LONDON AND PORT STANLEY RAILWAY DIARY

C. H. RIFF

Electric Railway Department

el Motor and Trailer Cars for London and Port Stanley Railway.

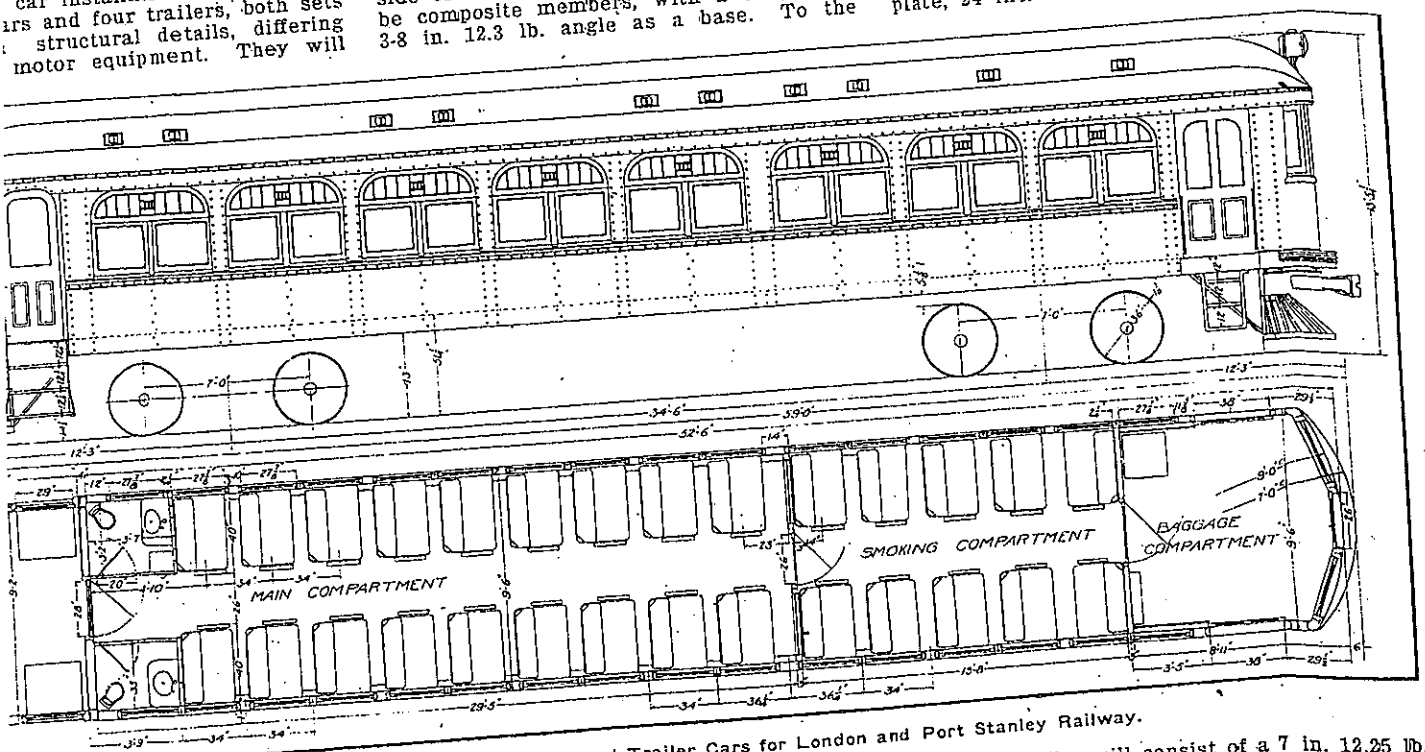
ilway and Marine World for lished particulars of the elec- nt for the London and Port and, in the December issue, en for 3 electric locomotives ctrical equipment for 5 motor ilers. Specifications were pre- iently for the bodies for the nd trailers by the Hydro er Commission of Ontario's staff, acting for the city of h owns the line, and tenders d early in December. While electrification is going on, the eing operated by steam by the tte Rd., which has it under

car installation will comprise ars and four trailers, both sets structural details, differing motor equipment. They will estimated as follows:—

	Motor.	Trailer.
Car body, complete as above	38,320	38,320
Control equipment	9,500	1,856
Air brake equipment	2,220	305
Four motors complete at 4,000 lbs.	16,000	....
Two 7 ft. wheel base trucks with 36 in. steel wheels	26,880	24,080
Total weight in lbs.	92,920	65,061

The entire frame of the cars will be of structural steel shapes and plates, with the centre and side sills continuous. The centre sill will consist of two 7 in. 15 lb. I beams at 20 in. centres, with a 3-16 in. cover plate, 24 ins. wide, extending between the diagonal tie plate in each panel. Centrally in each panel there will be a 3-16 in. plate, 9 by 24 ins., on the under side of the centre sill. The side sills will be composite members, with a 6 by 4 by 3-8 in. 12.3 lb. angle as a base. To the ing to the side angle depth, and will consist of 3-16 in. steel pressings both between the centre sill I beams and between the latter and the side sill angles, flanged to a channel section. At the centre, these will be tied to the centre sill by 3-16 by 12 by 42 in. top plates. Diagonally between these tie plates in each panel there will be two 3 by 3 in. 4.9 lb. angles.

The body end sill will consist of a central 3-16 in. steel pressing between the centre sill I beams, which will extend to the buffer plates, outside of which there are to be two steel castings fitting between the I beams and a 6 in. 10.5 channel 26 ins. from the centre, which will form the end panels. diagonal, passing alongside this casting to the end buffer. The top and bottom members of the end sills will be a 4 in. 6.25 lb. channel, the upper one on top of a 1-8 in. plate, 24 ins. wide, the width of the car.



Plan and Elevation of All Steel Motor and Trailer Cars for London and Port Stanley Railway.

all steel construction, of a design ing that in use for heavy steam service, and have been developed esult of extensive study of existing at, profiting by the experience of t have had steel equipment in use s. The general dimensions of the re as follows:—

over all	59 ft.
over end vestibules	58 ft.
over end of car body	48 ft.
ver all	9 ft. 6 ins.
ver sheathing	9 ft. 6 ins.
ver platform floor, includ- apdoors	9 ft. 5 ins.
from rail to top of roof,	
t	13 ft. 5¼ ins.
om under side of sills to roof, car light	9 ft. 10¼ ins.
from top of rail to top of	4 ft. 3¼ ins.

vertical flange of this angle there will be 1-8 in. steel side plate, 36¾ ins. deep, at the top of which, on the inside, there will be a 1½ by 2 in. 2.77 lb. angle, and on the outside a 3-8 by 3½ in. steel plate, this latter, with the angle and top of the side plate, forming the top section of the side sill girder.

The truck centres will be 34½ ft. The body bolster above the trucks will be 12 ins. deep at the centre, tapering to the depth of the side sill angle at the side. Between the centre sills there will be a 3-16 in. steel pressing, with similar pressings forming the web of the bolster outside the centre sills. Under the centre sills there will be a steel casting for the centre pin connection. A 3-8 by 14 in. steel plate will form the top plate of the body bolster, with a 5-8 by 14 in. steel plate for the bottom plate.

The buffer will consist of a 7 in. 12.25 lb. channel, bent on a 7 ft. radius, with a cross 6 in. 10.5 lb. channel joining the curved ends. A 1-8 in. plate will cover this end form, being attached to the centre sill I beams and channel braces, the latter carrying the buffer stresses through to the body side sills.

The corner posts will be 4 by 4 by 3-8 in. 9.8 lb. angles. The main side posts will be 3 in. 4 lb. channels, all but the end ones being arranged in pairs at 8½ ins. These pairs are to be placed on each side of the body bolster and cross bearer centres. Intermediate to these, there are to be 2 by 2 by ¼ in. 3.56 lb. tees. Between the pairs of channel side posts at the centre of the car, and at the bolsters, there are to be ¼ in. pressed steel fillers, each side of which will be a diagonal brace, that at the centre of ¼ by 3 in. steel, and at the bolsters of 1 by 4 in. steel. There will be two

Electric Railway Department

Electrification of the London and Port Stanley Railway.

The electrification of the L. and P. S. R. is nearing completion, and the official opening is to occur at an early date, possibly during this month. The line is 23.66 miles long, connecting London, Ont., with Port Stanley, on Lake Erie, passing through St. Thomas. This line was one of the earliest built in this country, and since its inception in the early fifties, has had an interesting history, passing through several different managements in an attempt on the part of the municipal owners to secure better operation.

