The Vancouver Power Company Limited

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Vancouver Power Company, Limited
British Columbia Electric Railway Company, Limited
Water power electric plants - British Columbia

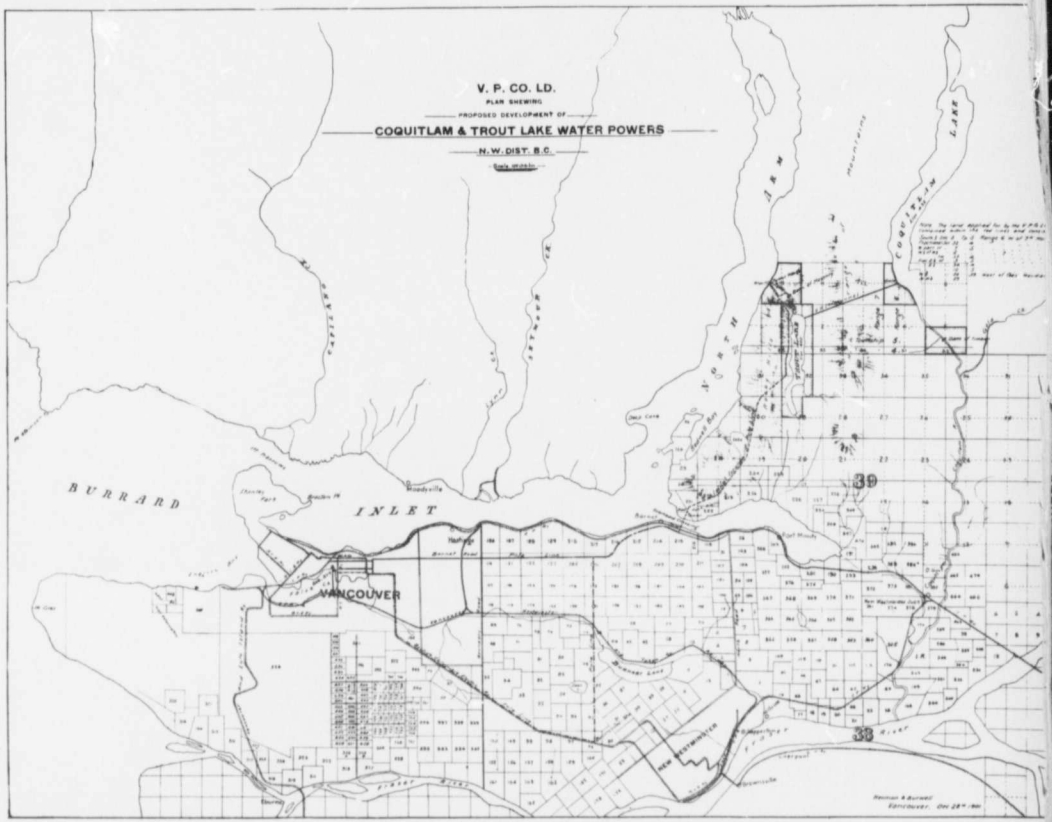
SHORT HISTORY

OF THE

VANCOUVER POWER COMPANY, LIMITED

AND A DESCRIPTION OF : :
THE WORK ACCOMPLISHED

EVANS & HASTINGS, PRINTERS
VANCOUVER, B. C.


