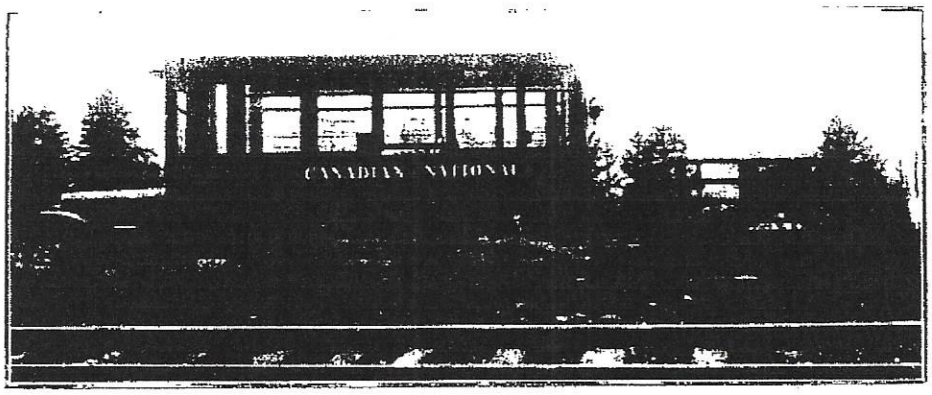
CANADIAN RAIL-CARS

Pt II

Carl Riff

used in the Reo "speed wagon," and rat- tion to lining the battery containers, two



Gasoline Driven Motor Passenger Car and Baggage Trailer, on Canadian National Railways, Stanley Subdivision, New Brunswick.

ed at 35 h.p.), which has increased the mileage per gallon of gasoline from 12 to 16. The gear ratio has been changed to give slightly less engine speed, the ratio now being such that an engine speed of 1920 r.p.m. gives a speed of 46 m.p.h.

The car is well equipped with brakes. Those on the rear wheels are operated by two foot levers, and each wheel of the four-wheel leading truck is braked by an arrangement wherein what would ordinarily be the steering wheel is used as a brake mast wheel, the wheel being turned to apply the brakes, through an arrangement of rods and levers. The heating system is unique, the exhaust from the engine being piped through coils arranged under the seats.

We are advised that the C.N.R. intends acquiring another gasoline motor car to be placed in service between Westport and Brockville, in addition to the present one. The mileage being made by the car now in service is over 355 daily, and the fact of no trouble or delay being experienced to date indicates remarkable performance. It is evident that this mileage, made day after day, is excessive for a gasoline propelled car, but with two cars covering the service the mileage demanded will be within a reasonable limit. It is probable that the new car will be somewhat larger than the one now in service, and that it will be equipped with a 6 cylinder engine. A seating capacity of 30 is being considerheating ducts were led into the containers, from the car heating system. Snow brushes, to remove the snow from the rails, were attached, and in addition a flanger, or rather a small plough, was fitted to the front of the car.

In addition to the cars mentioned above, the C.N.R. operating during the past summer another gasoline motor car, between Cross Creek and Stanley, 5.74 miles, on the Nashwaak and Cross Creek Subdivisions, Edmundston Division, Maritime District. This car and the trailer operated in connection with it are shown in the accompanying illustration. The chassis of the motor car was that of a Winton omnibus, and the body was built at the C.N.R.'s Moncton shops. The body is 15 ft. 3½ in. long, and 7 ft. wide, and is provided with seats for 18 passengers, in addition to the operator. The trailer is simply a push car fitted with sides as shown, and is used for baggage, etc.

The running time for the 5.74 miles was 30 minutes, the car making two round trips a day, leaving Stanley at 9.15 a.m. and 6.35 p.m. as trains 272 and 274, and leaving Cross Creek at 10.05 a.m. and 7.50 p.m., as trains 271 and 273. Freight service was provided, as necessary, as a switching movement from Stanley Jct. to Stanley by Nahwaak Subdivision trains. The car was put in service in the latter part of April, and run on schedule until Aug. 16, when repairs