The line had its inception in a public meeting held in London in Jan. 1853, to consider the building of a line from London to Port Stanley, the movers being Murray Anderson, for many years President of the line, and John Carling. The company was incorporated under its present name in 1853, under chap. 133, statutes of Canada. In August of that year the city of London decided to take £25,000 stock in the company, which was later increased, so that in 1886 it was stated before the London railway committee that the corporation had £162,850 in the venture. On Jan. 27, 1857, £30,000 more was granted by London to the railway. A book on Canadian railways, published in 1870, states that at that time the stock subscribed by the different municipalities, was as follows: London, $220,000; Middlesex county, $80,000; Elgin county, $80,000; St. Thomas, $8,500; total, $388,500. It was also stated that the railway was then indebted to London as follows: 1st mortgage bonds, $175,000; stock, $220,000; loans on 1st and 2nd mortgage bonds, $220,000; interest, etc., $502,126; total, $1,342,248. The amount of private stock held at that time was only $27,750. The line was opened Oct. 2, 1856.

From the first the line labored under financial difficulties from the fact that the cost of construction, which amounted to $1,027,828.24, exceeded the estimate by about $400,000, owing to the heavy cuttings, long embankments, and expensive bridges. However, reports from 1860 to 1870 showed that in no year did the gross earnings fall below the operating expenses. In 1870, 14 years after the line had been placed in operation, the revenue was $43,002.44, and the working expenses $30,293.00, leaving a net profit of $12,709.44. This was obtained with a total train mileage of 48,418, of which over 90% was revenue traffic. The total operating cost, including repairs, etc., was 62 cts. per train-mile.

The building of the line was commenced with a view to the general advantage and improvement of the country interested, rather than from any expectations of profits to be directly derived from revenue. It is said that in the early days the amount of traffic anticipated was not realized by the projectors, but by bringing into competition the then existing trunk lines, a reduction in freight rates on farm produce and merchandise of as much as 50% was realized, which fulfilled the object for which the line had been built.

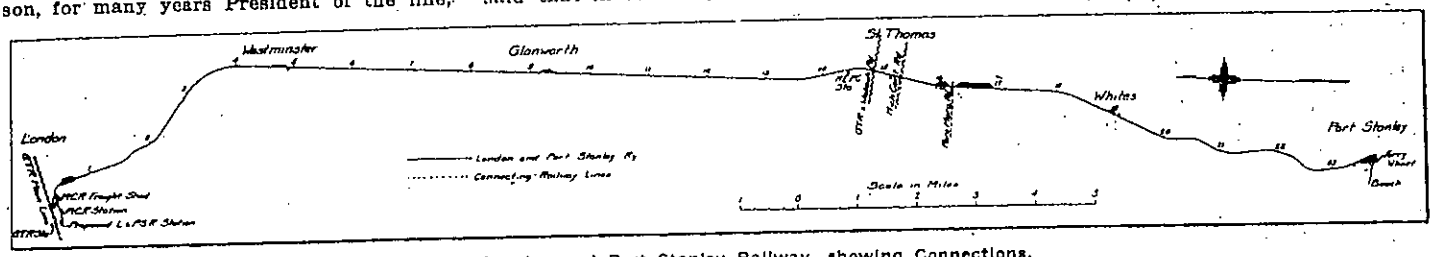


Fig. 1.—London and Port Stanley Railway, showing Connections.

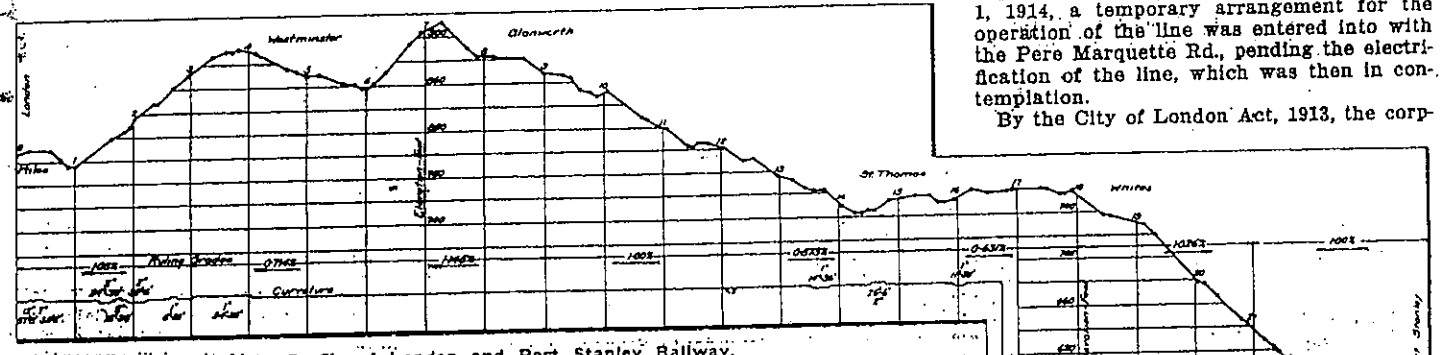


Fig. 2.—Profile of London and Port Stanley Railway.

As originally constructed, the line had a 5½ ft. gauge, and was laid with 56 lb. iron rails. The bridges and all buildings were of wood. The rolling stock in 1860 consisted of 2 locomotives, 3 passenger cars, 42 freight cars and 2 baggage cars. This had been increased in 1870 by the addition of 3 more passenger cars and 2 freight cars. Between 1860 and 1870, the passengers carried had increased from 21,919 to 44,427, more than double, and the freight tonnage from 16,780 to 23,831, about 30%. The original gauge of 5½ ft. received early consideration with regard to changing to the standard 4 ft. 8½ in. gauge, as all the connections with the exception of the G. T. R. were adopting that gauge.

On Apr. 25, 1870, the Great Western Ry. entered into an agreement with the L. & P. S. R. for a 99 year lease for the station and connection at Waterloo St., London, in consideration of the building of shops, and on Mar. 24, 1874, it leased the L. & P. S. R. for 20 years. As the leasing company had the standard gauge, the L. & P. S. R. gauge was changed to conform to it. The L. & P. S. R. had another change when on Aug. 12, 1882, the G. T. R. absorbed the Great Western Ry., and operated the line until the completion of the lease in 1894. Prior to the expiration of the lease, the city of London acquired the stock held by the city of St. Thomas, in 1893.

On Dec. 1, 1893, an agreement was made between the L. & P. S. R. and the Lake Erie and Detroit River Ry., for the lease by the latter of the L. & P. S. R. for 20 years from Jan. 1, 1894 for $10,000 a year rental, and in addition 10% on all gross earnings and receipts exceeding $80,000 a year, which was confirmed by the Ontario Legislature in 1894. This lease was transferred to the Pere Marquette Rd. about 1906, when the latter leased the Lake Erie and Detroit River Ry. On the expiration of the L. & P. S. R. lease on Jan. 1, 1914, a temporary arrangement for the operation of the line was entered into with the Pere Marquette Rd., pending the electrification of the line, which was then in contemplation.

By the City of London Act, 1913, the corporation was given power to lease the L. & P. S. R. from the L. & P. S. R. Co., to construct and equip the line as a steam or electric road, and to raise not exceeding $700,000 to construct, equip and operate it. The act also provided that the city might, by passing a bylaw, form a commission to be called The London Railway Commission, which would have the whole management and control of the construction, equipment, maintenance and operation of the line, the commission to have a membership of five, including the mayor ex officio, the other four to be elected for periods of two years, two to be elected annually. The implementing bylaw was passed by the London City Council, Nov. 29, 1913. The commission now consists of Sir Adam Beck, M.L.A., Chairman, P. Pocock, Vice Chairman, W. Spittal, Secretary (pro tem), M. D. Fraser, K.C., and H.

A. Stevenson, Mayor. This commission decided on the electrification of the line.

Traffic. As mentioned earlier the line was originally projected as a means of developing the country it traversed, and at the same time to provide an outlet for the populated centres along it to visit the pleasure grounds at Port Stanley, where the company acquired an area on the shore for that purpose. From the earliest days a heavy excursion traffic has been developed, for the encouragement of which rates less than ½ ct. a mile were given. This traffic has ever since remained the principal passenger business handled, large numbers travelling by the line from both London and St. Thomas during the summer, a good service at attractive rates having been maintained by the successive operating companies. For the year ended June 30, 1914 the passengers carried were 132,669, at a rate of 1.574 cts. a mile. The mileage of passenger trains was 64,551, and of mixed trains 14,739. The revenue per passenger train mile was $0.51563. The total passenger earnings were $40,884.22, or 30.09% of the total earnings.