V. P. CO. LD.
PLAN SHEWING
PROPOSED DEVELOPMENT OF
COQUITLAM & TROUT LAKE WATER POWERS
N.W. DIST. B.C.
BURRARD
INLET
VANCOUVER
NORTH ARM
COQUITLAM LAKE
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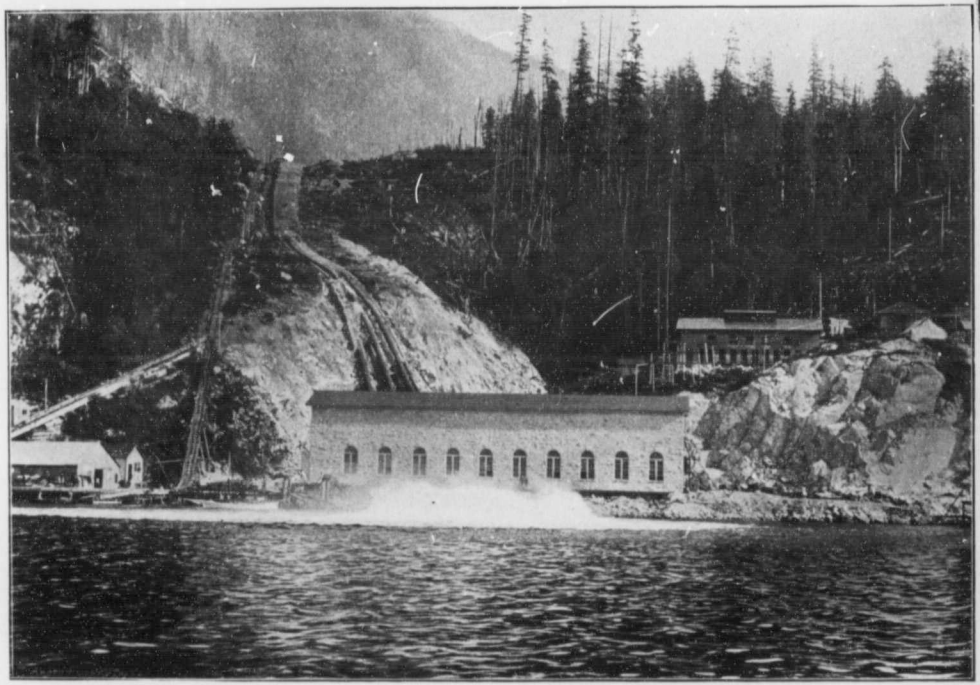


GENERATING STATION AND PIPE LINE

SHORT HISTORY

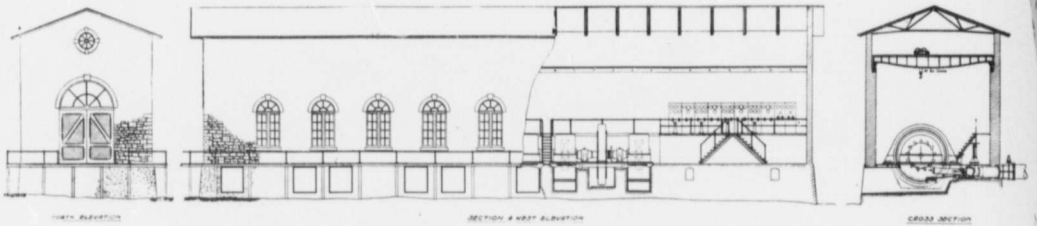
THIS Company was incorporated in the year 1898 for the purpose of developing the Coquitlam Lake Water Power to supply the cities of Vancouver and New Westminster and the adjoining municipalities with power, light and a general electric service.

The first scheme of development did not include Trout Lake, but consisted of a long ditch and flume line, extending from the outlet of Coquitlam Lake to a point near Port Moody, where it was then proposed to have the Power House located. This plan was found to be impracticable, owing to the unstable nature of the ground along the route of the ditch and flume line.

The alternative route then proposed was a tunnel directly from Coquitlam Lake to the North Arm of Burrard Inlet. It was not until the year 1901 that this route was examined with a view of proceeding with the work.

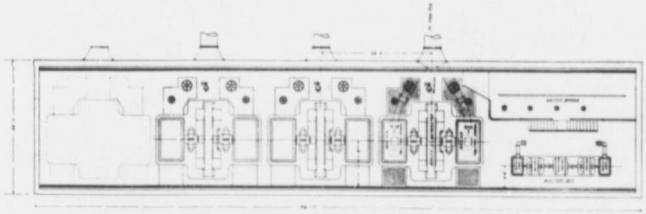
It was found on examination that Trout Lake was nearer Coquitlam Lake than any point of the North Arm of Burrard Inlet, and added to the advantage of this shorter route was the very valuable storage of water which this lake would create, acting as a balancing reservoir and enabling much higher peaks of power to be attained than if the tunnel was built directly through to the North Arm of Burrard Inlet.

