

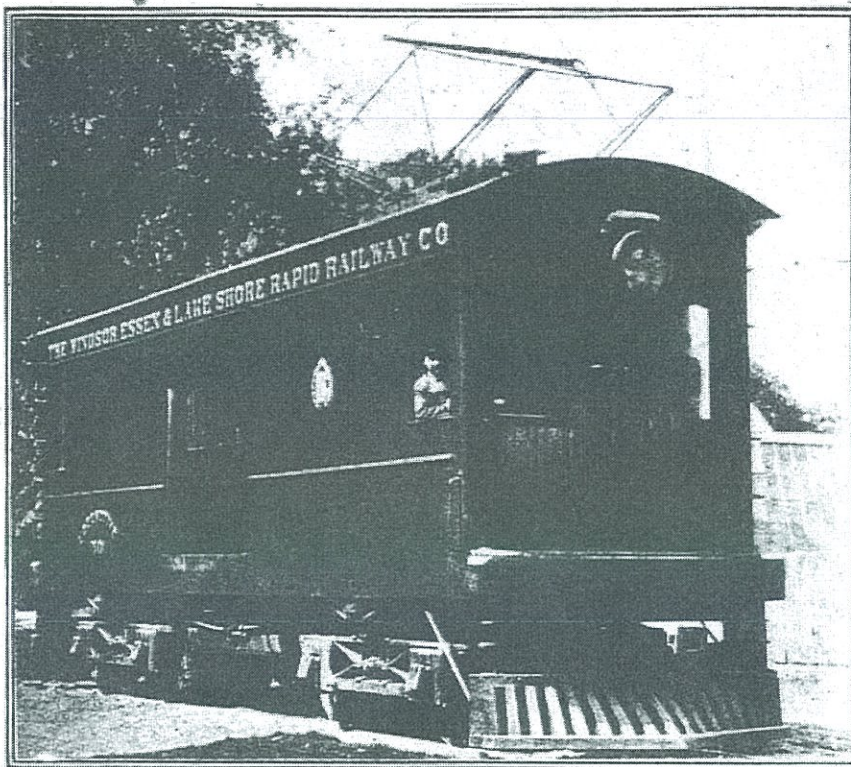
WINDSOR, ESSEX
AND
LAKE SHORE

W. E. & L. S. R. Railway Locomotive.

The Windsor, Essex and Lake Shore Rapid Ry., with headquarters at Kingsville, Ont., has completed recently an interesting locomotive which is illustrated on this page. In designing this locomotive special attention was paid to having motors, wheels, gears and axles interchangeable with those on the motor cars. The latter are equipped with two Westinghouse no. 100-h.p. motors in parallel, while in the locomotive there are four motors of the same type, the two motors on each truck being in series and the two sets in parallel.

The locomotive was built for pulling 200 cars for ballasting, hauling general freight and for handling trains on excursion duty. The general data of the locomotive are as follows: Approximate weight, 35 tons; length, 37 ft.; width, 8 ft.; distance between centres of trucks, 20 ft. 3 in., and weight of each motor, 4,900 lbs. The main part of the frame consists of two longitudinal sills of 12-in. I-beams placed 14 in. apart, with white oak fillers and bolted together. The outside sills are 8 x 12 in. oak, and the end sills 12 x 12 in. oak. The car bolsters are 12 x 12 in., the centre sill 8 x 12 in., with an intermediate sill 6 x 12 in., all of oak. At every cross piece, including the bolsters, the two outside longitudinal sills are held together by two 4-in. bolts, one placed on each side of the cross timber. The washers and nuts are recessed in the side of the sills and covered by the V-matched siding, which forms the outside finish of the car. Additional strength was given by putting in 6 x 12 in. oak diagonal braces, as shown in the plan. The end sills are held in place by the two 1 1/4-in. truss rods, each of which is fast inside the outside sills, and two straight 1 1/4-in. bolts which run the whole length of the car, one on each side of each of the 12-in. I-beams. The bumpers were constructed of 12 x 12 in. oak rounded on the outside and bolted to the end sills. These were faced with 12 x 1/4 in. steel.