Freight is of course the principal part of the traffic handled, consisting primarily of coal brought across Lake Erie from the Pennsylvania coal fields to Port Stanley by car ferry. Of the total freight tonnage, of 537,869 tons carried by the line in the above mentioned period, 552,182 tons, or 86%, was coal, of which 482,307 tons was bituminous and 69,875 tons anthracite. As the freight handled one mile amounted to 10,322,663, the average distance hauled is about 16 miles, showing that the bulk of the traffic is through, making for good operating conditions. The total freight revenue was $84,692,88; total freight earnings, $93,373.65; freight earnings, per train mile, $1.6146; proportion of total freight earnings to total earnings, 68.73.

For the year ended June, 30, 1914, maintenance of way and structures cost $25,008.89; maintenance of equipment, $31,257.03; traffic expenses, $6,777.00; general expenses, $8,230.15; total operating expenses, $180,915.11. This gave a ratio of operating expenses to operating revenue of 133.18, a deficit of $45,073.37.

In addition to the traffic handled by the lessee, the Pere Marquette Rd., the Michigan Central Rd. runs all its trains to London over the line from St. Thomas. The freight traffic of this line in London is very high. Likewise, the Pere Marquette traffic from the west, coming into St. Thomas over its leased Lake Erie and Detroit River Ry., is interchanged there for passage easterly by the Michigan Central Rd., over the section of the L. & P. S. R. connecting the two lines in St. Thomas, a distance of nearly a mile.

Agreements exist for the interchanging of G. T. R., Michigan Central Rd., Pere Marquette Rd. and Wabash Rd. traffic, the first at both London and St. Thomas, and the latter three at St. Thomas only. The Michigan Central Rd. has served notice on the London Railway Commission that the existing traffic interchange agreements will terminate July 1, 1915. Negotiations are now in process with both this line and the other three for new interchange arrangements, and it is expected that an early settlement of the question will be made.

The L. & P.S.R. has been using the G.T.R. station in London, but arrangements are being made for a separate terminal to the south of the G.T.R. station, on Richmond St., where the line will stub end. To permit the entry of its line to this new point, the Board of Railway Commissioners for Canada issued orders 23,752 and 23,753, May 28 and 27 respectively, granting the railway power to construct a track on the north side of Bathurst St. between Wellington and Richmond Sts., and to take possession of certain G.T.R. lands as follows: A 40 ft. strip between Wellington and Clarence Sts., a 50 ft. strip from Clarence St. westerly, immediately north of Bathurst. It is also authorized to construct its tracks and erect poles, fixtures and wires along Bathurst St., between its present track at Burwell St. to connect with the authorized property on Wellington St., and is authorized to use the existing track of the Michigan Central Rd. between Burwell and Wellington Sts.

It is proposed to erect a new station on the west of the foregoing for approximately the same distance to the easterly limits of Richmond St., immediately north of Bathurst St.

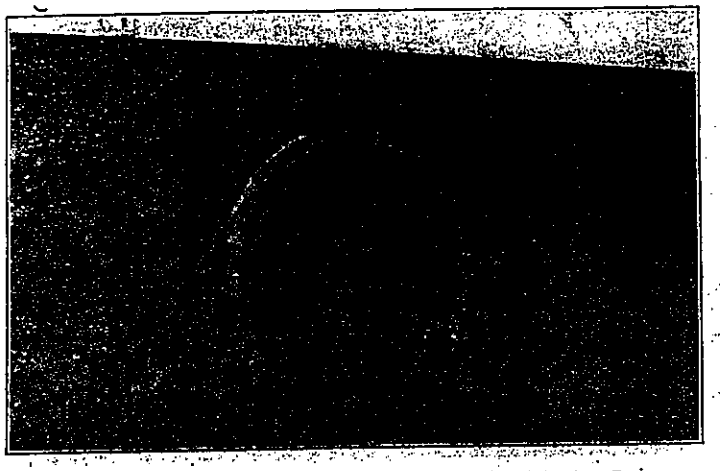


Fig. 3.—Sixty Inch Concrete Culvert replacing Wooden Box.

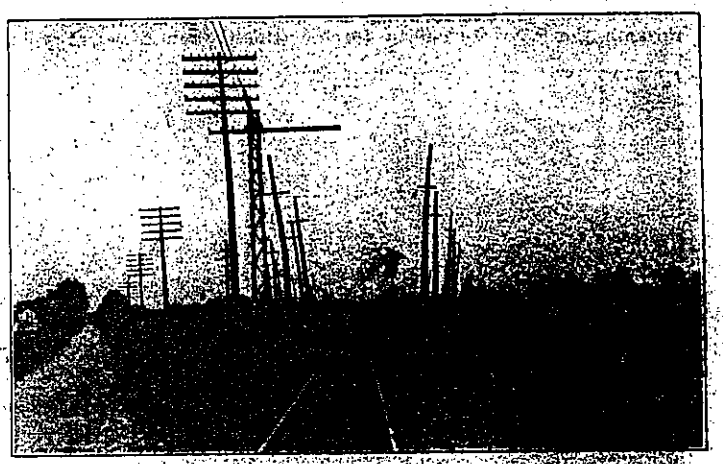


Fig. 5.—St. Thomas Yard, Looking North from Southerly Approach.

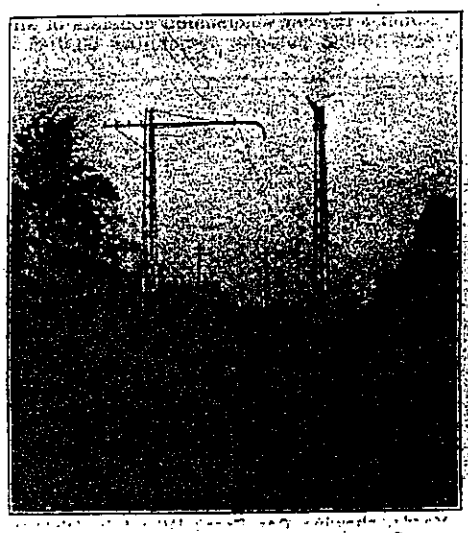


Fig. 4.—Overhead Construction on a Curve.

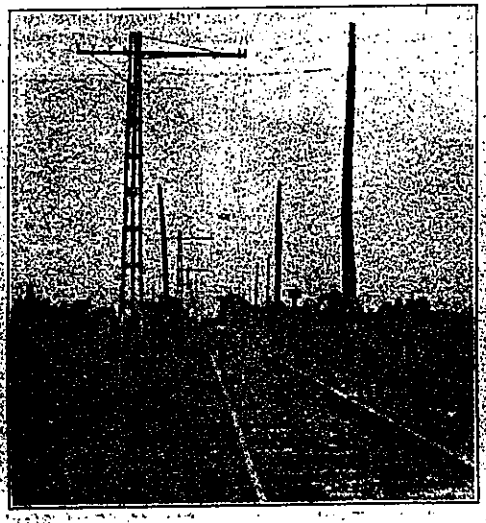


Fig. 6.—Overhead Construction at Glanworth Siding.

Fig. 7.—Overhead Construction on Bridge south of St. Thomas.

the west side of the line in St. Thomas on Talbot St. to replace the existing station about two blocks further north, which will then be removed. No immediate changes are in contemplation for the terminals at Port Stanley.

Rehabilitation of the Line. When the line was taken over by the London Railway Commission it was physically in a very bad condition, and required complete rehabilitation of the track, and structures, with the exception of the bridges, to place it in good operating condition. The renovating was handled through the Pere Marquette forces, which was still looking after the line on the short term agreement made on the expiration of the 20 year lease. As mentioned in Canadian Railway and Marine World, Sept. 1914, contracts were let as follows: Algoma Steel Co., 3,000 tons of steel rails and angle bars and 30,000 tie plates; J. J. Gartshore, 380,000 spikes; Canadian Ramapo Iron Works, 52 sets of switches and frogs; Steel Co. of Canada, 34,000 track bolts and 65,000 tie plates; and Canadian Concrete Products Co., 1,100 ft. of concrete piping of various sizes. The rails are 80 lb. Canadian Northern section,

All the bridges were in good condition and required no repairs of consequence, but the culverts had for the most part fallen into disrepair, and required either replacement or reinforcing. Two new reinforced concrete culverts were built at mileage 3.2 and 12.4, replacing in one instance a broken masonry one, and in the other, a wooden box culvert. These two culverts are 8 x 6 ft., made of reinforced concrete, with wing walls on each side. Seven old masonry culverts were reinforced with a 6 in. lining of reinforced concrete, the mud sills being also removed and replaced with from 6 to 12 ins. of concrete. About 15 concrete pipe culverts were put in, replacing for the most part broken down wooden box culverts. These varied in size from 24 to 72 ins., one of the 60 in. ones being shown in the accompanying fig. 3.

