same. As the head is small the cost per horse power would be somewhat greater. A raceway of thirty feet wide and ten feet deep would give a net capacity of over 2,000 electrical horse power.

No. 3, which is at the outlet from the Whirlpool, could be made to develop power at a comparatively small cost. As the distance to be overcome is very short and the material to be removed to form an open cutting or flumeway is of good quality sandstone, and as much of the stone quarried would be suitable for building the protective works and other constructions needed for the work, a moderate capital outlay per horse power would suffice to construct and equip a power of 1,500 or 2,000 horse power capacity.

No. 4 is in some respects well adapted for generating a water power on a large scale, but it would be much more costly per unit of power developed than any of the others.

The method of development proposed for No. 1 would certainly be the best adapted for this situation; but owing to the difference in the relative fall of the water between the terminals the greatest economic head that could be obtained would be about thirteen feet, and the same description of flume, if applied in this case, would yield less than one-third the water power, while the cost of flume, terminals, etc., etc., would be practically the same, and the cost of water wheels and generators somewhat more.

This scheme has some compensating advantages which make it well worthy of consideration: for instance, the opportunity of choosing a site for buildings and appurtenances, with an abundance of room for the same, advantages in selecting terminal points for the flumeways etc., and a large quantity of the best building material on the ground. With all these, however, it is the least desirable of the several schemes outlined, as the capital outlay per horse power required for construction and equipment would amount to nearly three times that of No. 1, and the same size of conduit, if laid to the most effective gradient, would not yield over, say, 5,000 electrical horse power.

No 5 would make an admirable and convenient water power, and could be developed by either a tunnel or a flume laid along the shore, as might be found the most desirable on closer scrutiny. The cost of development would be about $75 per effective horse power, and a twenty feet conduit for a head or tail race would give, say, 5,000 electrical horse power. In this case there would be no difficulty whatever in duplicating the plant at any future time should the requirements of the market for power demand it. The power house could be placed on level ground and the excavations would be in good quality of sandstone.

In projects Nos. 1, 2 and 3 the talus would have to be cleared off and excavations made where the power houses would be erected, and in each instance access secured from the top of the bank by means of inclined planes or vertical lifts, and approaches made by which men and materials could be got to the site of the works, something after the principle adopted in respect to the Niagara Falls Hydraulic Power Company's works on the American side.

As the water level of the Niagara is subject to considerable fluctuations, chiefly by reason of storms on Lake Erie, it would be necessary in each case to make provision for this in designing the machinery and appliances. As, however, the fluctuations are in general very quickly and uniformly distributed over the whole course of the river, the hydraulic head at any of the points referred to does not at such times vary much from the mean, and the change in levels can in some cases be provided for in the arrangement of the draft tubes of turbines, but in other cases where low heads are used special provision will have to be made to avoid detention during periods of extreme high or low water.

The problems of how best to deal with floating ice and frazil, which are inseparable from works of this nature, will, as usual, have to be considered, but as the intake would in each instance be located immediately at the parting of the waters, where the very best possible opportunity exists for solving the problem, without doubt the practical dealing with the question will be made comparatively easy.

In order to effect any one of these several water power developments, certain works would of necessity have to be constructed near the water's edge at either extremity of the raceway, and in each case the natural scenery would be effected to some extent; but this feature cannot be avoided if the development of the water power is to take place. With careful study the works may be made an interesting feature of the landscape—certainly vastly less prominent or objectionable than the building of a low level railway all along the shore.

The adoption of electricity as the most economical and desirable form of power for use in street railways has, within the last ten years, become almost universal, and it is generally believed that within a very short period electricity, as a motive power will largely supercede steam on the railways of the country. Should this prove to be the case a very large market for power would be created in the immediate vicinity of Niagara Falls which is already a great railway centre, and the utilization of the water power of both the falls and the rapids would, doubtless, be required to supply the needs of the railways and manufacturers at the lowest competitive rates.

As the privileges of developing water power at the Horse Shoe Falls has already been granted to a strong company, it seems to be quite reasonable to suppose that the privileges now referred to will be eagerly sought for by capitalists; and that the park revenue will be considerably increased by means of the rentals to be obtained therefrom.

The whole respectfully submitted.

(Sgd.) JAMES WILSON,
Superintendent.

Niagara Falls, June 20th, 1897.