On the elevation it will be seen that the vertical supports forming the truss structure of the locomotive do not come immediately over the bolsters and needle beams. Owing to the length of the locomotive it was difficult to place the vertical supports in exactly these positions, and the floor frame was considered strong enough to allow rigidity under any conditions to which the locomotive is likely to be subjected. There are three 6-in. needle beams, as shown on the elevation, the truss rods



WINDSOR, ESSEX AND LAKE SHORE RAPID RAILWAY ELECTRIC LOCOMOTIVE

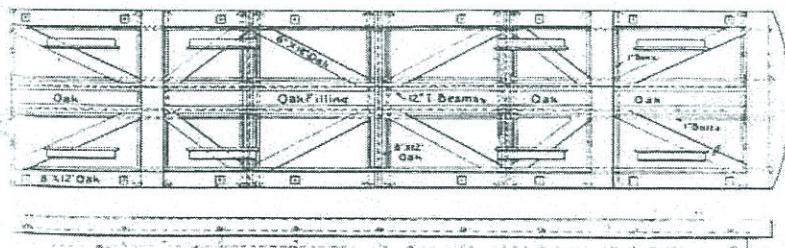
passing immediately beneath two of them, while the centre needle beam has a strut through which the rod passes.

Sliding doors are placed on the sides of the car so that it can carry a certain amount of freight. As the locomotive is to be run in both directions, a motorman's cab is built at each end. The flooring is of 2-in. pine, and space has been left under the apparatus in the car to lay a floor of steel rails if it is found that the weight of the locomotive has to be increased. The roof is of 1-in. pine boards, covered with painted canvas of good quality. Swinging draw heads are used.

The framing of the car and the general layout of the apparatus were designed by H. T. Gibbs, who represented the Canadian Westinghouse Co. in the installation of the electrical machinery at the plant.

The locomotive is equipped with two trucks. The wheels are 36 in. in diameter. The distance between centres of wheels is 6 1/4 ft. The axles are 6 in. in diameter, and are the same as used on the company's interurban cars. The motors and all other electric as well as air apparatus is of Westinghouse manufacture. There is one 100-h.p. motor on each axle, making a total of 400 h.p. The weight of the truck with wheels and without motors is 9,750 lbs.

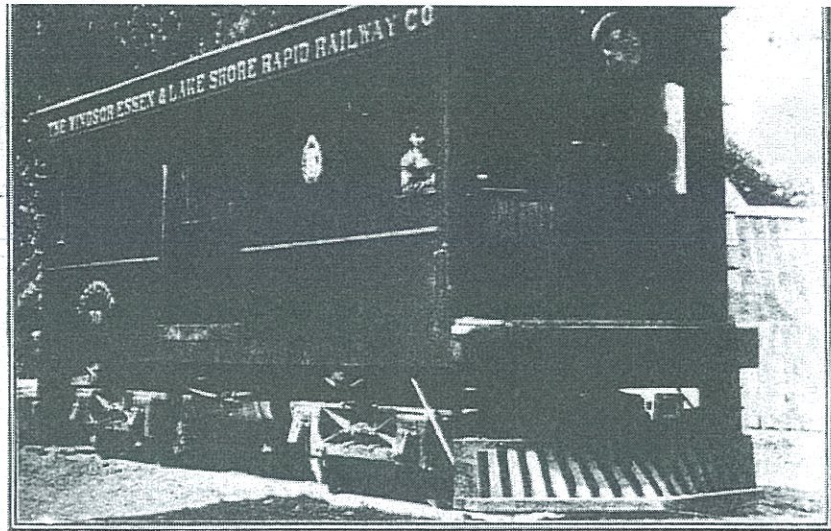
The locomotive is provided with the unit switch system of control, shown in the accompanying schematic diagram. The 104-volt lead shown on this sketch is used for the lights, the compressor motor and the motor-generator set for charging the storage batteries. From the table giving the sequence of switches, it will be seen that the first position of the master controller closes the four motor switches and nos. 1, 2, 3 and 4 of the switch group. On a trial of the locomotive it was found that it started up too rapidly, which made coupling dangerous, besides starting the train with a jerk. To remedy this a single-throw switch was installed in each of the cabs, and in series with one of the interlocking wires, so that the sequence of switches could be interrupted as soon as unit switch no. 2 was closed. When either of these single-throw switches was opened, only units nos. 1 and 2 could close, and after the locomotive had taken the strain of the cars the



100-h.p. motors in parallel, while in the locomotive there are four motors of the same type, the two motors on each truck being in series and the two sets in parallel.