Electrification. For the electrification of the line, 1,500 volt d.c. was selected after a study of the single and three phase a. c. system, and the high and low d.c. systems, the 1,500 volt d.c. offering what appeared to be the best power for the conditions to be contended with, most of the more recent

Fig. 8.—Hydro Electric Power Commission Sub Station at St. Thomas.

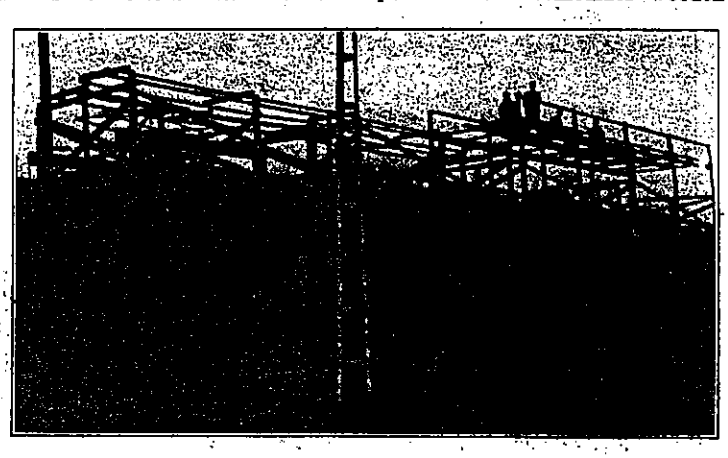


Fig. 9.—Method of Stringing Trolley and Feeder Wires.

poles, are employed, all at 90 ft. spacing. The wooden poles used are from 35 to 40 ft. long, with an 8 in. top.

Catenary suspension is employed on all main line work, with direct suspension in yards with wooden poles. The trolley wire is 4-0 grooved copper, suspended by clips at 20 ft. centres from a 300,000 c.m. copper catenary wire. The trolley wire is 23 ft. 3 ins. above the rail, giving a suspension at the poles of about 3 ft. The suspension consists of single and double pull-offs, depending on location.

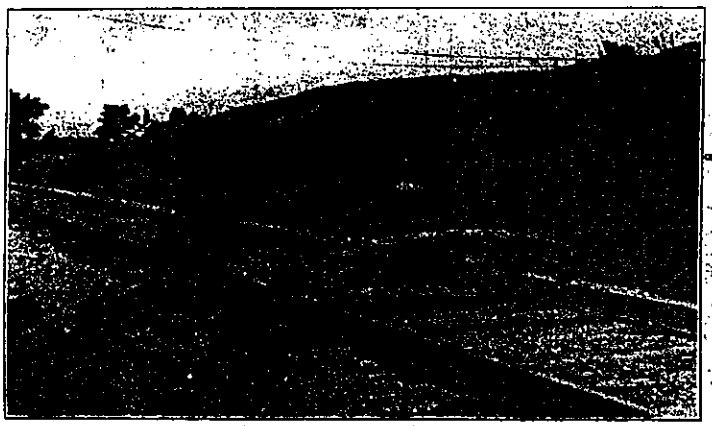


Fig. 10.—Bonding Rails with the Oxy-acetylene Torch.

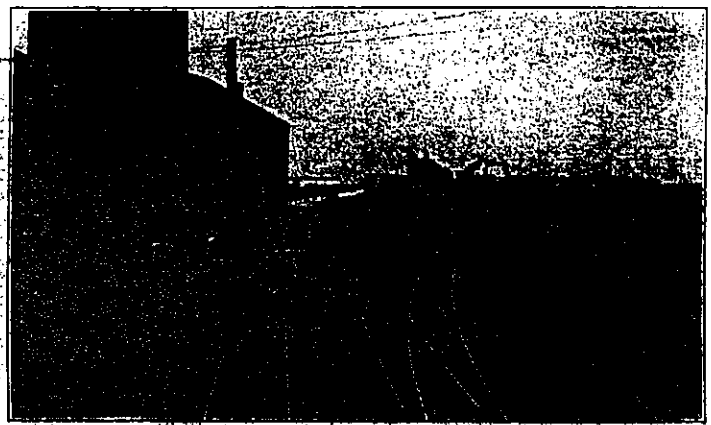


Fig. 11.—Port Stanley Yards, showing Car Ferry Wharf in Distance.

and with the exception of the tracks in London, St. Thomas and Port Stanley, and certain sidings, were laid during 1914. All other rail laying, with the exception of a few of the sidings now under discussion with the Pere Marquette Rd. with regard to transferring to the Commission, have since been laid, most of the ties being replaced by new untreated cedar throughout the whole length of the line, and all the track reballasted with gravel taken from a gravel pit adjoining the line just south of St. Thomas, near Whites, so that today the track is in excellent condition.

interurban electrification projects in Canada and the United States having adopted this voltage. The overhead work is supported on steel poles, which also carry the feeders, and dispatching wires. The poles are made of galvanized structural steel shapes, and weigh complete about 800 lbs. They are of triangular form, 35 ft. 0½ in. high, bedded in a triangular concrete base to give a 4 in. casing of concrete outside of the corners. The bases are 7 ft. deep, and are imbedded 6 ft. in the earth. They consist of three 60 deg. angles, 3-16 in. thick flanges, tied together with 3-16 x 4½ in. batten plates about 28 in. centres. The cross arm, 26 ft. clear above the rail, is a 4 in. 5¼ lb. channel, bolted to two of the vertical arms, and is braced in front with light angles. The pole legs have a slight batter, 28 ins. from corner to corner of the angles at the base, and 12 ins. at the top of the pole. The poles are placed at 180 ft. centres on tangents, and at from 140 to 160 ft. on curves. They call for a strength to resist a strain of 2,000 lbs. at the top, failing at from 2,500 to 2,700 lbs. The tension will seldom exceed from 500 to 1,000 lbs. In yards, either wooden poles alone, or the steel poles with intermediate wooden

The line is anchored every ¾ mile by steel poles placed on the opposite side of the track, with an anchoring wire between it and the next adjoining pole, to which the catenary is tied. Dead ends are inserted at every 4 miles, arranged for in a somewhat similar manner to the anchoring, with a pole on the opposite side, the dead ended wires paralleling each other a short distance, and then swinging off to the dead end poles. An anchor pole is shown in fig. 4.

Deflectors are provided at all switches, and in the larger yards the overhead work is direct suspended from cross spans from

the wooden poles, as in the St. Thomas yard, as shown in fig. 5, where the poles and cross suspension wires are shown prior to the trolley wire suspension. At minor sidings, such as that at Glanworth, fig. 6, the steel poles are carried through, with wooden poles on the siding side of the track, with suspension wires across from the adjoining steel poles to the wooden ones. On bridges the catenary construction is carried through by suspending the wires from a light steel overhead bridge as shown in fig. 7. All the insulators are tested to 3,000 volts. The sectionalizing is manually operated. Lightning protection is of the circuit breaker type and is provided at every fifth pole.

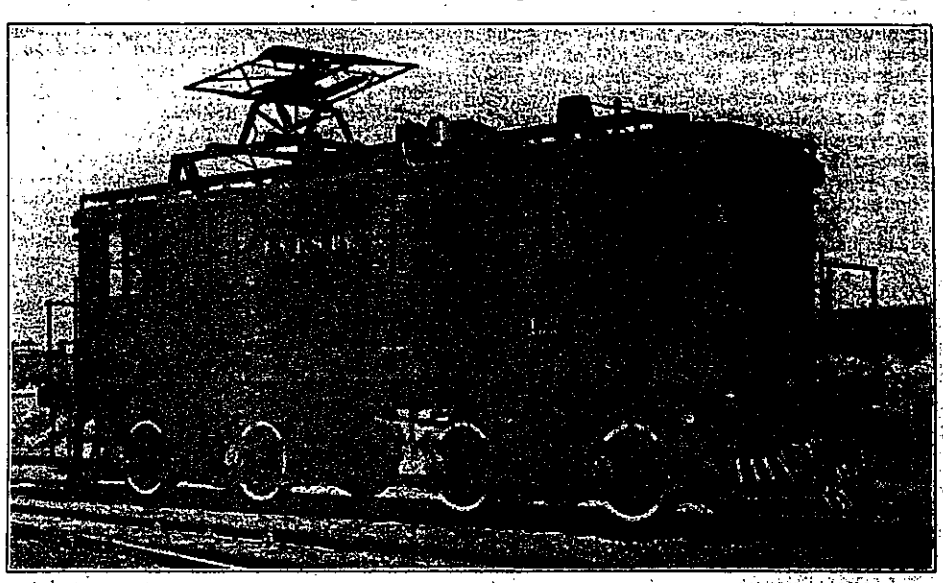
The bracket on the off side of the pole will carry 4 signal wires and a 500,000 c.m. aluminum feeder from the St. Thomas substation to Port Stanley. There are substations at London and St. Thomas, each equipped with two 500 k.w. 1,500 volt d.c. rotary converters, the one at London being located in the municipal electric plant, and the other at St. Thomas, in the Hydro Electric Power Commission of Ontario's substation, shown in fig. 8.