This scheme of development was accordingly decided upon, but a great deal of opposition was met with at about this time in securing the necessary water records, causing several months' delay in starting work.



SECTION & WEST ELEVATION

CROSS SECTION



PLAN

VANCOUVER POWER CO. LIMITED

GENERATING STATION AT TROUT LAKE

As a result, an investigation was finally held at the Government Offices in Victoria, and the Government decided that an important undertaking of this description should not be blocked by the obstacles put forward.

As soon as this matter was settled, construction work was proceeded with. The dense forest covering the site of the proposed works was cleared off, excavations were made for the Power House, Pipe Lines and Dam, and steam plants were installed for the construction of the Tunnel.

After the whole scheme had been formulated and laid out on the ground by the engineers, Mr. Hugh Cooper, of New York, an eminent engineer, was called upon to make an examination of the ground and proposed plan of development.

Mr. Cooper reported "that the provisions of nature here existing are extraordinarily designed for the creation of a successful water power, and the plans provided by the Company's engineers suited the conditions".

The whole work, with the exception of the Tunnel, the construction of the steel pipes, and the clearing of some of the land, was accomplished by day labor under the direct supervision of the Company's engineers.

Trout Lake is situated near the North Arm of Burrard Inlet, and is distant about sixteen miles from Vancouver. It has an area of about 500 acres, with an altitude of 400 feet above sea level, and is separated from Coquitlam Lake by a range of mountains having an altitude of from 3,000 to 4,000 feet; the two nearest points of these lakes being distant 12,775 feet.

Coquitlam Lake has an area of 2,300 acres and an altitude of 432 feet above sea level. The drainage area of this lake is about 100 square miles and the annual precipitation about 150 inches.

TROUT LAKE DAM

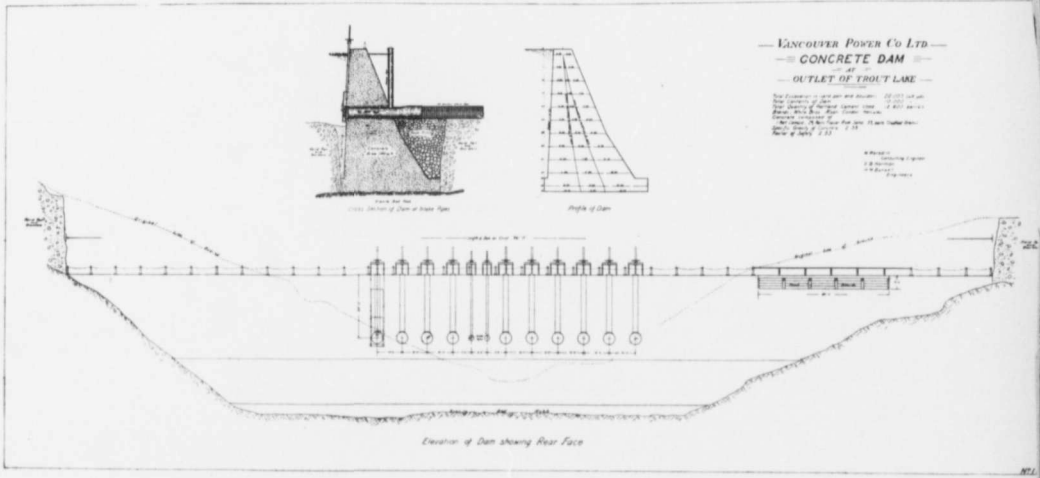
DEVELOPMENT

The chief features in the development of this power scheme are as follows:

A Dam at the outlet of Coquitlam Lake to raise its level and create storage; a Tunnel connecting the two lakes; a Concrete Dam across the outlet of Trout Lake, which increases the storage capacity of Trout Lake; Pipe Lines connecting this Concrete Dam with the Power House situated at sea level, and Transmission Lines extending from this point to Vancouver, New Westminster, Burnaby and Lulu Island.