The locomotive was built for pulling street cars for ballasting, hauling general freight and for handling trains on excursion days. The general data of the locomotive are as follows: Approximate weight, 35 tons; length, 37 ft.; width, 8 ft.; distance between centres of trucks, 20 ft. 3 in., and weight of each motor, 4,900 lbs. The main part of the frame consists of two longitudinal sills of 12-in. I-beams placed 13 in. apart, with white oak fillers and bolted together. The outside sills are 8 x 12 in. oak, and the end sills 12 x 12 in. oak. The car bolsters are 12 x 12 in., the centre cross sill 8 x 12 in., with an intermediate sill 6 x 12 in., all of oak. At every cross piece, including the bolsters, the two outside longitudinal sills are held together by two 1-in. bolts, one placed on each side of the cross timber. The washers and nuts are recessed in the side of the sills and covered by the V-matched siding, which forms the outside finish of the car. Additional strength was given by putting in 6 x 12 in. oak diagonal braces, as shown in the plan. The end sills are held in place by the two 1½-in. truss rods, each of which is fast inside the outside sills, and two struts at 1½-in. bolts which run the whole length of the car, one on each side of the 12-in. I-beams. The bumpers were constructed of 12 x 12 in. oak rounded on the outside and bolted to the end sills. They were faced with 12 x ½ in. steel.

On the elevation it will be seen that the vertical supports forming the truss structure of the locomotive do not come immediately over the bolsters and needle beams. Owing to the length of the locomotive it was difficult to place the vertical supports in exactly these positions, and the floor frame was considered strong enough to take rigidity under any conditions to which the locomotive is likely to be subjected. There are three 6-in. needle beams, shown on the elevation, the truss rods



WINDSOR, ESSEX AND LAKE SHORE RAPID RAILWAY ELECTRIC LOCOMOTIVE

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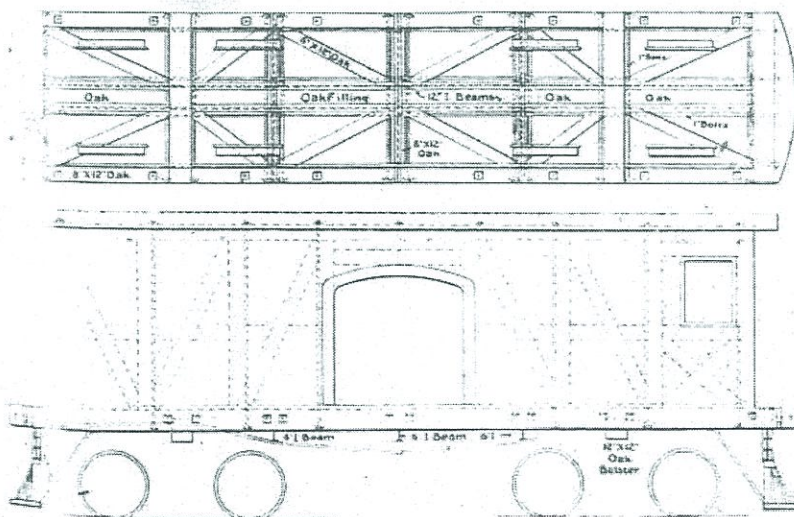
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The locomotive is provided with the unit switch system of control, shown in the accompanying schematic diagram. The 104-volt lead shown on this sketch is used for the lights, the compressor motor and the motor-generator set for charging the storage batteries. From the table giving the sequence of switches, it will be seen that the first position of the master controller closes the four motor switches and nos. 1, 2, 3 and 4 of the switch group. On a trial of the locomotive it was found that it started up too rapidly, which made coupling dangerous, besides starting the train with a jerk. To remedy this a single-throw switch was installed in each of the cabs, and in series with one of the interlocking wires, so that the sequence of switches could be interrupted as soon as unit switch no. 2 was closed. When either of these single-throw switches was opened, only units nos. 1 and 2 could close, and after the locomotive had taken the strain of the cars the single-throw switch could be closed with the left hand and the unit switches in the group would follow in their proper order. By cutting out the switch group at switch no. 2 instead of at no. 4, the two sets of motors are operated in series at 296 volts instead of at 413 volts. This arrangement is very satisfactory.

The voltages, which are controlled by the eight unit switches, are as follows:

Unit Switch.	Volts.
No. 1	251
" 2	296
" 3	355
" 4	413
" 5	458



W. E. AND L. S. R. R.—PLAN AND ELEVATION OF LOCOMOTIVE FRAMING.

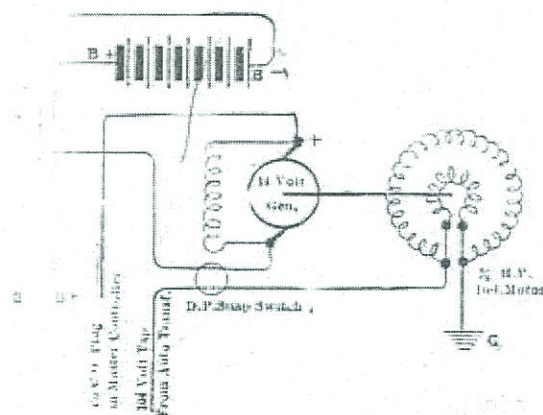
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[Oct., 1908]