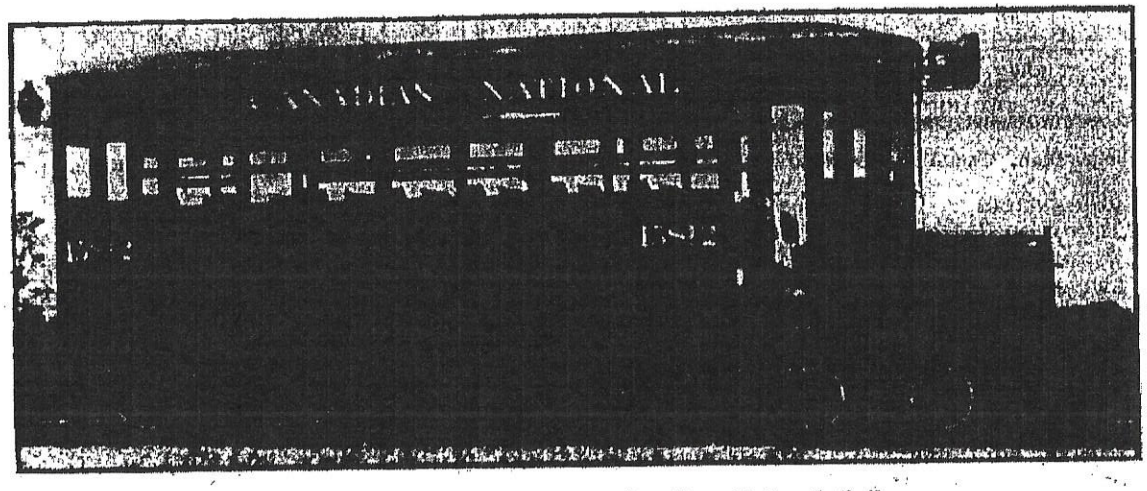
December
1921

and which ran formerly between Cross Creek and Stanley, N.B., has been converted to 3½-ft. gauge at the C.N.R. Moncton shops, and started on July 6 operating between Souris and Elmira, P.E.I., on the Maritime District, Island Division, Souris and Elmira Subdivisions. Trains 23 and 24, which operated between Souris and Elmira daily except Sunday, were cancelled on the date mentioned, and motor car service was installed on the following schedule: Daily except Sunday the car leaves Elmira at 6.20 a.m., Harmony Jct. at 7.03 a.m., and arrives at Souris at 7.30 a.m.; leaves Souris at 5.30 p.m. On Wednesday only Souris at 5.30 p.m., Harmony Jct. at 5.50 p.m., and arrives Elmira at 6.30. On Wednesday only the car leaves Souris at 1.15 p.m., arrives Harmony Jct. at 1.32 p.m., leaves Harmony Jct. at 1.45 p.m., and arrives at Souris at 2.05 p.m. Daily except Sunday and Wednesday the car leaves Souris at 10.45 a.m., Harmony Jct. at 11.05 a.m.,

mer only, the Elmira Subdivision being very difficult to operate in winter, on account of snow. The car hauls a small trailer, used chiefly for the transportation of cream.

The first of the two gasoline cars ordered recently by the C.N.R. management from Ledoux, Jennings, Ltd., Montreal, was, on June 28, as stated in our July issue, placed on the run between Picton and Trenton, 30.6 miles, on the Ontario District, Ottawa Division, Picton Subdivision, and between Trenton and Trenton Jct., 1.6 miles, on the Maynooth Subdivision, also, and between Trenton and Napanee, 34.6 miles, on the Rideau Subdivision. The car's schedule was given in our June issue on pg. 289. The car is giving very satisfactory service. It was described and a plan and elevation were given in our June issue, and herewith are shown illustrations of it and of its truck details.

When this car was delivered, it left



Gasoline Railway Motor Car, 15,812, Canadian National Railways.

two stops. The builders [illegible] that they have a report that on one day the car made 196 miles on 14 gals. of gasoline, or 14 miles to the gallon. To July 10 the mileage made was 5,000.

As stated in our July issue, the C.N.R. management intends to convert 2 passenger cars into self-propelled cars of the storage battery type at the Niagara, St. Catharines & Toronto Ry. shops at St. Catharines, Ont., for use on Ontario District lines. They will each be fitted with a set of storage batteries and 4 motors, and all other electrical and control equipment will be applied at St. Catharines. The type of battery to be used has not been decided.

The self-propelled cars in C.N.R. service have been renumbered recently. The gasoline electric car which has been operating for some time between Transcona and Winnipeg, Man., is now no. 15,800; the storage battery car operating between Bathurst and Campbellton is now no. 15,801; the 2 storage battery cars to be built at St. Catharines will be nos. 15,802 and 15,803; the gasoline car operating in Prince Edward Island has been numbered 15,810; the first car built by Ledoux, Jennings, Ltd., now operating between Cross Creek and Stanley, N.B., is no. 15,811; the 2 gasoline cars ordered recently from the same builders, are nos. 15,812 and 15,813; and the gasoline motor car to be operated between Bathurst and Campbellton is no. 15,814.

Greater Winnipeg Water District Ry.—The gasoline motor car bought for this line, which extends from St. Boniface, Man., to Waugh, Shoal Lake, adjoining Lake of the Woods, 91.9 miles, was delivered in Winnipeg, June 28, and was placed in service July 3. It leaves St. Boniface, 5.3 miles from Winnipeg, on

The cylinder portion of the pump is novel, consisting of a solid steel forging, in which the three cylinder bores, as well as all the valve seats, have been machined from the solid. It delivers at a 3,000 lb. pressure. The weight of the press is 90,000 lbs., and the installation complete, without the accumulator weighs, 200,000 lbs.

Gas Electric Car on Victoria and Sidney Railway.

Canadian Railway and Marine World for September and November contained some brief particulars of a gas electric car which has been placed in operation on the Victoria and Sidney Ry. on Vancouver Island. This line, of 16.26 miles, runs from Victoria to Sidney, from which point there is a ferry service to the British Columbia mainland. It traverses the Saanich Peninsula, a particularly picturesque and fertile portion of the lower east end of the island, which is becoming closely settled and requires a more frequent service than was possible with steam operation. The car is said to be averaging 110 miles a day, and on two days a week a 30 ton trailer is handled.

The Great Northern Ry. ordered two of these gas electric cars, which are shown in the accompanying illustration. One of them is being operated on the Victoria and Sidney Ry., and the other on a G.N.R. branch line in the State of Washington. They made the journey from Chicago to the Pacific Coast with their own power.