COQUITLAM LAKE DAM

The Dam at the outlet of Coquitlam Lake is a rock-filled timber crib structure, raising the level of Coquitlam Lake ten feet and diverting its overflow through the Tunnel. It has been made especially substantial to withstand the passage over it of large drift logs at flood water.


VANCOUVER POWER CO LTD
CONCRETE DAM
AT
OUTLET OF TROUT LAKE
Profile of Dam
Elevation of Dam showing Rear Face

TROUT LAKE DAM

Before deciding upon the location of the Concrete Dam at Trout Lake, a large amount of preliminary work had to be done in order to ascertain the nature and exact position of the underlying granite bed-rock, which was covered over with a strata of hard-pan of varying thicknesses. Ten shafts were sunk through this strata, varying from 20 to 54 feet in depth, and connected with drifts running along the bed-rock. In this manner the most suitable location was selected and proved. The excavation was then carried down to the bed-rock for the entire length and width of the Dam, requiring the removal of about 20,000 cubic yards of hard-pan and boulders.

The Dam has a maximum height of 54 feet and a width at its base of 40 feet, its length on the crest being 361 feet.

It is penetrated by ten 54-inch and two 24-inch pipes, all fitted with a special design of gates and screens on the up-stream face.

The concrete work amounts to 10,000 cubic yards, and was completed within five months from the date of its commencement, White Bros.' Portland cement being used chiefly in its construction.

TUNNEL PORTAL, TROUT LAKE

PIPE LINE

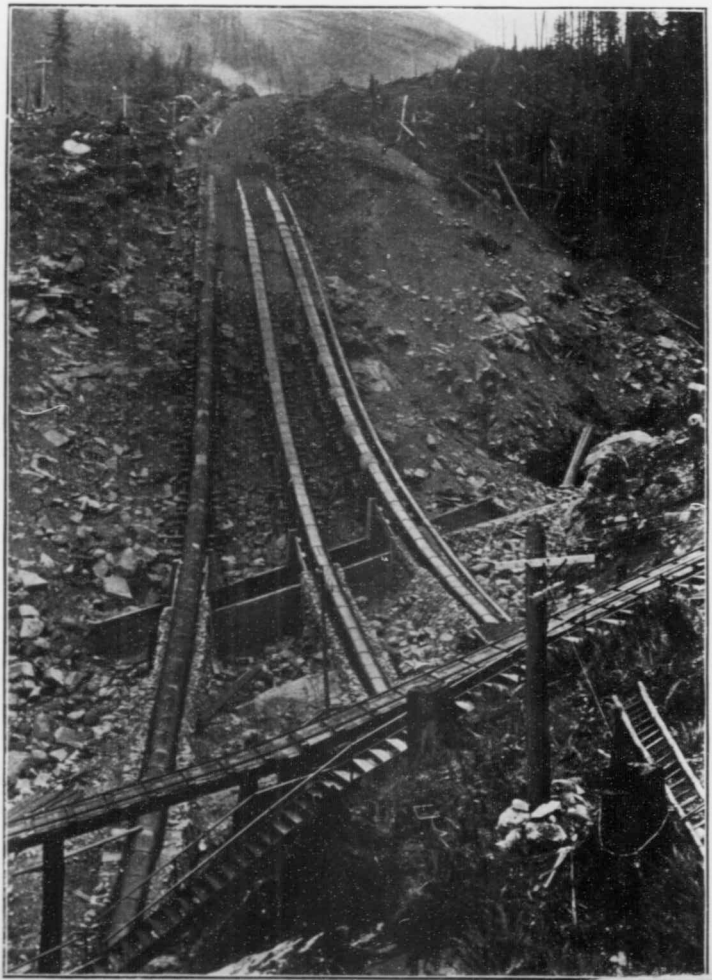
The Pipe Lines extend from the Dam to the Power House, a distance of 1,800 feet. At present there are laid three large pipes and one 24-inch pipe.

The upper 800 feet of each line is constructed of wooden stave pipes with diameters of 54 inches, and the lower 1,000 feet is of riveted steel construction, varying in diameter from 48 inches to 42 inches at the lower ends.