THE RAILWAY AND MARINE WORLD

Unit switch.	Volts.
.....	517
.....	561
.....	620

A detailed diagram is presented of the connections to the motor generator and the storage battery, from which it will be seen that the double-pole snap switch connects the motor as well as the generator circuit. All of the electrical apparatus, except the car motors, is placed inside the locomotive. The storage battery, motor generator, reverser, preventive coils and the switch group are secured to a structure made of 4 x 4 in. angle iron placed in one corner of the locomotive. It was intended to use 1,100 volts in Windsor and 6,600 volts over the rest of the line, and the car



W. E. & L. S. R. R. LOCOMOTIVE.—SCHEMATIC DIAGRAM.

equipment was so planned that a change to the lower voltage may be made without altering the equipment.

The auto transformer, which is oil-cooled and of 200-k.w. capacity, is placed in a diagonally opposite corner from the switch. The line switch is placed immedi-

which these cars are handled it is probable that 12 flat cars loaded with gravel will make a fair load for the machine. The motors are geared to run the locomotive at a maximum speed of about 35 m.p.h., but it is found to run about 40 m.p.h. on level tangents. The single-phase equipment on this road is giving satisfaction, and as the characteristics of this apparatus are becoming more familiar, keeping up the equipment becomes easier than at first. Some minor troubles, of course, have been experienced, but none of them is an inherent fault in the system, but rather of a mechanical nature and easily remedied.

The Canadian Westinghouse Company has spared no pains in making the operation of the road a success, and as the men are now well drilled in the maintenance of the equipment and inspection is systematically followed, troubles are as few as could be expected on any new system.—S. C. Dewitt, in Electric Railway Journal.

Step	Switches.											
1									9	10	11	12
1	1	2							9	10	11	12
	1	2	3						9	10	11	12
	1	2	3	4					9	10	11	12
2		2	3	4	5				9	10	11	12
3			3	4	5	6			9	10	11	12
4				4	5	6	7		9	10	11	12
5					5	6	7	8	9	10	11	12

W. E. & L. S. R. R.—Sequence of switches for single-phase locomotive.

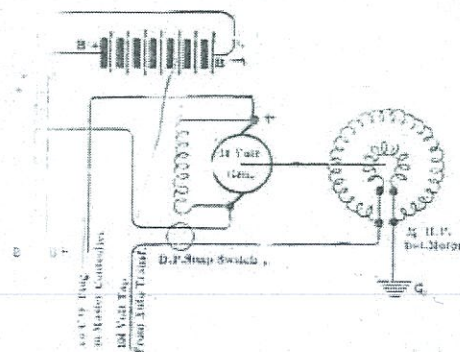
Quebec Railway, Light and Power Co.

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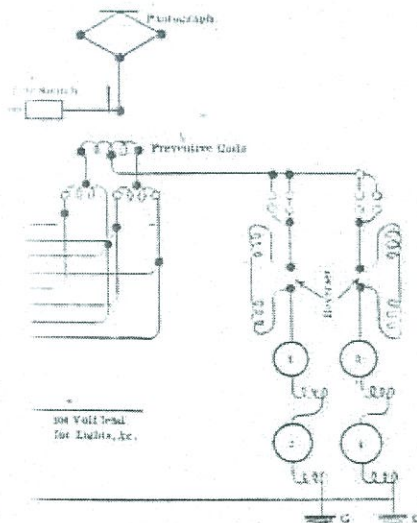


L.S.R.R. LOCOMOTIVE.—SCHEMATIC DIAGRAM.

equipment was so planned that a change to a lower voltage may be made without altering the equipment.

The auto transformer, which is oil-cooled and of 200-k.w. capacity, is placed in a diagonally opposite corner from the switch group. The line switch is placed immediately above the auto transformer, and is just below the pantograph collector. All the control wiring is in iron-armored conduit.

At the central apparatus of the car, which includes the switch group, reverser,



L.S.R.R. LOCOMOTIVE.—CONNECTIONS TO MOTOR GENERATOR AND STORAGE BATTERY

and pantograph, is electro-pneumatically operated. The air compressor, which is driven by a single-phase motor, is placed between the switch group and the sliding doors on the side. The car is piped for straight and automatic operation. There are two valves in each motor-circuit. The air governor is bolted to the side of the locomotive, from which the switch group, etc., are supported.