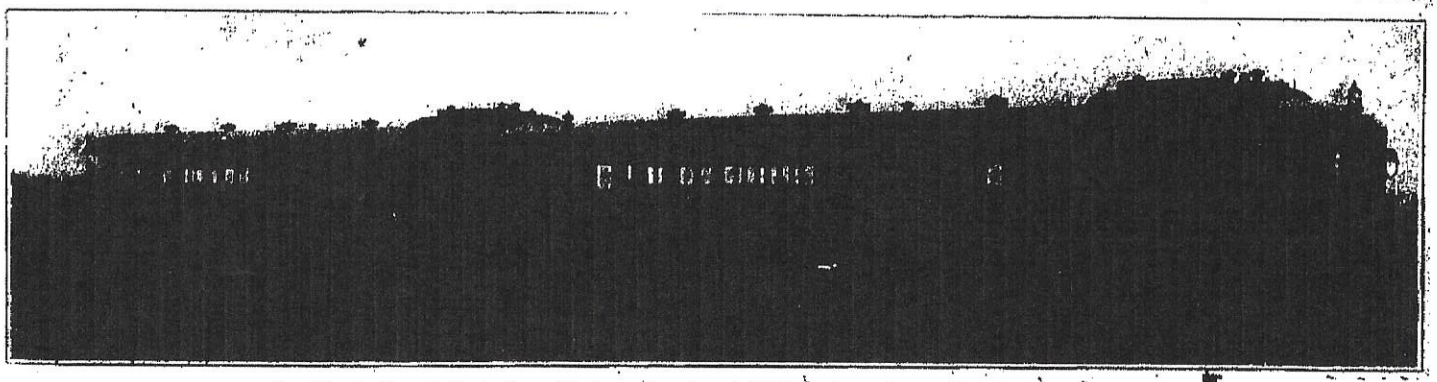
Each car is of the combination passenger, smoking and baggage compartment type. It measures 71 ft. 8 ins. long over bumpers, [illegible] ft. 5 ins. wide, and is partitioned into four compartments: one 27 ft. 11 ins. long for passengers; a smoking section, 12 ft. 5 ins. long; a baggage room, 10 ft. 11¾ ins long, [illegible] of the body is finished in green. The windows are fitted with plate glass; the seats are made long enough to accommodate three persons, are covered with friezette plush in the passenger compartment and with genuine Spanish leather in the smoking room, and the entire car is lighted with electric incandescent fixtures.

The generating unit is located above the floor line of the cab, free from dust and dirt and under immediate observation of the engineer. It consists of an 8 cylinder, 4 cycle gas engine of the V type, direct connected to a 600 volt, commutating pole electric generator, designed to meet the special conditions the service demands. Flexibility of control and economy of operation are assured through electrical transmission of the power. Starting the engine is effected by compressed air taken from the main reservoirs of the air brake system, which are built with surplus capacity for this purpose. The main air compressor is driven from the crank shaft of the main engine, and is fitted with an automatic governor which maintains a constant pressure. The engine can rotate at normal speed, irrespective of the speed of the car, and deliver its maximum power, a feature of great advantage on grades, in the case of snow storms, or in the event of emergency conditions. An [illegible] provided con-

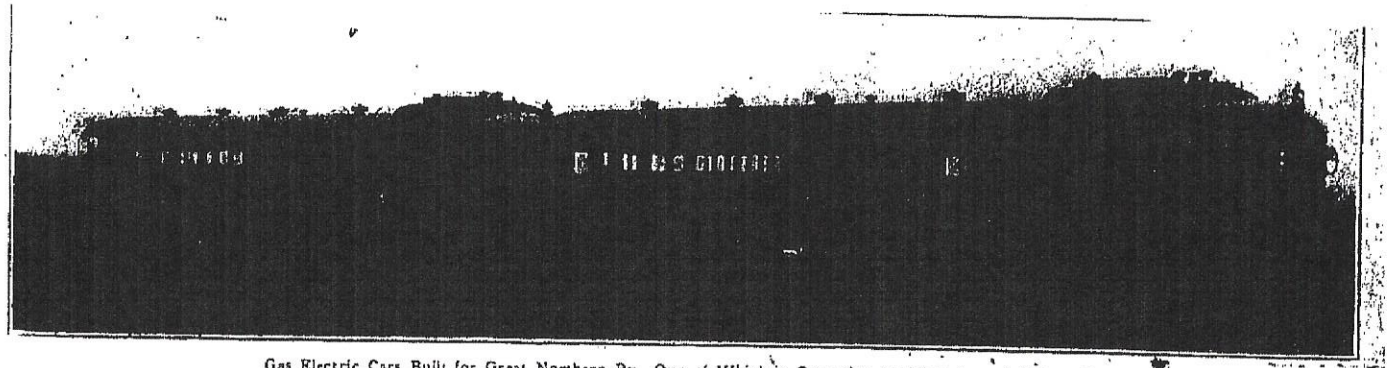
motor connections in the usual manner without stopping the engine, which always rotates in the same direction. This allows the car to be brought to a halt quickly, independently of the brakes in an emergency. All the levers are located within convenient reach of the operator. The radiators are placed on the roof and circulation for cooling the engine is maintained by the thermo siphon system.

The controller is also arranged for governing the motors by shunt field control. This auxiliary method of control assures greatly increased operating efficiency through uniform saving of power, economy effected by decrease in the weight of the equipment and an available increase in the service capacity. Two extra points are provided in the controller for final speed acceleration in parallel, whereby the motor fields are shunted and weakened. The resulting higher armature speeds permits the use of smaller pinions, and full utilization of the power input is secured throughout the entire speed range, from start to full speed.