The grading of the trench and the provision necessary for the support of the pipes was probably the most difficult engineering problem involved.

Near the lower extremity of the line a vertical rock bluff, 70 feet in height, was encountered, which made it necessary to carry the pipes on a temporary trestle, built to suit the vertical curves which it was decided to give the pipes at this point. After the pipes were completed, these trestles were replaced with concrete piers.

The Pipe Lines throughout were built to curves and tangents, both vertically and horizontally, angles being considered objectionable. For this reason it has a pleasing appearance and at the same time a little greater efficiency. The steel pipes and the head gates were constructed by the Vancouver Engineering Works, of Vancouver.



TUNNEL

The Tunnel connects Coquitlam Lake with Trout Lake and has a capacity of about 500 cubic feet of water per second, as nearly as can be calculated. In alignment it is straight, but the grade from one end to the other is not uniform, having a slight summit at the centre.

This was made necessary for drainage purposes during the construction of the work, which was carried into the mountain from both ends.

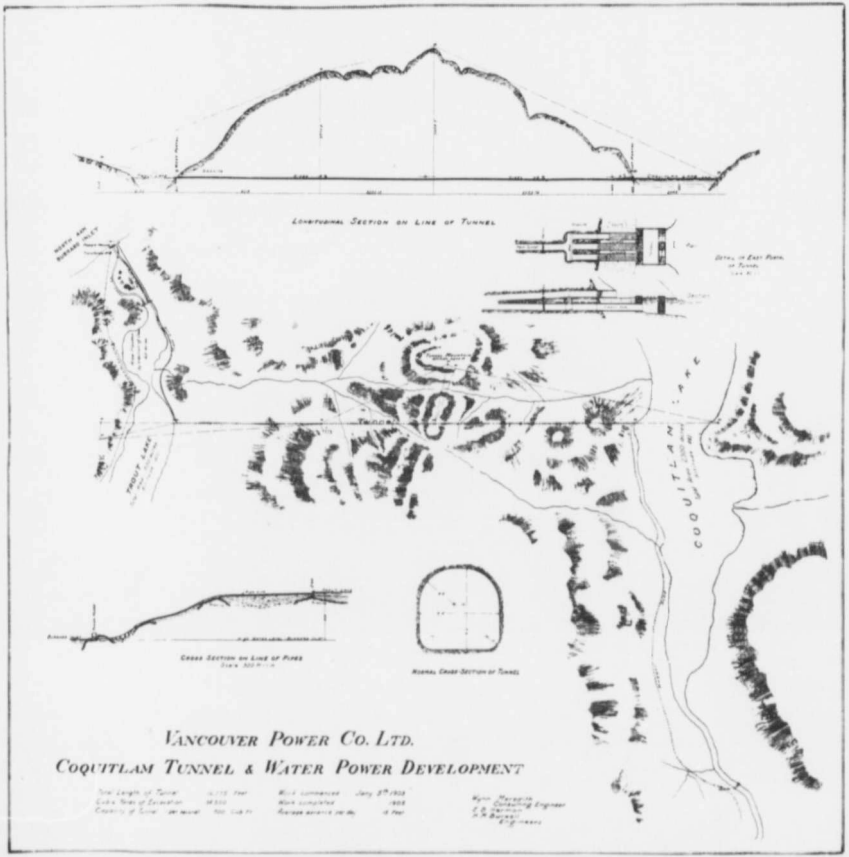
The summit is 22 feet lower than the Coquitlam portal, and the Tunnel throughout is below the hydraulic gradient.

The Tunnel passes under a mountain about 4,000 feet in height, and has a length of 12,775 feet and a width and heighth of 9 feet.

In getting the alignment, the engineers made a triangulation survey over this mountain, but in determining the levels, it was thought advisable to carry the survey around, instead of over, the mountain. This made it necessary to run about twenty miles of levels to connect both ends.

A notable feature in this work is the intake gate at the Coquitlam portal which controls the flow of water. This gate is located in the solid rock underground, and is operated from another short tunnel which is 18 feet above the main Tunnel at this point.