At the time the locomotive was used to pull gravel trains, and up to the time of writing not more than six loaded flat cars have been hauled at one time. From the ease with

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BRUCE MINES
AND
ALGOMA
RAILWAY

sion of the railway was about to be signed.
C. R. Scoles is General Manager, also contractor. J. M. Shanly is Engineer. (Aug. pg. 225.)

Brockville, Westport and Sault Ste. Marie Ry.—The roadbed is being relaid with new ties under the supervision of Roadmaster Stinson.

In reference to the proposed extension northward from Westport, we are informed that it is intended to proceed with this just as soon as legislation can be procured for the reorganization of the Co., and the Government bonus is revoked. (Aug. pg. 225.)

Bruce Mines and Algoma Ry.—A contract has been let for the construction of $14\frac{1}{2}$ miles of this line from the C.P.R. at Bruce Mines to Rock Lake, out of 16.6 miles projected from Lake Huron at Bruce Mines to the Rock Lake Mining Co.'s concentrating mill. It is proposed to construct the section from the lake shore to the C.P.R. tracks next spring. Birmingham & MacMartin, of Sault Ste. Marie, are the contractors for the $14\frac{1}{2}$ miles; they have commenced work and the contract calls for completion of the line by Dec. 15. The grading will run about 10,000 cubic yards to the mile, and, with the exception of about 10,000 cubic yards of solid rock, is all earth of a clay nature. The structures will be ordinary pile and timber trestles; there will not be any masonry work. The maximum grade will be 1.5%, and the maximum curve 9°. The line will be laid with 56-lb. rails, and will be operated by the Co. in connection with its copper mines. The rolling stock proposed to be purchased for use during the winter consists of one engine and 15 or 20 cars. The line was located by R. K. Russel, who is also engineer in charge of construction. There is a Dominion subsidy of \$28,800 for 9 miles of the railway, and of \$39,000 for 13 miles from the Ontario Legislature. (Aug. pg. 225.)

The officers of the Co. are: President, J. McKay, Sault Ste. Marie, Ont.; Vice-President, S. Skall, Cleveland, Ont.; General Manager, A. S. Burrows, Bruce Mines, Ont.; Treasurer, H. Will, Buffalo, N.Y.; Secretary, L. C. Holden, Sault Ste. Marie, Ont.

Canadian Northern Ry.—See pgs. 262 and

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done. (Jan., 1902, pg. 1.)

Bruce Mines and Algoma Ry.—The Dominion Parliament at its last session voted a subsidy of \$3,200 a mile, with a provision for an increase to \$6,400 a mile for the following sections of line already constructed and in operation: for three miles southerly from Bruce Mines Junction to the town of Bruce Mines, Ont., and the shore of Lake Huron; for six miles from Gordon Lake station northerly to Rock Lake. A subsidy of a like amount was also voted for the construction of 12 miles northerly from the present terminus at Rock Lake. This is in lieu of a subsidy for 21 miles voted in 1903.

The line from the station in Bruce Mines town to Jack's Island on Lake Huron is 5,000 ft. in length. Between the main shore and Jack's Island there is about 1,800 ft. of trestle, which affords excellent facilities for bringing in saw logs, round and other timber and unloading same into the bay, where rafts can be formed or barges loaded to be towed to destination. At the south-easterly end of Jack's Island a dock has been constructed alongside the railway terminal. The depth of water alongside the dock is 18½ ft.; the dock itself is 50 ft. wide and 700 ft. long, including approach. The northerly extension of the line, we are advised, is projected to Woman River, on the C.P.R. transcontinental line, and will open up a large tract of timber, agricultural and mineral lands. (Aug., pg. 275.)

Great Western Coal, Iron and Ry. Co.

September 1904

in operation.

Windsor, Essex and Lake Shore Rapid Ry.—

Dr. Jas. Brien, ex-M.P. for Essex, is quoted as saying:—"The grading of the roadbed will be finished between Kingsville and Windsor, Ont., next week, and this will be followed by the laying of tracks at once. The water-power of Niagara Falls will be used when Detroit and Buffalo are connected. The distance is 229 miles. The route will be from Windsor to Essex, Kingsville, Leamington, Wheatley, Tilbury, Chatham, London, and thence to Buffalo. Detroit capital is largely interested in the company." A mortgage to the National Trust Co. of the property and franchises of the company, to secure an issue of bonds for a sum not exceeding \$20,000 a mile of the company's projected line, has been filed with the Provincial Secretary, Toronto. (Nov., pg. 543.)

January 1906