Since the Commissioners received the foregoing report, a further application has been made on behalf of the Town of Niagara Falls for rights in the water power of the river at the well known Whirlpool Rapids in front of the northern part of the town, and as far as the Whirlpool.

The Commissioners, realizing the vast importance of this subject and the necessity of their being in a position to recommend a definite line of policy whenever the Government might deem the time opportune for dealing with the question, have taken steps to secure the services of hydraulic and electrical engineering experts to be associated with the Park Superintendent in the preparation of detailed plans for the best practical method of using the waters in the rapids of the lower river for power purposes.

The expenditure on the maintenance of the Park property has been, as usual, confined chiefly to the front portion of the Park proper at Niagara Falls, and to the Queenston Heights Park; the funds at the disposal of the Commissioners not permitting of much being done to the extensive territory at Niagara Glen or to the long connecting reaches along the bank of the river.

A considerable improvement has, however, been made to a portion of the Victoria Parkway, in front of the Town of Niagara Falls, in cutting down the sidewalk to the level of the roadway, and in acquiring some additional lands at the Upper Suspension Bridge where the traffic is greatest, and where the accommodation afforded by the original chain allowance was too much restricted. A small additional strip was also added to the roadway at this point by an exchange of lands effected between the Bridge Company and the Commissioners.

A noticeable improvement has also been made to the Victoria Parkway at the crossing of the Grand Trunk Railway Bridge, the substitution of a steel arch in place of the suspension bridge erected by Roebling in 1855, permitting a portion of the space formerly occupied by the steel towers supporting the cables being left more open. This has been put into a neat condition in accordance with the arrangements entered into with the Bridge Company.

For a full resumé of the various works which have been undertaken during the year reference can be had to the report of the Superintendent of the Park, which will be found appended hereto.

FINANCIAL.

The following summary will show the receipts and expenditures for the year:

Receipts.

Rental from the Canadian Niagara Power Company for one year to 1st November, 1897	$25,000 00
Rental from the Niagara Falls Park and River Railway Company to 1st December (15 months)	12,500 00
Rental from Messrs. Zybach & Co. for refreshment and photo privileges, one year to 31st December, 1897	8,200 00
Receipts from tolls at Dufferin Islands and at Brock's Monument	1,721 15
Receipts from sundry sales of old materials, etc, etc	85 44
Imperial Bank overdraft	428 51
Total	$47,935 10

Expenditures.

Paid Imperial Bank account of overdraft January 1st		$3,473 06
Capital Account;		
Permanent improvements, including cost of materials, etc	$2,987 00	
Wages of mechanics and laborers	2,884 95	
Land purchases and surveys	411 18	
Miscellaneous, including legal expenses	548 99	
		$6,862 18
Maintenance Account:		
Salaries and wages, including wages of laborers, teams, etc	$10,132 45	
Cost of materials, etc	2,652 56	
Office expenses	191 45	
Commissioners' expenses	235 94	
Miscellaneous	150 15	
Interest on bank overdrafts	111 20	
		13,473 75
Coupon interest on debentures, and charges		24,126 11
Total		$47,935 10

All of which is respectfully submitted.

J. W. LANGMUIR,
Chairman.
GEORGE H. WILKES.
J. W. CHARLTON.
JAS. BANFIELD.

REPORT OF THE SUPERINTENDENT.

To the Commissioners for the Queen Victoria Niagara Falls Park.

GENTLEMEN,—I beg to submit my report of the works done in connection with the Park during the year ending the 31st December, 1897.

General Maintenance.

The usual works incident to the proper maintenance of the grounds, buildings and other structures pertaining to the Park system, were all carried on during the past season with as much care and attention as the means at command for this part of the work would admit of, and it is believed that the results attained met with the hearty approval of the residents of the vicinity and of visitors generally.

As heretofore our efforts were chiefly confined to the Parks proper at Niagara Falls and Queenston Heights, but something was also accomplished at Niagara Glen and on Victoria Parkway in front of the Town of Niagara Falls. Owing to the unfavorable spring, some of the ornamental beds of shrubbery and perennials did not show up as well as anticipated. The stock of flowering plants, however, has been largely augmented during the season, and much better results may be hoped for in the future.

New Trees and Shrubs.