The contract for building the tunnel was awarded to Messrs. Ironside, Rannie & Campbell,


Longitudinal Section on Line of Tunnel
Cross Section on Line of Pipes
Typical Cross-Section of Tunnel
COQUITLAM LAKE
Vancouver Power Co. Ltd.
Coquitlam Tunnel & Water Power Development

of Vancouver, who started the work on January 9th, 1903, and carried it through to its completion on April 27th, 1905, making an average advance of 15 feet per day. When both ends met the closing error in alignment was found to be only 7/8th of an inch, and the error in the levels only 1 3/4 inches.

Considering the dangerous nature of this work, the contractors and employees are to be congratulated on the small number of accidents as well as the rapid prosecution of the excavation.

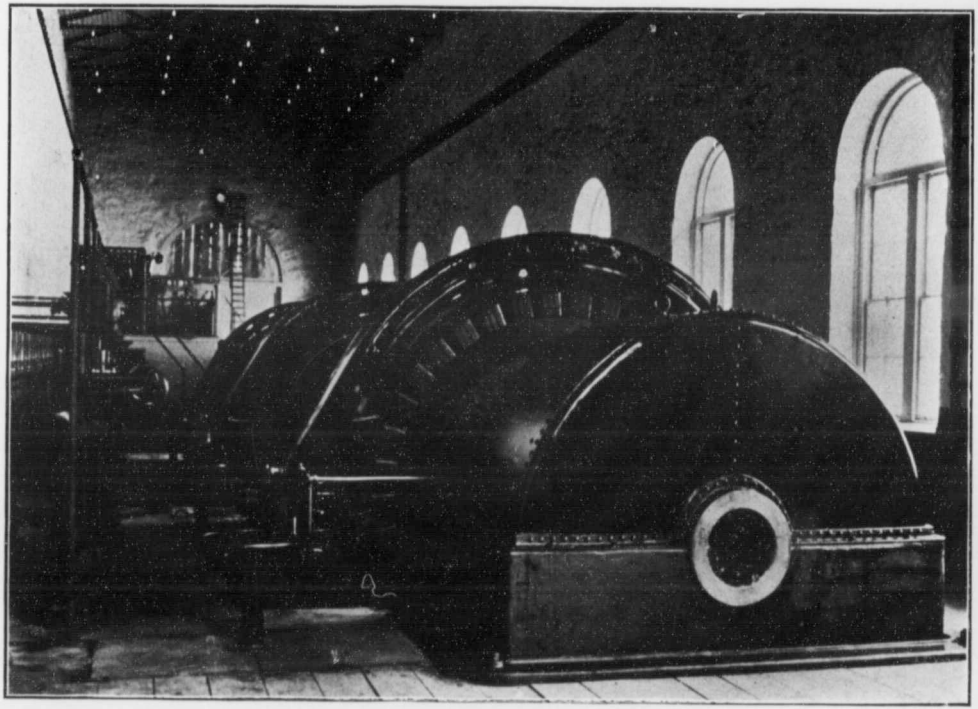
POWER HOUSE

The Power House is situated on the North Arm of Burrard Inlet at sea level, and is built of stone, with a concrete foundation.

The only suitable site for this building was on the edge of a rock bluff, which made it necessary to excavate about 15,000 cubic yards of granite before starting the foundation of the building.

The capacity of the Power House is 12,000 H.P. in four units of 3,000 H.P. each. There are at present installed only three units, and the water is supplied under a static head of 400 feet.

The arrangement of the water wheels and the generator for each unit is extremely simple, consisting of a hollow shaft, with the generator set in the centre and a "Pelton" water wheel at



INTERIOR OF GENERATING STATION

each end, the whole revolving on two ring oiling bearings, kept cool by a water jacket and also by a stream of water passing through the hollow space in the shaft.

The generators are 3-phase, 60-cycle "Westinghouse" alternating current machines with revolving fields, and run at 200 revolutions per minute, the regulating being accomplished by "Lombard" governors operating deflecting needle nozzles, the needles being adjusted by hand for average load conditions.