The method of erecting the overhead work is shown in fig. 9. The tops of two box cars were fitted with wooden frames, between which boards were placed on longitudinal members. The side railing above this floor was collapsible, swinging down on the floor when travelling on the line. The two cars, with a cable car, were moved along the line by a locomotive.

The process of bonding is shown in fig. 10. Ohio Brass Co. 4-0 copper bonds are used, welded to the outer side of the rail heads. The outfit employed consisted of a light four wheel car on the rails, carrying two cylinders, one of oxygen, and one of acetylene, behind which were supported a number of strands of copper wire for brazing. The process makes a good union very quickly.

Electric Locomotives. As mentioned, the freight traffic consists chiefly in hauling loaded coal cars from Port Stanley to St. Thomas and London, a car ferry, operating over 10 months in the year, delivering the cars to the line from the Pennsylvania coal fields across Lake Erie. Some additional traffic, consisting principally of loaded coal and merchandise cars, is delivered to the line at St. Thomas for London. The traffic from London to St. Thomas consists of loaded merchandise cars, and empty coal cars, while between St. Thomas and Port Stanley it consists almost entirely of returning empty coal cars for delivery to the car ferry. This ferry has a capacity of 30 cars on its four tracks, the two central tracks holding 8 cars each, and the outer two 7 cars each. It can make two round trips a day, delivering to the line 30 loaded cars, and taking away 30 empties, each trip. The Port Stanley switching yard is practically level, and is approximately 1,000 ft. long. It is shown in fig. 11, which also shows the ferry dock in the distance.

These were the conditions to be met in designing the electric locomotives. For the purpose of specifying their capacity it was assumed that the traffic would be handled in 800 ton trains, and that certain periods of time would be desirable in handling the switching and interchange at points along the line. For instance, immediately after unloading and reloading the ferry, the locomotive would be required to classify the cars and make up the train in an approximate time of 45 mins., the maximum train to be moved being assumed at 15 loaded cars of 70 tons each. After this Port Stanley yard switching, the locomotive would haul the assumed loading of 800 tons up grade to St. Thomas, with power to stop and start again at Whites, where a car might be passed. In St. Thomas the switching service, consisting of picking up and setting off cars to interchange lines and sidings, might take about 30 mins. The assumption is made that the trainload before reaching and after leaving St. Thomas would be approximately the same, on account of the balance between the freight dropped off and the London interchange from the connecting railways. Stops might be required at Glanworth and Westminster, and on arriving in London the cars would be distributed to the various sidings, and a train made up for the return trip, consuming possibly an hour.



Locomotive (Temporarily Equipped with One Light Trolley).

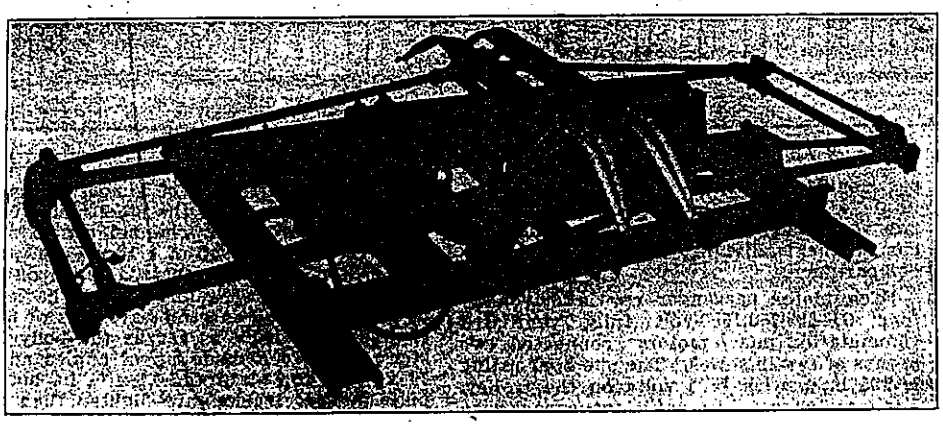


Fig. 12. Pantograph Slider Trolley.

Three electric locomotives, preliminary descriptions of which appeared in Canadian Railway and Marine World, Nov. and Dec. 1914, have been built. They are of the 4-0-4 type and are carried on two swivel trucks bringing all the weight on the drivers, while the equipment is housed in a steel box type cab extending over practically the entire length of the locomotive. Each one is provided with four GE-251, 750-1500-volt motors designed for 750 volts across each armature and insulated for 1500 volts. Two motors are connected permanently in series and the two-motor groups thus formed are capable of connection in series or parallel for speed control. The cab is divided into three compartments, one at each end for accommodating the operator, and an intervening compartment where the control equipment and accessories are located. The operating compartments are provided with 1500 volt electric heaters. Each of the GE-251 motors has an hourly rating of 245 h.p. with 1500 volts on the trolley. At this rating the locomotives exert a tractive effort of 21,500 lbs. Control is effected by a double end, type M, standard equipment, a master controller at each operating position actuating the main 1500-volt contactors by means of a 600-volt circuit supplied from a dynamotor. Multiple unit train operation is arranged for so that the simultaneous control of three locomotives coupled together can be accomplished from any master controller. The equipment is also so designed that a locomotive may haul a train of 8 or 10 passenger trailer cars and provide 600 volt lighting energy for them. The current collectors consist of pantograph slider trolleys having two contact pans pressing against the trolley conductor. Two of these devices are furnished on each locomotive. They are electro-pneumatically controlled from any operating position with one, two or three locomotives hauling a train. The pantograph is shown in fig. 12. It is novel in design, the legs crossing each other in lazy-tong fashion, the reason for this arrangement being the requirement of a vertical range of 9 ft., without unduly lengthening the length depressed. The specifications call for a maximum safe speed of 45 m.p.h., and a capacity for accelerating an 800 ton train on a 1% grade with a clean, dry rail, and to be able to develop a drawbar pull for a 5 min. period corresponding to a 35% adhesion. They

were delivered last week by the Canadian General Electric Co.

Cars. The original intention in ordering the car equipment was to provide 5 motor cars and 4 trailers, of all steel construction, the design of which was given in detail in Canadian Railway and Marine World; Jan. 1915. A plan and elevation of this all steel car is shown in fig. 13. It was subsequently decided to proceed as at first intended with the 5 steel motor cars, and to change the other cars to wooden construction. These include an express car, 3 trailer cars and a box car. The motor cars are of a design approaching that in use for heavy steam railway service, and have been developed as the result of extensive study of existing equipment, profiting by the experience of lines that have had steel equipment in use for years. The general dimensions of the bodies are as follows:—

Length over all			59 ft.
Length over end vestibules			58 ft.
Length over end of car body			48 ft.
Width over all	9 ft.	6	ins.
Width over sheathing	9 ft.	6	ins.
Width over platform floor, including trapdoors	9 ft.	5	ins.

Each car has two lavatories, finished in white, with a sheet steel ceiling, giving a tile effect, and equipped with water closet, washstand, 5 gallon water cooler, and all requisites. The water is provided from a 50 gal. tank over top of the lavatory, under the roof. Each side of the roof contains 10 ventilators of the deflector type, automatic in their operation. The lavatories contain special lavatory room ventilators.

Four of the motor cars have the three compartment layout, while the other one has the two compartment layout. In the three compartment layout, the car end is slightly changed so as to incorporate the vestibule into the baggage compartment, 8 ft. 11 ins. long. Adjoining is the smoking compartment, 13 ft. 8 ins. long, with the main compartment 29 ft. 5 ins. long to the other vestibule. The two compartment car has the two vestibules, with the main and smoking compartments dividing the length into two compartments.