A large consignment of the choicest ornamental and flowering trees suitable for the locality were procured from reliable nursery men and planted out. These, together with the planting of previous seasons, will in a very few years add materially to the appearance of the property, and in all probability will amply suffice for some portions of it.

All new stock and many varieties of the standard trees and shrubs have been labelled, the proper and common names being printed plainly on cardboard and encased in tight fitting copper and mica frames, and attached to the growing wood by adjustible copper fastenings. Great care has been exercised in securing accurate identification of each species, and it is hoped the labels will prove to be waterproof and enduring.

The instructions given several years ago to secure, as far as was possible, specimens of all the desirable varieties of trees and shrubs which might reasonably be expected to grow in this favored locality, and thus lay the foundation for a comprehensive botanical garden, where the student of arboriculture could compare the various classes of trees and shrubs, has been constantly kept in mind: and already, notwithstanding the paucity of the appropriations made from year to year by the commissioners for planting, and the great extent of ground requiring treatment, a good beginning has been made and a large variety of specimen trees of the choicest kinds, together with many of the best of the flowering shrubs, have been set out.

Arrangements have also been made for a considerable addition chiefly of new and desirable forms of shrubbery to be planted out next season.

Cribwork Protection to the River Bank.

The protection works around the shore of the river opposite to the Dufferin Islands, where serious erosion had taken place, as referred to in previous reports, and which important work has been in course of construction for the past four

years; was completed early in the season by filling in the gap left from the end of last season's work to the summer house at the southern end of Riverside Ramble. The depth of water to be overcome along this portion of the work was greater than encountered on most of the work previously done, necessitating a greater expenditure of labor and material in its construction.

The completion of this cribwork opened up the way for the extension of Riverside Ramble around the shore of the mainland all the way to Dufferin Gate, a distance of nearly half a mile. This work was thoroughly well done. The cribbing was filled up to the top with large stones, and a nice gravelled walk, averaging six feet in width, was constructed over the whole distance, thereby affording a delightful and permanent and well shaded walk around this pleasant reach of the river.

In addition to the filling of the cribwork, the space behind has also been filled up even with the top of the walk with heavy stone and gravel for most of the distance, thus securing a firm "toe" for the foot of the steep hill adjoining, which will hereafter effectually prevent a repetition of the sliding of the hill side into the river.

The portion of Riverside Ramble south of the foot of Suspension Bridge was found upon examination to be entirely worn out: the old cribwork foundation had become quite useless as a protection to the shore, and a considerable slide occurred at a steep point of the hill side during the early spring. It was, therefore, deemed necessary to renew the work. The depth of water was not as great as was found south of the summer house, and the work was expeditiously accomplished. A solid gravel walk with stout cedar guard railing was also placed along this portion of the work.

The remaining portion of Riverside Ramble should be taken in hand next spring, and the same permanent character given to the cribwork, especially as it is now in need of substantial repair.

During the season it was found that the very swift current at Dufferin Gate had underminded the protection work in front of the gateman's house. The old work was, therefore taken out and a crib resting on very large timbers, thoroughly bolted to the bed rock, was put in. This was also filled with stone and surfaced with gravel and should last for many years.

Conservatory.

The erection of a small conservatory having been authorized, in which to keep the exotic plants we now have on hand as well as many which may be added from time to time, and to afford room for visitors to enjoy a modest display of winter blooming plants, work was begun in the autumn on a structure sixty feet long, twenty feet wide, fourteen feet high at the ridge and six and a half feet at the wall plate. Owing to the smallness of the appropriation, the construction of the permanent walls had to be deferred until next season, and the building made to rest on temporary posts; for the same reason the flower benches and walks were not made permanent, but otherwise the structure is complete, and has proved to be very serviceable. A large hot water furnace has been put in, and the new building, together with the two small forcing and propagating houses erected in 1894, are now all warmed by hot water circulating through four inch pipes.

Flagstone Walk.

The difficulty of maintaining gravel walks in fit condition for use by visitors in the vicinity of the Horseshoe Fall, owing to the excess of moisture in summer and accumulations of ice in winter, has been referred to in previous reports. As

an experiment, Rainbow Ramble which extends from Table Rock to Cedar Island has been provided with a split flagstone pavement of Credit Valley freestone, four feet wide, laid in the centre of the gravel path ; which, while inexpensive, appears to answer the purpose very well. The location of this walk is likely to be changed in a year or two, and therefore only such a class of walk as could be readily taken up and relaid was available.

