

cal equipment of the transformer stations was furnished by the Westinghouse Electric and Manufacturing Company. The power house serves as an additional transformer station, and contains two 300-K.W. lowering transformers, wound for 3,300 volts primary and 550 volts secondary circuits, which are used to feed that portion of trolley included within the limits of the city of Rushville.

Power Station.—The power house at Rushville, Indiana, is a strictly fireproof building of brick, concrete and steel, with rooms well lighted and skilfully arranged for future addition and enlargement. The boiler room occupies one side of the building and is at present equipped with three 300-h.p. Babcock and Wilcox boilers. Natural gas is now being used for fuel, but provision is made for the burning of coal, if at any time the supply of gas becomes insufficient. The engine room occupies the other side of the building, and is separated into two parts by a heavy brick partition. In the main room are installed the two generator units which consist of a 500-kilowatt Westinghouse revolving field alternator, 25 cycles per second, direct-connected to a 700-h.p. Corliss type, cross-compound, condensing engine. Both engines and generators are designed for an overload capacity of 50 per cent. Each engine is equipped with an independent jet condenser, which take their water from an underground tunnel connecting to a large mill-race. Two pairs of 250-kilowatt air-blast transformers are arranged to change the current which comes from the generator at 2,300 volts, three-phase, to 33,000 volts, two-phase, for transmission to the transformer stations along the lines. Air for these transformers is supplied by two motor-driven blowers. The generator field is excited by direct-current generators, one of which is direct-connected to an alternating current type C Westinghouse induction motor; the other to a Westinghouse compound steam engine. The marble switchboard controlling panels are also located in this main engine room, and the controlling apparatus is installed in the other portion of the building which is known as the high tension chamber. The main bus bars are located in the basement, and are supported upon a masonry structure and separated by barriers of alberine stone.

Car Shops.—The car shops are located near the power station. The entire building is 205 feet by 104 feet, and is divided as follows: Offices and waiting room for train crews, store-room, blacksmith shop, car wash-room, machine shop, truck repair shop, room for winding and drying armature and field coils and for other electrical work, paint shop and carpenter shop. Six tracks enter the building, each of which is provided with a working pit. A transfer track runs across the centre of the building. The construction of the building is fireproof throughout, with concrete foundations and floors, brick walls and steel framing. The roofs are made of asphalt gravel laid upon a cinder and concrete base, with louvers and skylights, all in steel frames. Concrete partitions are used where brick walls have not been constructed, and there is a Kinnear rolling iron door over every track. The machine shop is occupied with a full equipment of modern tools. Provision is made in the centre for a travelling crane to run the entire length of the building.

Cars.—The present equipment consists of ten passenger cars. Each car measures 55 feet over all, and is divided into three compartments. The first compartment is 9 ft. 10 in. long and is intended to carry baggage. It is provided with doors opening on either side. The cars are intended for single-end operation, and space for the motor-man is provided in front of the baggage compartment, from which it is separated by a strong railing made of pipe. The middle compartment has a seating capacity of sixteen people, and is intended for gentlemen desiring to smoke. The third compartment occupies the remaining portion of the car, and has a seating capacity for thirty-eight people. The car is finely finished in mahogany, has plate glass in the windows and art glass in the ventilators and the upper part of the windows. The car body is mounted on Baldwin Locomotive M.C.B. trucks with steel tired wheels 36 inches in diameter, 6-inch axle and 5-inch by 9-inch journals. Each truck is equipped with two 75-h.p., single-phase, alternating-current, Westinghouse motors. Cars are equipped with

the Westinghouse unit switch system of multiple control, and so may be operated either singly or in trains. The motors are controlled by the rheostatic system and may be operated on either alternating or direct current. Both straight and automatic air-brakes are provided on each car, the straight being used when the cars are run singly, the automatic system when the cars are run in trains. The motors on the present car equipment are geared for a maximum speed of 45 miles per hour for local service. Each car is equipped with two trolleys, one of the Union Standard type with trolley wheel, to be used when operating from the direct-current lines, in Indianapolis, or from the low-voltage, alternating-current lines in Rushville; the second trolley is of the bow, high speed type, and has been designed for service at 3,300 volts, alternating current. It is confidently believed that with the high-voltage, alternating-current trolley wire and the sliding contact bow trolley adopted by this company, that heavy freight can be hauled advantageously, without experiencing those difficulties heretofore encountered when service of this kind has been attempted on the direct-current system.

Operation.—Local cars are operated each way every hour, making stops upon signals at all of the cities and towns and at the principal crossings of the country. These cars are all provided with compartments in which baggage and light express matter may be carried. They are designed to run at a schedule speed of thirty miles per hour. To properly take care of the through service, additional "limited" cars will be put on the line; each of these will be equipped with four 150-h.p. motors, designed to operate at a schedule speed of 50 or 60 miles per hour, as under the provisions of the various franchises they will not have to make any stops in the country or at any of the smaller towns and will only be required to make one stop at each of the larger intervening cities. It is expected that when the road is completed from Indianapolis to Cincinnati these "limited" cars will be able to make the trip from the centre of one city to the centre of the other in three hours' time. It is the intention at a later date to run two express cars per day in each direction, taking care of the light freight and express business. This road has been built in every detail with a view to the handling of heavy freight, even to the extent of carrying it in long trains. Whenever, in the intervening cities, short radius curves could not be otherwise avoided, the private property of the inside corner has been purchased, and the sidewalks and curbs set back so as to make easy curves and permit the handling of heavy trains.

Fares.—An average fare of 1½c. per mile is charged by the company for carrying passengers, the road being divided into 5c. sections; no fare less than 5c. is charged for any ride. A school children's ticket is issued, good for use one hour before or after school hours. A mileage or sectional ticket is also issued at a reduced rate, giving 160 5c. rides for \$7, a reduction of 12 per cent. from the ordinary fare. No other tickets are sold and cash fares are collected on the car.

The most interesting feature of the new installation is the absence of rotary transformer sub-stations and the small amount of feeder copper used. It should be noted that in the trolley line, which is composed of No. 000 copper wire, no feeder circuit is necessary other than the No. 4 high potential transmission line, which carries the current from the power house to the transforming points.



WATER-POWERS OF QUEBEC.

By J. C. Langelier, Quebec.

There is not a country in the world which has so many and such immense water-powers as the Province of Quebec. These may be counted by the dozen; waterfalls capable of developing from 25,000 to 75,000 h.p., and there are several that exceed 450,000 h.p. The Great Falls of the Hamilton river, at 150 miles from the head of tide, are 302 feet high, and, regard being had to the volume of the river's water at this point, it is calculated that this fall is capable of producing a motive force exceeding one million horse-power.