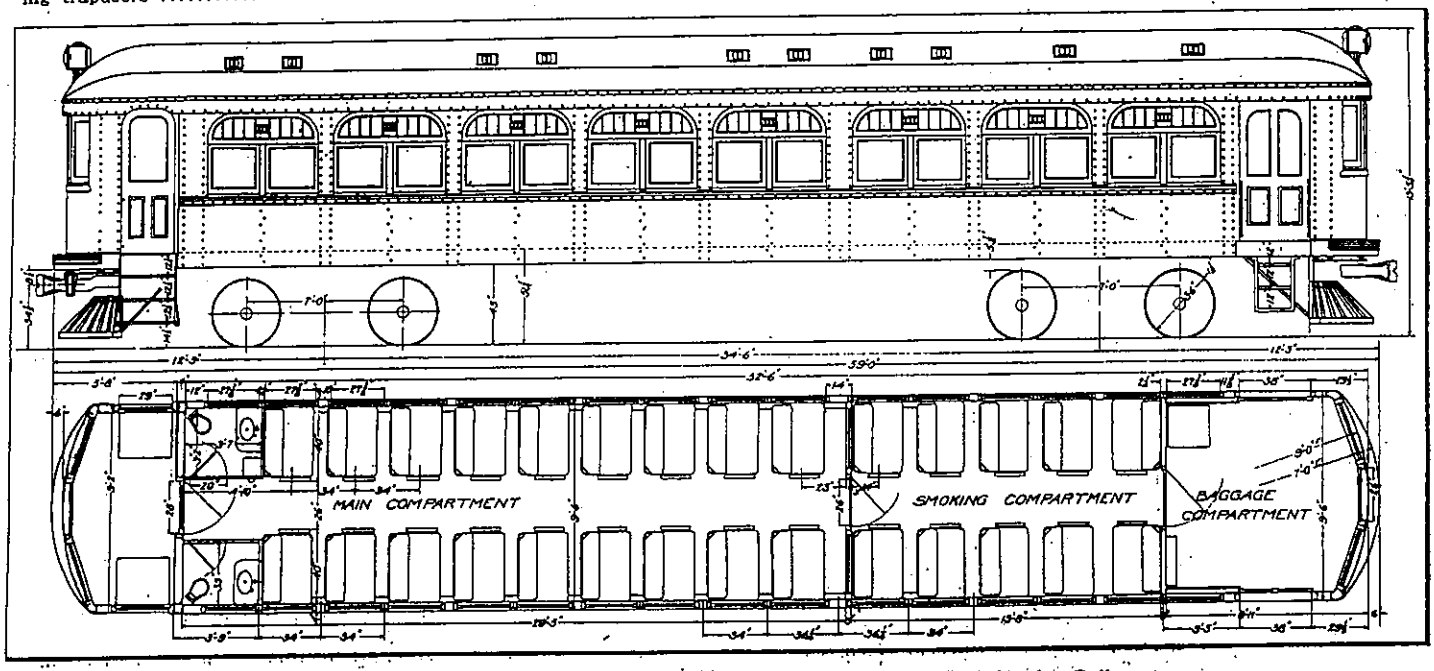


Fig. 13. Plan and Elevation of All Steel Motor Cars for London & Port Stanley Railway.

Height from rail to top of roof, car light	13 ft.	5¼	ins.
Height from under side of sills to top of roof, car light	9 ft.	10¼	ins.
Height from top of rail to top of platform	4 ft.	3¼	ins.

The weight of the car body, including heating equipment, seats, light foundations, brake rigging, draught gear, including supports, ready for the installation of the control equipment and air brakes, has been estimated as follows:—

Car body, complete as above	38,320
Control equipment	9,500
Air brake equipment	2,220
Four motors complete at 4,000 lbs.	16,000
Two 7 ft. wheel base trucks with 36 in. steel wheels	26,880
Total weight in lbs.	92,920

The entire frame of the cars is of structural steel shapes and plates, with the centre and side sills continuous. The inside finish is of the best selected inlaid mahogany, natural sanitary finish, including the doors, linings and mouldings, and the trimmings are of solid bronze, and include grab handles on the body corner posts and vestibule corner posts, match scratchers between the seats in the smoking compartments, and the hinges, etc. The basket racks are continuous, removable in sections, running the full length of the car, and of a bronze finish. The seats are of a high back design, finished in plush for the main compartments, and in pantasote for the smoking compartments. They are 40 ins. wide overall, with the back rising to a height of 42 ins. The aisle width is 26 ins.

Each motor passenger car is driven by four GE-225-750|1500-volt fully ventilated commutating pole motors connected two groups of two in series. The one hour rating is 125 h. p. with 1500 volts on the trolley. Each motor car has sufficient capacity to haul one trailer car and provision is made for the motor and trailer cars to be operated in trains up to a total of three motor and three trailer cars. All trailer cars are equipped with master controllers at each end so that multiple unit train operation is possible from either end of any motor or trail car.

Control energy for a motor and trailer is derived from a 1500|600-volt dynamotor on each motor car. The dynamotor will also supply energy for lighting one motor and one trail car. Main and auxiliary train cables run continuously through a train, provision being made for the simultaneous raising and lowering of all pantographs and also for simultaneous sanding, by electro pneumatic valves, of all cars from any operating position. The pantograph trolleys are identical with those on the locomotives.

Each car carries a combined straight and automatic air brake outfit of the variable release type, with the air supply furnished by 1500-volt compressors. The compressor governors are all equalized on a special wire running throughout the train in the auxiliary train cable.

The original intention was to have the heaters of the hot air type, situated at one end of the car, delivering air through a 3 x 8 in. duct of ⅛ in. steel along the floor line of the wall. This has been changed to individual seat 1,500 volt electric heaters, 28 heaters under the seats, 2 in the vestibule, and 3 in the baggage compartment. As the trailers are to be used for summer traffic only, they have no heaters, but air ducts are provided so that hot air heating may be installed if found necessary. The baggage car has 12 electric heaters; the box car will have none. The steel motor cars were built by the Jewett Car Co., Newark, Ohio.

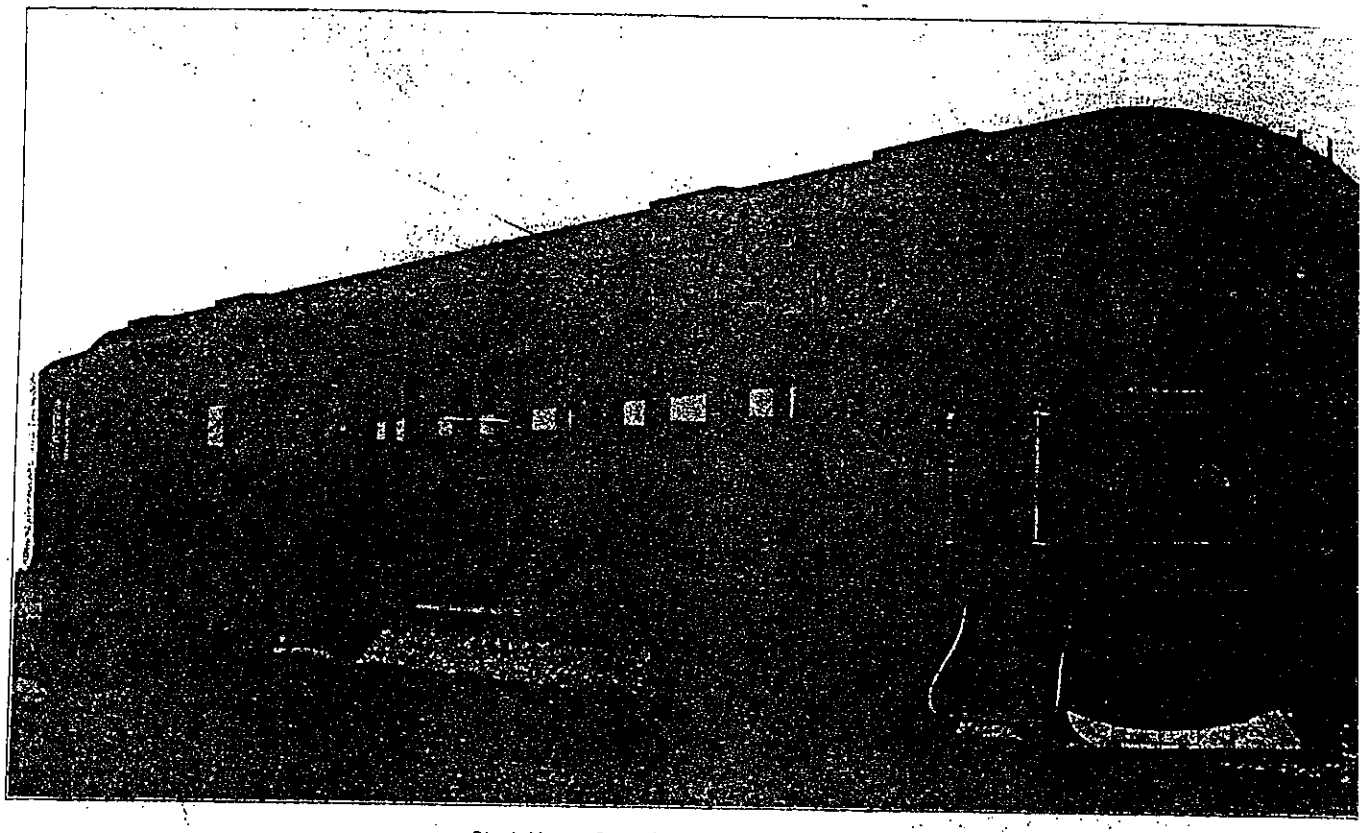
The trailer cars are of wooden construction, steel underframe, of almost the same general dimensions as the steel motor cars. They have two 8 in. channel centre sills, and side sills made up of a 12 x ⅜ in. plate and a 3 x 5 x ⅜ in. angle, trussed on the under side with a 1⅛ in. truss rod having a 24 in. drop. End intermediate sills of 8 in. channels run back as far as the body bolsters, which are made up of angles and a 14 x ⅜ in. top plate and 14 x ⅜ in. bottom plate. The trucks are lighter than the motor car trucks, with 33 in. wheels and a 6 ft. wheel base. They are of the two compartment layout, as in some of the motor cars.