Permanent Roadways Required.

I have again to urge the early construction of a permanent roadway, with its complement of sidewalks, curbstones, etc., from the restaurant southwards at least as far as Table Rock. Over this portion of the park the traffic is at all times very heavy, and the incessant moisture from the falls keeps the roads and pathways in an unfit condition for either driving or walking over. The only remedy which suggests itself is to construct brick on concrete for the driveway, and a brick or cement walk for pedestrians,

This is certainly an urgently needed work, and one which would add very greatly to the comfort and convenience of many thousands of visitors each year, and it is hoped that means may be found of undertaking the work early in the spring of next year.

Sundry Works of Improvement.

It was found desirable to enclose the upper pond in the picnic ground with a stone coping similar to that which was last year put around the pond near the monument to Sir Casimir Gzowski. The small fountain pond still requires protection of a similar nature, as during the busy season several children, for want of such protection, fell into the water, and had not prompt assistance been at hand, the consequences might have been more serious.

A consignment of park settees of neat design and finish was procured and distributed through the grounds during the early part of the season, which appears to suit the requirements of visitors, and should be added to during the coming season.

Three new spring water drinking fountains were added this year to the six in number which had been already provided, one near the Mowat Gate, one at the play grounds, and the third on the front walk near to the picnic garden. These have large chisled sandstone basins or reservoirs, and are provided with an abundance of clear spring water conveyed to them by pipes from living springs at the foot of the high bank bounding the park.

Victoria Parkway.

Under an agreement entered into with the town of Niagara Falls, an important improvement was made to Victoria Parkway, which fronts the town on the river side and forms the principal approach to the park from the railway stations in the town. The sidewalk, which was in several places considerably above the level of the street, was cut down to a uniform grade therewith and some low places in the roadway adjoining the walk filled in. The undergrowth and brushwood along the edge of the river, where it obstructed the views of the river and gorge to any appreciable extent, was kept trimmed, and all decayed timber cut down.

Niagara Glen.

The work of opening up the rare beauties of Niagara Glen so as to make them reasonably accessible to the general public, was continued this year, and the pathway which had been opened down to near the water's edge was extended southwards, its general course following the bank of the river as nearly as was found to be practicable, and now terminates at the water's edge at the limits of the glen. A branch path was also made, leading to some pot-hole stones of gigantic dimensions, which are well worthy of a visit.

Another short branch path was made to a spring gushing out of the face of the cliff which forms the lower or present river channel.

It is hoped much more may be done in the coming year to open up the delightful scenery of this romantic glen.

Whirlpool Point.

A beginning has been made to remove the nakedness of Whirlpool Point. As the rock formation at this point is practically at the surface of the ground, the first thing to be done was to give the whole a good coating of soil, in which shrubs and trees could find a foothold, and on which grass would grow. This has been partially done, and by next spring some shrubbery may be planted out, and shade trees by the autumn.

This is a charming spot from which to view the mighty whirlpool, and it should be made attractive to visitors.

Queenston Heights Park.

Not very much has been attempted this year in the way of improvements at Queenston Heights. The thick undergrowth in the grove was all cut away, and the boundary near the west end of the lands patented was correctly defined and fenced off. Brock's Spring was also made more secure, and the pipes leading the waters to the front of the ground were changed and enlarged to insure a better flow. An additional fountain was also placed half way down the heights, for the accommodation of pedestrians going up from the village. A new pathway has also been commenced, leading up from the village, which will make the ascent less fatiguing.

At the cenotaph which marks the spot where Sir Isaac Brock fell, the lands which had to be purchased in order to improve the surroundings were fenced with a neatly patterned garden railing of wire, well secured to turned cedar posts, all nicely painted, and furnished with two gates. The ground was cleared of stone, ploughed deeply, levelled off, covered with good soil, and sown with lawn grass. A choice selection of ornamental shade trees, many of them of weeping habit, was planted out. A gravel walk was also made around the monument.

Altogether, the appearance of the place has been transformed, and if the township authorities could be induced to put the road which runs alongside the ground in something like good condition, the *tout ensemble* would be more worthy of the events commemorated.

The whole respectfully submitted.

JAMES WILSON,
Superintendent.

Niagara Falls, December 31st, 1897.