are shown in place and forms being constructed thereon and two other sets being raised into position. The approach spans at one end were built first and the next season the same trusses were used in the construction of the approaches at the other end.

Methods of Concreting.—The distribution of concrete to various parts of such a high structure as this, was a problem not ordinarily met with and did not allow much choice as to selection of plant. About the only way that concrete could be distributed with equal facility in the gorge when concreting abutments, or on the deck of structure and the various intermediate points was by buckets operated on a cableway, and this method was accordingly adopted.

A concrete mixing plant and machinery necessary to operate the cableway were installed on one side of the gorge, and a tower to support the cableway on the other side. Electrical power was used to operate all machinery. Supplies of sand and gravel of good quality were plentiful at the site and were easily and cheaply obtained. In fact, this was one of the main reasons for building a concrete arch instead of one of stone or steel.

The concrete was mixed rather dry and after being transported to the desired point in the bucket conveyer was thoroughly rammed and tamped into place. After abutments had been concreted the tall double concrete piers over the abutments to support the roadway girders and the lower portion of the arch ribs at each side were concreted. (See Fig. 7.) In the meantime the main centering was being erected and when completed a large section of the ribs at the crown was placed simultaneous with additional sections of the haunches, in order to balance the load on the centering and avoid the possibility of dangerous deformations or movements due to unequal loading. (See Fig. 6.) After this, the work was carried on in equal sections on each side of crown to meet the side section at predetermined keyways where the ribs were keyed together. On account of the sharp curvature of the ribs, top forms had to be used on most of the haunch sections to hold the fresh concrete in place, these forms being set as concreting progressed and not previous to the starting of concrete work. The arch rib reinforcement, consisting mainly of layers of plain round bars near both extrados and intrados, was placed in sections as concreting progressed, with all bars lapped at splices a sufficient distance to develop their strength in bond. The high piers supporting the approach roadway girders were poured in sections of considerable height and the columns on the arch were concreted before the arch centres were removed; the girders, however, were not poured until the centres were struck and the arch had assumed its deformation due to its own weight. The spandrel columns were built up from pedestals formed at the time of pouring arch ribs, stub bars to lap with the vertical bars in columns being embedded in these pedestals.

After the forms for roadway deck were built the reinforcing steel for girders and cross-beams was placed. The connections between beams and girders were bulkheaded off, the girders poured and then the beams and slab concreted.

A combined statement from twenty-five of the larger electric railway companies in different parts of the United States, shows that for the year ending June 30th, 1915, there was a decrease of $3,601,948 in gross income, a decrease of $1,516,025 in operating expenses, and a decrease of $2,083,394 in net income as compared with the year ending June 30th, 1914.

WATER POWER FROM EXCESS WATER SUPPLY.

According to W. B. Conant, of Concord, Mass., writing in "Municipal Engineering," the Metropolitan Water and Sewerage Board of Boston, Mass., is about to undertake the utilization of the run-off at the dam of the Sudbury reservoir, a part of the metropolitan water supply system. The reservoir has a capacity of seven and a quarter million gallons. About 90 per cent. of the flow of water will be used to develop electricity, but without impairment of the required supply to Boston for ordinary uses. The Sudbury basin lies nearer Boston and below the greater Wachusett reservoir of the system, and receives the greater part of its water from the latter. A generating station was put in operation at the Wachusett dam in 1911 and has generated about five million kilowatt hours a year since beginning service. The electrical energy is sold to the Connecticut River Transmission Company at 0.53 cent per kilowatt hour, which represents a substantial return on investment to the Metropolitan Board.

The Edison Electric Illuminating Company of Boston has contracted for five years to take the energy produced at the new Sudbury generating station, at 0.625 cent a kilowatt hour. A 900-kva. and two 275-kva. vertical-shaft generators, directly driven by 1,000 and 300-h.p. turbines, will be installed in the present granite gate house on the crest of the dam. A head of 60 feet is available on the larger unit and of 35 feet on the two smaller wheels, which will be located in chambers beneath the generators. About 650 kilowatts will be the average output of the station, but sufficient water power is available to generate a maximum of 1,400 kilowatts.

It is noteworthy that the value of water for domestic purposes exceeds that for power generation by thirty or forty fold, but the fact remains that an investment of $125,000, in the case of the Wachusett station, yields a revenue of some $30,000 yearly, and it is expected the Sudbury undertaking will be proportionally profitable.

The contracts with the purchasers of the power provide that the primary uses of water in the two reservoirs shall not be interfered with in operating the generating plants. In other words, the surplus alone is used to produce electricity, and this is available at certain times and seasons. It is interesting to note that the demands of the cities for their domestic supply, and of the electric companies for the delivery of electricity, are reciprocal. The Connecticut River Transmission Company derives the greater part of its supply from its own hydro-electric station in the western part of Massachusetts, while the Boston Edison Company has relied hitherto entirely on steam generating plants.

The practicability of using the surplus, in the case of Boston's water supply, has already been fully demonstrated, and is creating interest among engineers in other cities.

DEVELOPMENTS NORTH OF EDMONTON.

The D. A. Thomas interests have begun construction and development work in the district north of Edmonton. Mr. C. F. Law, of Vancouver, representative of Mr. Thomas, is visiting The Chutes, near Fort Vermilion, where three test-holes for oil are being drilled. Three large steamboats are to be placed in commission north of Edmonton, so as to maintain an adequate transportation service on 2,400 miles of the northern waterways. It is expected that the first boat will be finished in time for the open water next year. In the Peace Pass, above Hudson's Hope, some of the company's men have located seams of high-grade bituminous coal.