The express car is of wooden construction, steel underframe, the same as the trailer cars, only 64 ft. long, with the same motor equipment as the steel motor cars. It is slightly narrower than the passenger cars, 9 ft. 2¾ ins. wide, and has two 6 ft. doors on each side. It is equipped for double end operation.

A standard 30 ton box car, finished outside the same as the passenger cars, will be used for light freight service. It is of wooden construction throughout. The underframe consists of six sills, two side and

Steel Motor Cars, London and Port Stanley Railway.

Canadian Railway and Marine World for July contained a complete description of the L. & P.S.R. rolling stock, the steel motor cars being illustrated by an elevation and floor plan. An illustration of one of the completed cars is given herewith. They are 61 ft. 1¾ ins. long, over buffers, and are exceptionally wide, viz., 9½ ft. over posts. This makes possible seats 40 ins. long, with aisle 26 ins. wide. The car is divided into baggage, smoking and general passenger compartments. In the main compartment there are two lavatories, one for men and one for women, with metal tile walls, and tile floor set in cement. The bottom framing is made up of structural sills with pressed steel cross bridging, plate bolsters with pressed steel fillers being used. Side posts are of channel and tees of light section, with angle iron corner posts. The posts in bulkhead and partitions are also of channels, with channel header across between side plates. The entire outside and bulkheads are composed of steel plates. Carlines are pressed steel, and the roof is of large steel plates laid across the full width of the car. The cars are fitted with extra heavy steel pilots, and M.C.B. draw bars. The interior finish is mahogany inlaid, with inside and outside Gothic sash with cathedral glass, and storm sash fitted to all body windows. The ceiling is of agasote, and the wooden floor is covered with linoleum. The car is lighted by semi-indirect system with pendant fixtures, light wiring being in concealed conduit, as is also heater wiring, heaters being of the cross seat electric type. There is a vestibule on the rear end only, with triple steps covered with steel trap doors. The lavatories are very completely equipped with flush hoppers, wash stand with liquid soap holder, towel rack, etc., all fixtures being nickel plated. The interior of the cars present a tasteful appearance, the mahogany being finished in a rather light tone, and great care having been exercised in selecting soft harmonizing colors for ceiling and stained glass. Nothing in the way of incidental equipment, such as buzzers, air sanders, fire extinguishers, etc., has been omitted, and a large switch cabinet extends from floor to ceiling, with slate back, containing all electrical switches. The roof is a compromise arch design. They were built by the Jewett Car Co., Newark, Ohio, and electrically equipped by the Preston Car & Coach Co.



Steel Motor Cars, London and Port Stanley Railway.

Berlin and Waterloo Street Railway Annual Statement.

Following is the statement for the calendar year 1914 of this line, which is

August 1915

Opening of the Electrified London and Port Stanley Railway.

The newly electrified London and Port Stanley Ry., a detailed description of which was given in Canadian Railway and Marine World for July, was opened for traffic July 1, when some 2,500 passengers were carried from London, and over 1,000 from St. Thomas to Port Stanley, in addition to local traffic along the line. No freight was carried during the day. The power machinery is reported to have worked very well, but some slight defects developed which required adjustment. To enable these adjustments to be made, steam was used for the operation of the line for a few days after July 1, and the electrical operation of the line was reported to be working reasonably satisfactorily July 8. Freight carrying was started July 2, and it was reported July 8, that it was increasing and was being handled expeditiously.

The work of electrifying the line was done under the direction of F. A. Gaby, Chief Engineer, Hydro Electric Power Commission of Ontario, the assistant engineers of the Commission employed being E. G. Hewson, electrical work; H. L. Bucke, track work; A. E. Davison, pole work; and E. Brandon, substations. D. M. Morrison was resident engineer in charge of the whole work, with office at St. Thomas.

The official opening of the line took place July 22, when a large number of guests attended on the invitation of the London City Council, Board of Trade and Public Utilities Commission. They were taken over the line from London to Port Stanley and return in the afternoon, and were then entertained at dinner in London.

August 1915

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the west side of the line in St. Thomas on Talbot St. to replace the existing station about two blocks further north, which will then be removed. No immediate changes are in contemplation for the terminals at Port Stanley.

Rehabilitation of the Line. When the line was taken over by the London Railway Commission it was physically in a very bad condition, and required complete rehabilitation of the track, and structures, with the exception of the bridges, to place it in good operating condition. The renovating was handled through the Pere Marquette forces, which

All the bridges were in good condition and required no repairs of consequence, but the culverts had for the most part fallen into disrepair, and required either replacement or reinforcing. Two new reinforced concrete culverts were built at mileage 3.2 and 12.4, replacing in one instance a broken masonry one, and in the other, a wooden box culvert. These two culverts are 8 x 6 ft., made of reinforced concrete, with wing walls on each side. Seven old masonry culverts were reinforced with a 6 in. lining of reinforced concrete, the mud sills being also removed and replaced with from 6 to 12 ins.

28 in. centres. [illegible] above the rail, is a 4 in. 5¼ lb. channel, bolted to two of the vertical arms, and is braced in front with light angles. The pole legs have a slight batter, 28 ins. from corner to corner of the angles at the base, and 12 ins. at the top of the pole. The poles are placed at 180 ft. centres on tangents, and at from 140 to 160 ft. on curves. They call for a strength to resist a strain of 2,000 lbs. at the top, failing at from 2,500 to 2,700 lbs. The tension will seldom exceed from 500 to 1,000 lbs. In yards, either wooden poles alone, or the steel poles with intermediate wooden

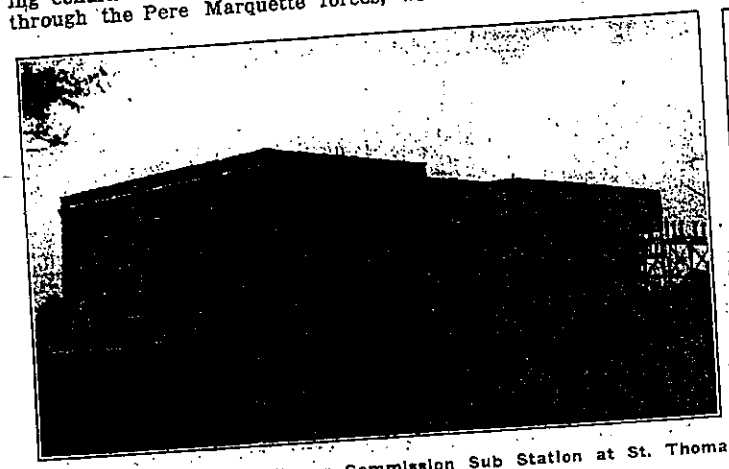

Fig. 8.—Hydro Electric Power Commission Sub Station at St. Thomas.

Fig. 9.—Method of Stringing Trolley and Feeder Wires.

was still looking after the line on the short term agreement made on the expiration of the 20 year lease. As mentioned in Canadian Railway and Marine World, Sept. 1914, contracts were let as follows: Algoma Steel Co., 3,000 tons of steel rails and angle bars and 30,000 tie plates; J. J. Gartshore, 380,000 spikes; Canadian Ramapo Iron Works, 52 sets of switches and frogs; Steel Co. of Canada, 34,000 track bolts and 65,000 tie plates; and Canadian Concrete Products Co., 1,100 ft. of concrete piping of various sizes. The rails are 80 lb. Canadian Northern section,

of concrete. About 15 concrete pipe culverts were put in, replacing for the most part broken down wooden box culverts. These varied in size from 24 to 72 ins., one of the 60 in. ones being shown in the accompanying fig. 3.