The trucks are of the heavy swing bolster type with elliptic bolster and coil equalizer springs. The bearings, treads and flanges of the wheels and axles conform to M.C.B. standards. The brake equipment includes hand brakes in addition to the combined straight and automatic air brakes. A high power incandescent headlamp and reflector, an air whistle and a pneumatic gong are provided; and a hot water heater, coal fired, is installed for heating the car. To prevent freezing in cold weather when the car is lying idle, the heater circulation may be connected to the engine cooling system. A 150 gallon gasolene supply tank is suspended underneath the car. While the car is run



Gas Electric Cars Built for Great Northern Ry., One of Which is Operating on Victoria and Sidney Ry.



Gas Electric Cars Built for Great Northern Ry., One of Which is Operating on Victoria and Sidney Ry.

ft. 5 ins. wide, and is partitioned into four compartments: one 27 ft. 11 ins. long for passengers; a smoking section, 12 ft. 5 ins. long; a baggage room, 10 ft. 11⅞ ins. long; and the engine cab, 11 ft. 11 ins. long, containing the power plant apparatus. The net weight of the car is approximately 51½ tons, and it has a total seating capacity for 86 passengers. A centre vestibule with side entrances runs crosswise between the passenger and smoking compartments. There is also a rear platform entrance leading into the passenger compartment. The smoking section provides for 26, and the passenger compartment for 60 of the total seating capacity. The car is essentially a locomotive and car combined in one unit. The motive power centres in an internal combustion engine, generator and the motors. But one foreman and one conductor are required to operate the car.

All steel construction, except the interior finish, prevails throughout. The frame consists of steel I beams and channels, strongly cross braced, and steel plates form the outside sheathing. The underfloor is of wood, sheathed with sheet iron on the lower side. Between this and the floor proper a heavy felt lining is inserted, and the car sides are also interlined with felt. The interior trim is of mahogany, highly finished, and the ceiling is sheathed with three ply wooden veneer, painted straw yellow with green stenciling and gold striping. The exterior

speed of the car, and deliver its maximum power, a feature of great advantage on grades, in the case of snow storms, or in the event of emergency conditions. An auxiliary equipment is also provided, consisting of a 2 cylinder, 4 cycle gas engine, direct connected to a single cylinder air compressor and lighting generator. The function of this set is to supply an initial charge of air for starting the main engine and to deliver power for lighting the car. This set is started by hand

The method of control is simple, substantial and similar to that of any standard electric trolley car. The car is equipped with motors of 200 h.p capacity Mounted on the axles of the forward truck are two GE 205, 600 volt, box frame, oil lubricated, commutating pole railway motors of 100 h.p. each. By means of a special controller they are placed progressively in series and parallel connection.

Energy is transmitted directly without the intervention of mechanical change speed gearing. The voltage is governed by varying the strength of the generator field, which is accomplished by the movement of a single handle on the controller, and the resultant speed changes of the motors produce a smooth and rapid acceleration without rheostatic power losses or gear changes. Separate handles are provided for throttling the engine and for reversing the car. The latter is accomplished instantly by changing the

freezing in cold weather when the car is lying idle, the heater circulation may be connected to the engine cooling system. A 150 gallon gasolene supply tank is suspended underneath the car. While the car is running, the gasolene is pumped automatically by the engine: and when first starting, by a hand pump.

Both the cars referred to were built by the General Electric Co. at Schenectady, N. Y. They are of the same type but larger than the gas electric car which has been operated on the Quebec and Lake St. John Ry. during the last two years. The dimensions of the last mentioned car, which will be interesting for comparison, are as follows:—Length, 58½ ft., width, 10 ft. 5 ins. It has the same number of compartments, viz., general passenger, 25½ ft. long; smoking, 10 ft. long; baggage, 8 ft. long, and engine cab, 12 ft. long. The net weight is 39½ tons, and the seating capacity 76 people.

Self Propelled Cars on Canadian National Railways.

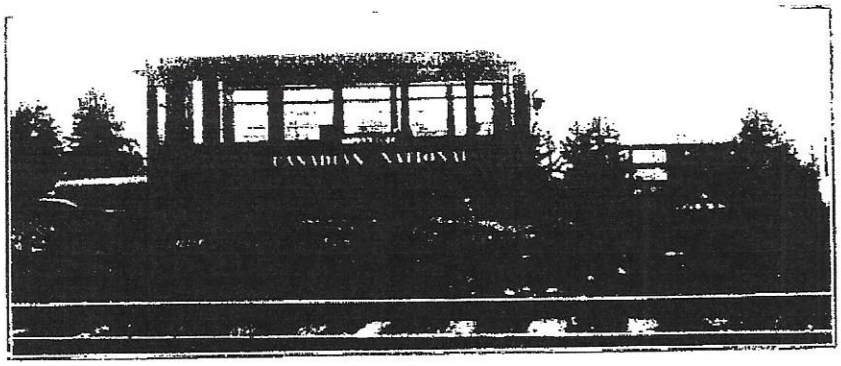
The gasoline driven railway passenger motor car placed in operation by the Canadian National Rys. between Westport and Brockville, 44.4 miles, on the Brockville Subdivision, Ottawa Division, Ontario District, described in Canadian Railway and Marine World for November is being continued in operation between those points as trains 78, 80, 82 and 84 from Westport to Brockville, and as trains 77, 79, 81 and 83 from Brockville to Westport, the running time in each direction being 1¾ hours. The schedule has been maintained consistently by the car, and the service has proved to be popular, as is evidenced by the fact that the car is loaded to capacity on every trip in each direction. The car is also proving most successful financially, the loss entailed by steam train operation being wiped out, and a good profit being shown after allowing for interest and depreciation. During November, adjustments were made to the engine (a Reo 4 cyl., identical with that used in the Reo "speed wagon," and rated at 35 h.p.), which has increased the mileage per gallon of gasoline from 12 to 16. The gear ratio has been changed to give slightly less engine speed, the ratio now being such that an engine speed of 1920 r.p.m. gives a speed of 40 m.p.h.

