

rock. Towards its lower end the canal widens out into a forebay 54 feet in width, the forebay being closed in by a solid concrete dam 32 feet high and 26 feet in width at the bottom, tapering to six feet in width at the top. Between two high bluffs at a point in the head race, 150 feet above the concrete dam, has been constructed a wooden dam sloping at an angle of 42 degrees up stream and having a vertical height of 44 feet. The sills and timbers of this dam are spaced five feet apart, and all timber, including sills, are of 12 by 12 material solidly bolted to the rock, the whole

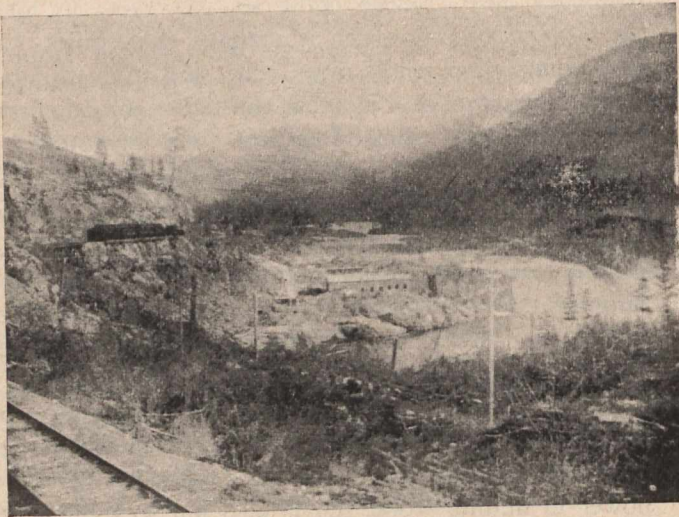


Figure 1.—General View of Bonnington Falls and the Power House.

being then planked by a double layer of 4-inch planking. In the bottom of this dam are five sluice-ways and its object is to break the impact of water flowing into the head race from the canal during high water, or, in general, to insure the control of water entering the forebay at all times.

Lower Bonnington Falls have an extreme difference of level of 32 feet, which measures the head of water available at the power house. The main concrete dam is provided with three feeders, two of nine feet each and one of ten feet. The upper ends of the feeders are closed by gates which measure respectively 12 by 13 feet, 12 by 13 feet, and 13 by 14 feet. These gates are of wood, and consist of a framing of 12 by 12 timber to which is solidly bolted 8-inch planking. The two outside frames extend upward of 38 feet, and to the walls of each pit are bolted the racks for raising and lowering the gates. The gates are further provided each with a small iron flood-gate, 12 inches by 12 inches in size, and the main gates are raised and lowered by means of headgate irons rigidly bolted to the top of the dam. The winch controlling the headgate irons are operated by one man. These and other features are shown in Figure 4, which gives the end elevation of the dam, power house and tail-race. The three steel penstocks, each nine feet in diameter by 20 feet in length, run through the concrete dam into the hydraulic section of the power house near the base of the dam, and from each penstock is carried a 10-inch stand pipe, the height of which nearly reaches the top of the dam. The back of the dam practically forms one side of the power house and tail-race, the latter extending at right angles to it, and consisting of a pit

approximately 30 feet in depth by 20 feet in width, extending nearly the length of the power house, which is 66 feet. In the clear water the tail-race is flanked by built masonry and concrete retaining walls which vary from four to six feet in thickness and extend upward to approximately the level of the power house floor. Bolted to the lower end of each penstock is a 13-foot casting containing one pair of 39-inch horizontal cylinder gate turbines. To these castings or wheel housings are bolted the draft tubes, which are 22 feet in length and 10 feet in diameter at the lower end. The housing is supported on each end by the retaining walls of the tail-race and are further carried by I-beams. The turbines for driving the exciters are supplied with water taken from the main turbine housings.

To be more explicit, the three 40-kilowatt, 125-volt multipolar exciters are direct-driven from independent horizontal, 12-inch registered gate turbines, which are contained in the cast-iron flumes, the latter in turn supported by transverse beams bolted to the main beams of the large wheels, while bolted to the cast iron flumes are the draft tubes and feeders. The latter are connected to the shaftings of the large wheels from which they derive their water supply. The portion of the power house containing the generators and switchboards, together with the transformer house built thereon, as an L, is bedded on the solid granite rock, which, after being suitably dressed and surfaced with concrete, gave most perfect foundations for the heavy machinery to be placed therein. A single roof covers the entire structure with the exception of the transformer house, which is independently roofed. The building is fire-proof, with walls of brick and roof of wood covered with galvanized iron. The inside dimensions of the turbine house are 25 feet by 64 feet, those of the gen-

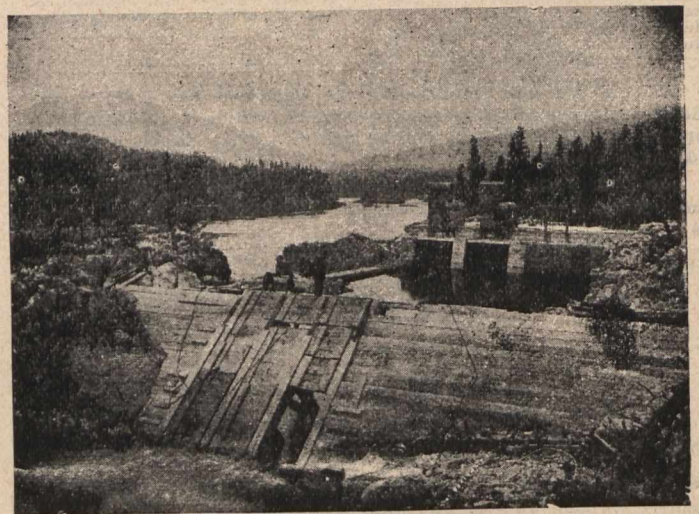


Figure 2.—Wooden and Concrete Dams and Forebay.

erator room are  $31\frac{1}{2}$  feet by 66 feet, while the transformer house measures  $17\frac{1}{2}$  feet by 28 feet. A flight of nine stairs takes one from the floor of the generator room to that of the transformer house, the difference in elevation of the two floors furnishing space for the blowers of the air blast transformers and ducts, as will be described hereafter. The height of the building from floor to the ridge of the roof is 40 feet, and