Electrification. For the electrification of the line, 1,500 volt d.c. was selected after a study of the single and three phase a. c. system, and the high and low d.c. systems, the 1,500 volt d.c. offering what appeared to be the best power for the conditions to be contended with, most of the more recent

poles, are employed, all at 90 ft. spacing. The wooden poles used are from 35 to 40 ft. long, with an 8 in. top.

Catenary suspension is employed on all main line work, with direct suspension in yards with wooden poles. The trolley wire is 4-0 grooved copper, suspended by clips at 20 ft. centres from a 300,000 c.m. copper catenary wire. The trolley wire is 23 ft. 3 ins. above the rail, giving a suspension at the poles of about 3 ft. The suspension consists of single and double pull-offs, depending on location.

Fig. 10.—Bonding Rails with the Oxy-acetylene Torch.

Fig. 11.—Port Stanley Yards, showing Car Ferry Wharf in Distance.

and with the exception of the tracks in London, St. Thomas and Port Stanley, and certain sidings, were laid during 1914. All other rail laying, with the exception of a few of the sidings now under discussion with the Pere Marquette Rd. with regard to transferring to the Commission, have since been laid, most of the ties being replaced by new untreated cedar throughout the whole length of the line, and all the track reballasted with gravel taken from a gravel pit adjoining the line just south of St. Thomas, near Whites, so that today the track is in excellent condition.

interurban electrification projects in Canada and the United States having adopted this voltage. The overhead work is supported on steel poles, which also carry the feeders, and dispatching wires. The poles are made of galvanized structural steel shapes, and weigh complete about 800 lbs. They are of triangular form, 35 ft. 0⅛ in. high, bedded in a triangular concrete base to give a 4 in. casing of concrete outside of the corners. The bases are 7 ft. deep, and are imbedded 6 ft. in the earth. They consist of three 60 deg. angles, 3-16 in. thick flanges, tied together with 3-16 x 4½ in. batten plates about

The line is anchored every ¾ mile by steel poles placed on the opposite side of the track, with an anchoring wire between it and the next adjoining pole, to which the catenary is tied. Dead ends are inserted at every 4 miles, arranged for in a somewhat similar manner to the anchoring, with a pole on the opposite side, the dead ended wires paralleling each other a short distance, and then swinging off to the dead end poles. An anchor pole is shown in fig. 4.

Deflectors are provided at all switches and in the larger yards the overhead work is direct suspended from cross spans from

A. Stevenson, Mayor. This commission decided on the electrification of the line.

Traffic. As mentioned earlier the line was originally projected as a means of developing the country it traversed, and at the same time to provide an outlet for the populated centres along it to visit the pleasure grounds at Port Stanley, where the company acquired an area on the shore for that purpose. From the earliest days a heavy excursion traffic has been developed, for the encouragement of which rates less than ½ ct. a mile were given. This traffic has ever since remained the principal passenger business handled, large numbers travelling by the line from both London and St. Thomas during the summer, a good service at attractive rates having been maintained by the successive operating companies. For the year ended June 30, 1914 the passengers carried were 132,669, at a rate of 1.574 cts. a mile. The mileage of passenger trains was 64,551, and of mixed trains 14,739. The revenue per passenger train mile was $0.51563. The total passenger earnings were $40,884.22, or 30.09% of the total earnings.

Freight is of course the principal part of the traffic handled, consisting primarily of coal brought across Lake Erie from the Pennsylvania coal fields to Port Stanley by car ferry. Of the total freight tonnage, of 687,869 tons carried by the line in the above mentioned period, 552,182 tons, or 86%, was coal, of which 482,807 tons was bituminous and 69,375 tons anthracite. As the freight handled one mile amounted to 10,322,000, the average distance hauled is about 16 miles, showing that the bulk of the traffic is through, making for good operating conditions. The total freight revenue was $84,692,88; total freight earnings, $93,373.65; freight earnings, per train mile, $1.6146; proportion of total freight earnings to total earnings, 68.73.

For the year ended June, 30, 1914, maintenance of way and structures cost $25,008.89; maintenance of equipment, $31,257.03; traffic expenses, $6,777.00; general expenses, $8,230.15; total operating expenses, $180,915.11. This gave a ratio of operating expenses to operating revenue of 133.18, a deficit of $45,073.37.

In addition to the traffic handled by the lessee, the Pere Marquette Rd., the Michigan Central Rd. runs all its trains to London over the line from St. Thomas. The freight traffic of this line in London is very high. Likewise, the Pere Marquette traffic from the west, coming into St. Thomas over its leased Lake Erie and Detroit River Ry., is interchanged there for passage easterly by the Michigan Central Rd., over the section of the L. & P. S. R. connecting the two lines in St. Thomas, a distance of nearly a mile.

Agreements exist for the interchanging of G. T. R., Michigan Central Rd., Pere Marquette Rd. and Wabash Rd. traffic, the first at both London and St. Thomas, and the latter three at St. Thomas only. The Michigan Central Rd. has served notice on existing traffic [illegible] terminate July 1, 1915. Negotiations now in process with both this line and the other three for new interchange arrangements, and it is expected that an early settlement of the question will be made.

The L. & P.S.R. has been using the G.T.R. station in London, but arrangements are being made for a separate terminal to the south of the G.T.R. station, on Richmond St., where the line will stub end. To permit the entry of its line to this new point, the Board of Railway Commissioners for Canada issued orders 23,752 and 23,753, May 28 and 27 respectively, granting the railway power to construct a track on the north side of Bathurst St. between Wellington and Richmond Sts., and to take possession of certain G.T.R. lands as follows: A 40 ft. strip between Wellington and Clarence Sts., a 50 ft. strip from Clarence St. westerly, immediately north of Bath- the west of the foregoing for approxim ly the same distance to the easterly li of Richmond St., immediately north Bathurst St. It is also authorized to struct its tracks and erect poles, fix and wires along Bathurst St., betwee present track at Burwell St. to connect the authorized property on Wellingto and is authorized to use the existing of the Michigan Central Rd. between well and Wellington Sts.

It is proposed to erect a new stati

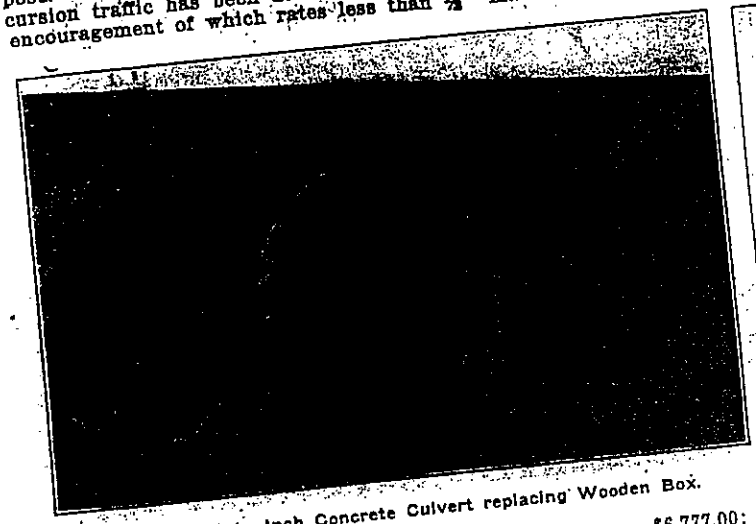

Fig. 3.—Sixty Inch Concrete Culvert replacing Wooden Box.

Fig. 5.—St. Thomas Yard, Looking North from Southerly Approach.

Fig. 4.—Overhead Construction on a Curve.

Fig. 6.—Overhead Construction at Glanworth Siding.

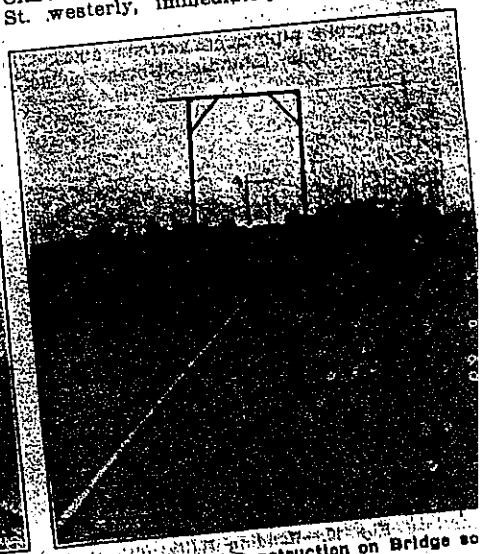

Fig. 7.—Overhead Construction on Bridge ac of St. Thomas.