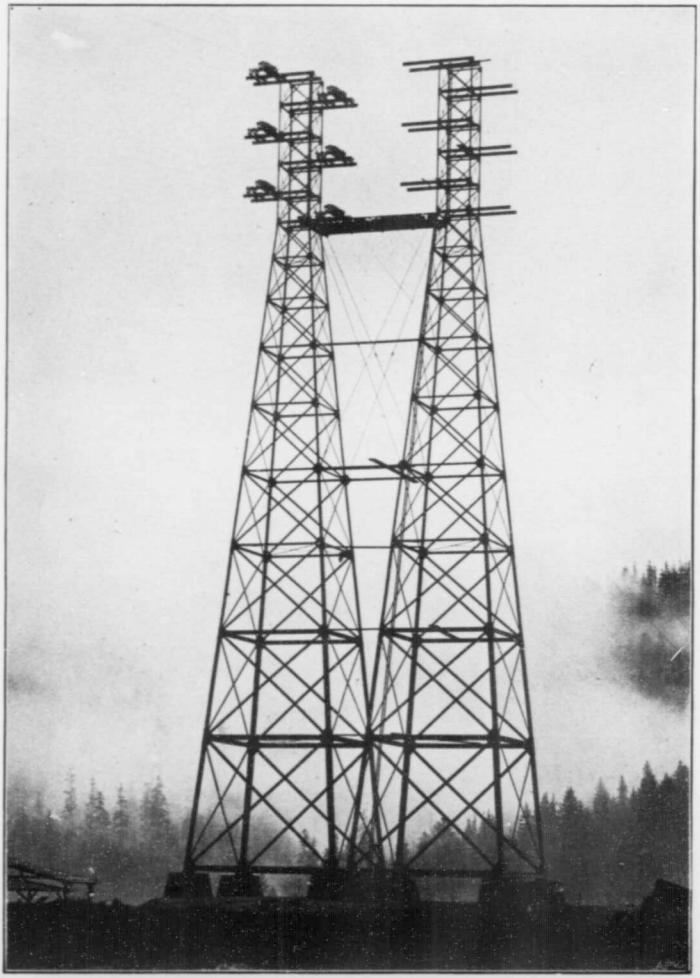
TRANSMISSION LINE

The transformers are of the air-cooled type, placed in a separate concrete building, which also contains the high potential switches and appliances.

The voltage here is stepped up to 20,000 and transmitted under this pressure to the substations at Vancouver, Burnaby, New Westminster and Lulu Island.

The Transmission Line has a length of about sixteen miles to Vancouver, and consists of a double line of poles built in accordance with standard construction for high potential wires.

It presents a notable feature in the crossing of Burrard Inlet near the village of Barnet.



...DS ON TRANSMISSION LINE

The span here is 2,750 feet, and the current is transmitted through steel cables, which are suspended 150 feet above sea level at their lowest points.

On the southerly end of the span are two steel towers, each 140 feet in height and set on top of a small knoll, bringing the top of the towers 300 feet above sea level.

There are some unique features in the anchoring and the insulating of these cables, but space here does not permit of these details.

Provision has been made in the head gates at the Dam and the location of the Power House and Pipe Lines for an ultimate development and utilization of 30,000 H.P.

This large amount of power, if used continuously, would be somewhat in excess of the capacity of the Tunnel, but as commercial peak loads are only of comparatively short duration, the total power is made attainable by means of the large balancing reservoir which Nature has provided in the creation of Trout Lake.

The work of organizing the Company and ascertaining the possibility of developing this water power, and afterwards the careful examination into the feasibility of the development proposed by the engineers, has been accomplished by Mr. J. Buntzen, as general manager of the British Columbia Electric Railway Company, Limited, the parent company of the Vancouver Power Company, assisted by Mr. R. H. Sperling, advising electrical engineer, and to Mr. R. M. Horne-Payne, chairman of the British Columbia Electric Railway Company, Limited, is due the credit for finally financing the scheme.

The construction work has been performed under the supervision of Mr. Wynn Meredith, of San Francisco, chief engineer for the Company, and Messrs. E. B. Hermon and H. M. Burwell, of Vancouver, engineers in charge of construction.