The car is well equipped with brakes. Those on the rear wheels are operated by two foot levers, and each wheel of the four-wheel leading truck is braked by an arrangement wherein what would ordinarily be the steering wheel is used [illegible]

ed. The C.N.R. will buy the car now in service from the builders, the Ledoux, Jennings Co., Montreal, which furnished it to the railway for a month on trial.

The electric storage battery car, in operation between Campbellton and Bathurst, 62.96 miles, on the Bathurst Subdivision, Campbellton Division, Maritime District, has continued to provide a satisfactory service and is still showing a favorable cost of operation. We are informed that the saving made by this car over the cost of steam train operation is $2,500 a month. The car was in the Moncton shops from Nov. 14 to 19, undergoing alterations to fit it for winter operation. The interior was fitted with additional lining, and storm sash and double flooring were applied. The battery containers were lined; as although the batteries are kept at a high temperature, by electrical action, when the car is in operation, they rapidly become cool when the car is standing, resulting in lowered efficiency. In addition to lining the battery containers, two heating ducts were led into the containers, from the car heating system. Snow brushes, to remove the snow from the rails, were attached, and in addition a flanger, or rather a small plough, was fitted to the front of the car.

In addition to the cars mentioned above, the C.N.R. operating during the past summer another gasoline motor car, between Cross Creek and Stanley, 5.74 miles, on the Nashwaak and Cross Creek Subdivisions, Edmundston Division, [illegible]



Gasoline Driven Motor Passenger Car and Baggage Trailer, on Canadian National Railways, Stanley Subdivision, New Brunswick.

Storage Battery Car Frame, Canadian National Railways.

with 250 Edison A-12-H storage batteries, and 4 G.E. type G-261 ball bearing motors of 25 h.p. each. On completion of the conversion, the car was returned to Winnipeg in a freight train, with gears disconnected, and placed in service between Winnipeg and Transcona, where it was operated formerly as a gas-electric car.

As stated in our October issue, the Canadian National Rys. are having another battery car built at the N., St. C. & T. R. shops at St. Catharines. An illustration of its frame is given herewith. C.N.R. mechanical officials are developing plans for a standard frame for all future battery cars to be acquired, and it is expected that the frame to be adopted as standard will be somewhat similar to that shown herewith. It has side sills of 6 in. channels, center sills of 6 in. I-beams, platform sills of 5 in. I-beams, alternated with open truss supports as shown. The car for which this frame was built will be 58 ft. long and 9 ft. wide, and will be equipped with 260 A-12-H Edison batteries and 4 G.E. G-261 motors of 25 h.p. each. It will have a baggage compartment at the front, a smoking compartment to seat 20 passengers in the central portion, and a main compartment seating 40 passengers. Good progress is being made with construction.

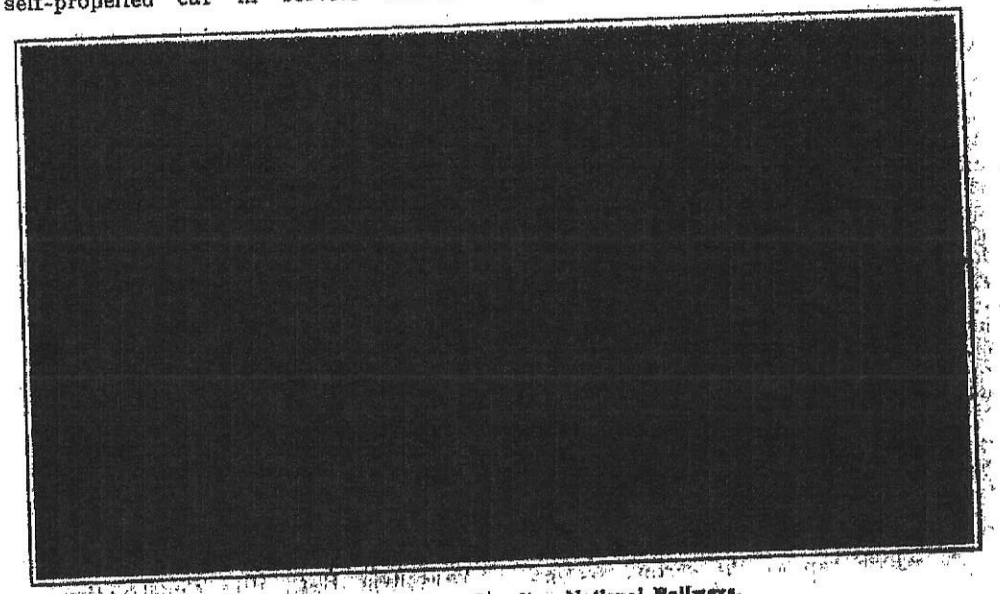
In addition to the cars mentioned above, the Canadian National Rys. have invited tenders, in alternative form, for 6 more storage battery cars. In view of the success which the C.N.R. have had with storage battery cars during the two years they have been operated, which is emphasized by the management's intention to augment considerably the number now on the lines, it is evident that this type of car has definitely established a place for itself in self-propelled car service on steam railways. The absence of complicated mechanical features, making for minimum maintenance cost, is a most desirable feature, and in districts where electrical power is cheap, operating costs are low.

