

The trucks weigh 12,800 lbs. each, or a total of 25,600 lbs. per car. The air brake equipment weighs 2,800 lbs., including the compressor. The electrical equipment including control and wiring, weighs 17,000 lbs., and the bodies complete weigh 34,725 lbs., which gives a total car weight without passengers of 80,125 lbs.

St. Clair Tunnel Electrification Operating Data.

The Grand Trunk Ry. tunnel under the St. Clair River between Sarnia, Ont., and Port Huron, Mich., was electrified in 1908. The electrification was fully described in Canadian Railway and Marine World, Dec., 1908.

The system is single phase, 3,300 volts, six 66 ton Westinghouse locomotives being used. Two coupled together haul 1,000 ton trains up the 2% grades encountered in the tunnel at 10 m.p.h. Electric operation has made it possible to handle fully one third more trains than was possible with steam operation, and has eliminated danger from gas.

Through Walter D. Hall, Superintendent of the tunnel, information regarding the results of six years of electrical operation of the tunnel has been made available. He states that the steam locomotive men who, after a few weeks of training, were put in charge of the locomotives are still operating them and, with two exceptions the same firemen, now called assistants, are with them. Not a passenger or member of the yard crew has been injured by electric shock and but two casualties have occurred to workmen in the electric bay of the shops.

The average cost per year for maintenance of the six electric locomotives has been \$11,131 as compared with \$21,173 for the four steam locomotives which they replaced. The average cost per car handled through the tunnel, a distance of about 5 miles, was 17.22c. compared with 26.64c. with steam locomotives, although the capacity of cars handled today is much greater than that of the cars of 1907 and 1908. The electric locomotives are available for service about 90% of the time. The total yearly locomotive mileage for the six units averaged 208,810, or 34,800 per unit.

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The wire hangers of 1/4 in. pipe proved satisfactory except where subjected to steam locomotive gases in the yard. In such places 3/4 in. x 1 in. galvanized or sherardized steel band has been used when hangers needed replacing. A special hanger or universal trolley wire clamp was devised by Mr. Hall for use in supporting the iron contact wire. This consists of two grooved plates, held together by one carriage bolt with provision for attaching a band iron hanger by means of which the clamp with attached wires can be supported from messenger wire or insulator.

The average cost of maintenance per mile per year of the 12 miles of overhead construction and rail bonding was \$127 for labor and \$72 for materials and tools. The saving in the cost of track maintenance in the tunnel is estimated at \$1,500 a year.

The cost of fuel for the steam locomotives was \$42,729 a year, while that for the electric locomotives was \$17,186, with the electric locomotives handling a greater tonnage. While slack coal is used in the power plant in place of the hard coal formerly used on the locomotives, fewer tons of the former are consumed. The energy cost given also includes energy supplied for operating pumps, for tunnel, terminal, yard and engine house lighting and for crane and other motors. The average watt-hours per ton mile at the generator busbars were 37.6.

An interesting indicating device has been installed in the boiler room to supplement the automatic device used to adjust the rate of fuel consumption to the load. The latter consists of a diaphragm valve in the fan engine line, which controls both the fan speed and the engine speed through variation in boiler pressure. There are times when trains follow each other in such quick succession that it is not advisable to wait for the steam pressure to drop in order to bring

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The commutators make from 60,000 to 99,480 miles between turnings and the brush mileage is from 40,000 to 60,000. The pinion mileage is from 64,000 to 118,000, and none of the gears have worn out in 254,000 miles of service.

Formerly the greatest mechanical expense was due to flange wear, the average mileage between tire turnings being 25,000. Since the installation of electro-pneumatic flange oilers, the invention of Mr. Hall, some tires have already made 184,000 miles since last turning, and are still in service. Tires which formerly made 12,000 miles now reach 83,000 between turnings.

The few train delays which have occurred were due mostly to insulator failures or flashovers caused by the steam locomotive exhaust. At first some short circuits were caused by birds which alighted on the arcing tips of lightning arresters, but this cause of trouble was removed by installing porcelain perches over the arcing tips. Such strain and special insulator failures as occurred were apparently due to expansion under the effect of temperature changes. Strain insulator trouble has been overcome by the use of fibre "shrouds" which protect from rain and steam locomotive gases. The tunnel insulator design was also improved by increasing the amount of insulation between wire and ground and making broken insulators more readily replaceable. A steel contact wire was also placed below the copper wire to reduce the rate of wear.

The wood section breakers gave some trouble due to warping. These have been removed and an overlapping arrangement of the contact wires has been substituted.

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Sandwich, Windsor and Amherstburg Ry.'s Franchise.—The Ontario Legislature is being asked by the Windsor City Council to limit the duration of the franchise of the company as to supplying electric energy for lighting, heating and motive purposes within the city under the bylaw of 1892, and the further bylaw of 1896, by providing that the franchise and all the powers granted thereunder shall cease after Dec. 31, 1922, that being the date of the expiration of the company's franchise for the operation of its electric railway in the city.

The Shawinigan Water and Power Co. is asking the Quebec Legislature to authorize it to acquire and deal with the shares and securities of other companies, to carry on all kinds of manufacturing business, to guarantee the performance of contracts, etc. The company owns, among other things, the Three Rivers Traction Co., and the Shawinigan Terminal Ry.