a syphon across the river, the cost per foot of the syphon being about four times the cost of the flume for an equal capacity.

The flume system, including wasteways and forebay for penstocks, were completed in the fall, and unfortunately the city was then obliged to shut down on all work on the hydro-electric plant on account of the failure to sell the balance of the hydro-electric bonds due to the financial stringency.

The system as completed was tested out, however, and found to be in satisfactory condition for service, but when the completion of the plant was carried out, two years later, it was found necessary to build the syphon at the section above referred to, on account of a slide occurring which carried away about six hundred feet of the flume. This syphon is built with capacity for half the ultimate capacity of the system. It is wood-stave pipe construction, 66 inches in diameter, 2,100 feet long and designed for varying head to a maximum of 120 feet.

The advisability of covering the flume as a protection against snow was considered, but as the design provided for a velocity varying from 6½ to 7½ feet per second, and careful inspection was required during the first winter's operation, it was decided to leave the system open until the need of a cover could be better determined from actual experience.

Forebay.—The forebay is of timber construction and located in a small depression, so that a hogsback lies between the forebay and the power house as a protection against accident to the water system. Its general dimensions are 18 ft. by 36 ft. long and 12 ft. deep, with ample provision for overflow to a wasteway down a small ravine to the river.

Penstocks.—There are two 42-inch penstocks from the forebay to the power house, each 490 feet in length. They were built by the Vancouver Wood Pipe and Tank Company and are of wood-stave pipe construction with staves 2½ inches thick and steel bands of ½ in. to ¾ in. diameter, spaced for pressure head from 30 ft. to 210 ft. Each penstock was connected up with its turbine by 28 feet of steel riveted pipe, anchored in concrete and connection between the wood-stave and steel pipes was made by an expansion joint.

Generating Station Building.—As already noted, the location of the generating station was governed not only by the plans for the present development, which can be brought up to at least 5,000 h.p., but the prospect of a future development of from 15,000 h.p. to 20,000 h.p. by a conduit system direct from the North Barriere Lake was also considered.

At the site chosen, the sub-surface conditions of alternate layers of gravel, quicksand and blue clay, required that the entire foundations of the building should rest on piles, and these were driven to an average depth of about 30 feet to secure a firm support.

The entire structure was built of reinforced concrete, the details for the tailrace and supporting walls, and beams for the units requiring considerable form work. The sand and gravel for the concrete was obtained close by the plant, and there were no unusual features of construction worthy of special mention.

The accompanying plan and elevation of the building show the general arrangement and some details of construction. The building as completed is intended to form half of the final structure, the construction of the other half will be carried out when other units are required.

The present dimensions are 45 ft. by 48 ft., making the structure, when extended, 45 ft. by 96 ft. It will be noted, on referring to the plans, that the arrangement for the installation of the equipment is fairly compact, although the high-tension equipment is well separated from the other section. The construction of the generating station was carried out by Wm. Greenlees, of Vancouver.

Turbines.—There are installed two horizontal turbine units of 1,100 h.p. each, manufactured by the Platt Iron Works, of Dayton, Ohio, and installed by the C. C. Moore Company. They are the single discharge, inward flow type, mounted in scroll casings divided horizontally, and were designed to operate for 190 feet head at 600 r.p.m.

The runners are of bronze, 28-in. diameter, with a pump-head speed of 66 per cent. of the spouting velocity. The installation of each unit included a cast steel flywheel 5 ft. 6 ins. diameter, a 42-in. butterfly valve hand-operated, and a 10,000 foot-pound direct connected oil pressure type Lombard governor.

The guaranteed efficiency of the turbines was 81 per cent. at full load and 84 per cent. at 80 per cent. full load; regulation 2 per cent. with 250 h.p. thrown off to 10 per cent. by 800 h.p. off, and 20 per cent. by 1,100 h.p. off, under two-second movement of governor.

Generators.—The generators were supplied by the Canadian Westinghouse Company. They are direct connected to the turbines and are designed for 750 kw. at 3-phase, 60-cycle, 2,200 volts. On the same bed plate and direct connected to each generator is a 40-kw., 125-volt, 600 r.p.m. exciter, each exciter capable of exciting both generators when necessary.

There were two banks at three 500 kv.a. transformers wound for 2,200 to 44,000 volts, oil-insulated and water-cooled. One bank for the generating station and the other for the sub-station at Kamloops.

Switchboard.—The switchboard includes at present seven panels of natural black slate. They are mounted on a gallery commanding a full view of the units and have the usual standard switchboard equipment for low and high-tension control. The panels are placed with a view to extension, so that on final completion of the building the switchboard will consist of about twelve panels centrally located.

From the switchboard to the low-tension delta at the transformers 500,000 cm. varnished cambric, lead-covered three-conductor cable in conduit, was used, and 300,000 cm. lead-covered three-conductor, 3,000-volt cable, from the generator to the switchboard. The transformers and switchboard equipment, including lightning arresters, was supplied by the Canadian General Electric Company.

Transportation.—All of the power plant equipment was brought from Kamloops to the Barriere by the C.N.P. Railway, and was hauled in to the plant over a government road a distance of about five miles.

Transmission Line.—The length of the transmission line from the Barriere generating station to the sub-station at Kamloops is 43 miles, and with the exception of two stretches of about eight miles each, the line passes through a comparatively open country parallel to the C.N.P. Railway line with overhead crossings.

It follows as much as possible on the river side of the railway to avoid future crossings when supplying power for irrigation. The poles are of cedar, varying in length from 40 to 50 feet generally, and are fitted with wooden cross-arms designed with the view to a two-circuit line at some future time. These poles were obtained near the line of the C.N.P. Railway, about thirty miles north of the Barriere.

[NOTE—For description of Kamloops steam turbine stand-by plant, see *The Canadian Engineer*, November 5th, 1914, issue.—EDITOR.]