We are advised that the Canadian C.N.R., recently, to put on gasoline or electric self-propelled cars in that district. He replied that they would not give better service than is being supplied by steam trains, and that their operation would not be economical, as it would be necessary to run steam trains to serve places in the territory not contemplated in the self-propelled cars' operation.

We are officially advised that the Canadian National Rys. management is considering placing an electrically operated self-propelled car in service between Quebec and Loretteville, Que., 8.6 miles, on the Batiscan Subdivision, Saguenay Division, Quebec District, Central Region.

The Pacific Great Eastern Ry. is adding a gasoline motor car to its rolling stock. The engine and trucks will be supplied by the Four-Wheel Drive Auto Co., Kitchener, Ont., and the body and furnishings will be made at Vancouver. The car will be equipped with standard railway appliances to comply with the British Columbia Railway Act. It will

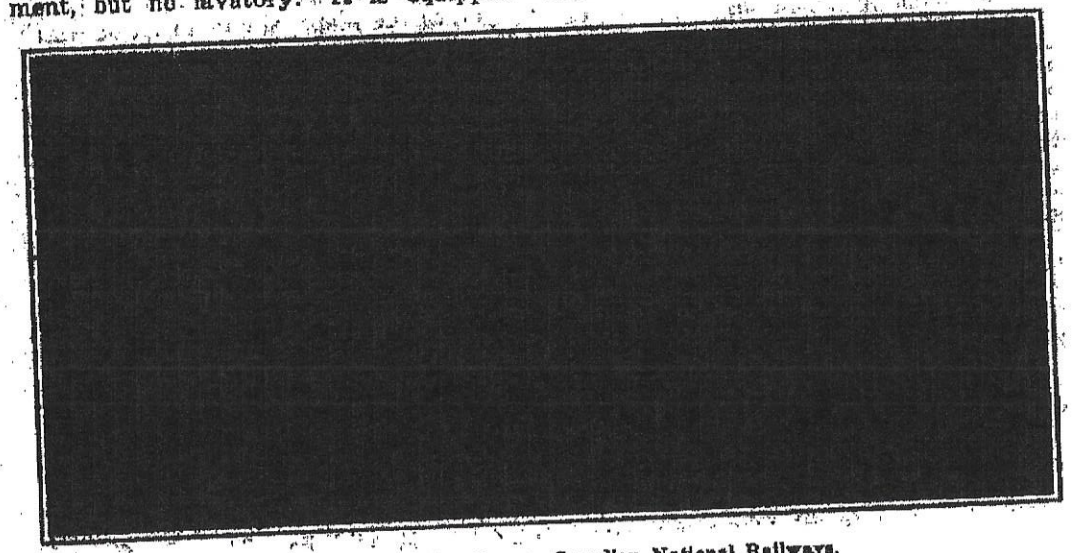
gage space, [illegible] in trailers. The complete power installation for these cars, which have Diesel engines with electrical transmission to the driving wheels, is as follows, the apparatus being of similar nature for all sizes: one Diesel engine of the 4-stroke cycle type, with 6, 8 or 12 cylinders, according to capacity. The size of generators and other electrical equipment is also increased to accord with increased engine capacity. They have one direct-coupled direct-current generator of the 8-pole type, with commutating poles. The generator is shunt wound, but has a separate series winding, the latter being connected to the circuit only when the generator is driven from the storage battery in starting. The generator voltage can be varied, within wide limits, up to 550 volts. They have two electric motors of standard series-wound railway type, with commutating poles. Power is transmitted to the axles by spur gearing. A storage battery of alkaline Jungner type, suspended beneath the car, furnishes current for starting, lighting and auxiliary apparatus. It is charged automatically while the car is in motion, and a special switch is provided for charging when the car is standing.



Storage Battery Car, Canadian National Railways.

Self Propelled Cars on Steam Railways.

Canadian National Railways. — The accompanying illustration shows the storage battery car converted from a gas-electric car at the Niagara, St. Catharines & Toronto shops at St. Catharines, Ont., as described in Canadian Railway and Marine World for October. The car, as rebuilt, is 57½ ft. long and seats 96 passengers. It has a smoking compartment, but no lavatory. It is equipped with 250 Edison A-12-H storage batteries, and 4 G.E. type G-261 ball bearing motors of 25 h.p. each. On completion of the conversion, the car was returned to Winnipeg in a freight train, with gears disconnected, and placed in service between Winnipeg and Transcona, where it was operated formerly as a gas-electric car.



Storage Battery Car Frame, Canadian National Railways.

As stated in our October issue, the Canadian National Rys. are having another battery car built at the N., St. C. & T. R. shops at St. Catharines. An illustration of its frame is given herewith. C.N.R. mechanical officials are [illegible] plans for a standard frame

National Rys. management is considering the possibility of placing a storage battery car in service between Toronto union station and Weston, 8.41 miles northwest of Toronto, to operate on the original G.T.R. line from Weston to Parkdale and Toronto union station, making morning and evening trips.

The Peterborough, Ont., City Council asked Sir Henry Thornton, President, C.N.R., recently, to put on gasoline or electric self-propelled cars in that district. He replied that they would not give better service than is being supplied by steam trains, and that their operation would not be economical, as it would be necessary to run steam trains to serve places in the territory not contemplated in the self-propelled cars' operation.

We are officially advised that the Canadian National Rys. management is considering placing an electrically operated self-propelled car in service between [redacted] have seating accommodation for 25, and also baggage and express space. It will be capable of hauling cars of freight, and will also be suitable for use in switching service. It is intended to run it during this winter between Williams Lake and Quesnel. Williams Lake is 277.8 miles from Squamish dock, and the distance from Williams Lake to Quesnel is 70.7 miles. We are advised that the car will be suitable for service on the North Shore Branch, should traffic conditions warrant it, and it is believed that this type of car will enable the railway to give a service where the traffic is light without subjecting the public to a reduced train service.

Foreign.—A remarkable increase has taken place lately in the use of Diesel-electric self-propelled cars in Sweden. Since 1913, several Swedish railways have been operating cars of this type, with engines rated at from 75 to 120 h.p., but several cars have been introduced recently which are equipped with engines of 160 and 250 h.p. Some of these high-powered cars are more in the nature of locomotives, being fitted with only a baggage space, the passengers being carried in trailers. The complete power installation for these cars, which have Diesel engines with electrical transmission to the driving wheels, is as follows, the apparatus being of similar nature for all sizes: one Diesel engine of the 4-stroke cycle type, with 6, 8 or 12 cylinders, according to capacity. The size of generators and other electrical equipment is also increased to accord with increased engine capacity. They have one direct-coupled direct-current generator of the 8-pole type, with commutating poles. The generator is shunt wound, but has a separate series winding, the latter being connected to the circuit only when the generator is driven from the storage battery in starting. The generator voltage

[redacted]

government elevator is being proceeded with, with the expectation of having it ready for operation by April, 1924.

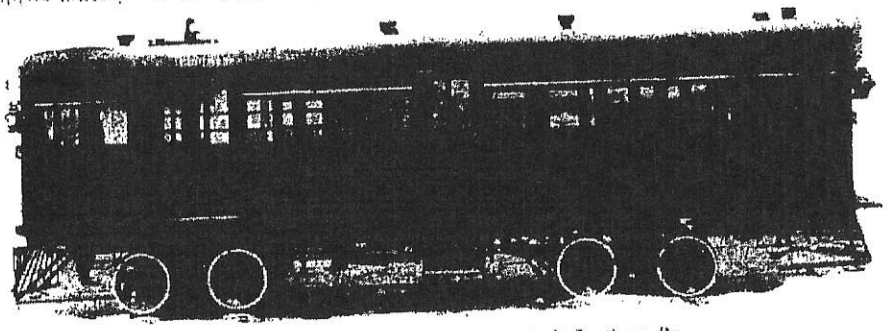
During the first 8 months of 1923, there were 10,261,598 bush. of wheat exported through the government elevator at Vancouver. Shipments were heavy during January, February, March and April, and then dropped off during the succeeding 4 months, but it is expected that export handling during the last 4 months of this year will be heavy, and that the amount of 11,512,698 bush handled through the government elevator in 1922 will be greatly exceeded in 1923.

Self-Propelled Cars on Steam Railways.

The large gasoline motor car ordered by the G.T.R. management from the National Steel Car Corporation, before the co-ordination of the G.T.R. with the Canadian National Rys., was described fully in Canadian Railway and Marine World for February, when it was pointed out that this was the largest self propelled car ordered for operation on Canadian steam railways. The car was practically completed recently with the exception of the interior finishing, and a trial run was made between Hamilton and Niagara Falls, under the supervision of R. J. Needham, Mechanical and Electrical Engineer, Central Region, Toronto. It is reported that the trial was successful. Afterwards the car returned to the builder's plant at Hamilton, Ont., for completion of the interior fitting.

Particulars of the conversion of a gasoline-electric car which was operated formerly between Winnipeg and Transcona, Man., into a storage battery car, at the Niagara, St. Catharines and Toronto Ry. shops at St. Catharines, Ont., were given in a preceding issue of Canadian Railway and Marine World. As a gasoline-electric car, the power plant consisted of a G.E. gasoline engine,

The Quebec, Montreal & Southern Ry received on April 4 from Ledoux, Jennings, Ltd., Montreal, car 51, one of two self-propelled gasoline driven passenger cars ordered recently, an illustration of which is given herewith. This car is approximately 42 ft. long, 8½ ft. wide and 10½ ft. overall height. The underframing is of the same type as that of the car previously delivered to the Q. M. & S. Ry. by the same builders, as described in Canadian Railway and Marine World for Oct. 1922, and the truck and drive arrangement are also similar. Illustrations of the latter, as applied to a car built for the Canadian National Rys., were given in Canadian Railway and Marine World for Aug. 1922.



Self Propelled Car Quebec, Montreal & Southern Ry

The car is equipped with a small platform at the back, providing easy access to the marker lamps. The car body is of all steel construction, the sheathing being 1/16 in. thick. The windows are of the ordinary drop type, sliding upward about 8 in., and are provided with standard railway curtains. Provision has been made for the application of storm windows for cold weather use. The seating capacity is 34, and the baggage compartment, 14 ft. long, will accommodate additional passengers if necessary. Entrance to, and exit from, the passenger compartment is by the central doors at each side, and there is an emergency door at the rear, for use in case of accident. The baggage compartment doors are of the sliding type. The equipment includes electric lighting, overhead ventilators, 2-compartment water cooler, dry hopper closet, locomotive bell, Stromboss horn, sanding apparatus and locomotive type pilot. The wheels are 30 in. in diam., and side rods are used on the rear or driving truck. The car has a Reo

of Nova Scotia, Premier Venot, of New Brunswick, J. E. McLurg, General Manager, Halifax Shipyards, and several mayors and presidents of local boards of trade, interviewed Sir Henry Thornton, President, Canadian National Rys., in Montreal, April 22, in connection with the C.N.R.'s Atlantic Region western terminus, with a view of having the region extend from the Atlantic coast to Montreal, instead of to Riviere du Loup and Moncton, Que., as fixed by the management recently.

Following the interview, which was private, a statement was issued at the C.N.R. general offices, as follows: "Capt. J. E. Master, President of the Maritime Board of Trade, presented to Sir Henry Thornton the position of the maritime delegates in the terms of the resolution passed at the Amherst convention on March 2, as follows: 'Whereas, the decision of the Directors of the Canadian National Rys. to make Riviere du Loup the western terminus of the Atlantic Region is most unsatisfactory to the people of the maritime provinces generally. Be it resolved that this convention of the boards of trade of the maritime provinces here represented, is of the opinion that the City of Montreal, the present terminus of the Intercolonial Ry., should be the western terminus of the Atlantic Region of the Canadian National Rys.; that the Directors of the Canadian National Rys. be invited to meet representatives from the boards of trade of the maritime provinces in Moncton within ten days from this date to discuss the matter fully and if the board is unable to arrange such a meeting in Moncton that it be requested to fix a date and place in which to receive a delegation from the boards of trade of the maritime to furnish a remedy promptly. With regard to the manner in which the working of the regions as at present constituted was being carried on, the delegation expressed its appreciation."

In connection with the foregoing, it may be mentioned that Mr. Baxter, St. John, N.B., asked in the House of Commons recently: "Is it true, as reported in the press, that J. A. Sinclair, a member of the Canadian National Rys' Board, stated to members of the delegation of the St. John Board of Trade, which attended a conference at Amherst, N.S., that it was news to him that Cochrane and Brockville were not to be the western termini of the Atlantic Division as that was the understanding at the last meeting he had attended, or words to that effect." If Mr. Sinclair has been substantially correctly reported, why was a matter of such importance dealt with in his absence?" The acting Minister of Railways, Mr. Graham, replied: "The Government has no information as to the correctness of the report in question."

Dominion Express Co. Withdraws from Canadian Government Railways, Etc.

T. E. McDonnell, Vice President and General Manager, Dominion Express Co., issued notice, April 27, that, to accommodate the Dominion Government's wishes, the company's service will be withdrawn from government railways at the end of May, and he extended to employes the management's thanks for the efficient service they have rendered, and for the wonderful spirit of loyalty which has reflected so much credit upon themselves and upon the company. The company will also withdraw its service from the following railway lines: Cumberland Ry. & Coal Co.; Maritime Coal, Ry. & Power Co.; Atlantic, Quebec & Western Ry., and Quebec Oriental Ry., but will remain on the Temiscouata Ry.

The Greater Winnipeg Water District Ry. is reported to have been given a contract for carrying mails from Winnipeg to points on its line. Three centers will be served at present, a train leaving Winnipeg on Fridays and returning on Saturdays. Heretofore, a haphazard service by wagon has been given from Elina, on the Canadian National Rys.

6 months of 1923, operating revenues were $116,778,673, an increase of $14,208,039 over the first 6 months of 1922; and operating expenses, $115,266,441, were $9,769,810 more, which gave net earnings of $1,512,232 for the first 6 months of this year, compared with an operating deficit of $2,925,997 in the first 6 months of 1922.

From the May figures as given in the table on the preceding page and as analyzed above, and from the June results as also mentioned, it is evident that the railways are operating on a pretty narrow margin. They are moving heavy traffic and doing it efficiently; if the traffic was not heavy, or if they were not moving it efficiently, they would not be able to break even. The operating ratios they are obtaining are not what they should be; they are exceptionally good, however, with conditions as they are. A falling off in traffic would, with rates remaining as they are, make the operating ratio more unfavorable than it is, and cut the net earnings to the vanishing point. While traffic remains good the railways are sorely beset by employes who want more wages, and by patrons who want rates reduced, through direct reduction and so-called equalization. It does not require much imagination to see that the railways are not getting results to put them in a position to afford either wage increases or rate reductions.

Self-Propelled Cars on Steam Railways.

Previous issues of Canadian Railway and Marine World have contained descriptions and illustrations of the numerous self propelled cars acquired by the Canadian National Rys. (including a large gasoline car ordered by the G.T.R. before the amalgamation), Greater Winnipeg Water District Ry., Quebec Central Ry. (including the car operated by the C.P.R. on its LaSalle Loop Subdivision), and Quebec, Montreal & Southern Ry., each car having been described as it was acquired. Most of the cars are in operation on the runs specified in previous issues, but some redistribution has been effected on the Canadian National Rys., as follows: No. 15,800, formerly a gasoline-electric car operating between Winnipeg and Transcona, Man., is being converted into a storage battery car at the Niagara, St. Catharines & Toronto Ry. shops at St. Catharines, [illegible] mundston Division, Atlantic Region, is now being operated between Dalhousie and Dalhousie Jct., 6.21 miles, on the Dalhousie Subdivision, Campbellton Division, Atlantic Region, service between Cross Creek and Stanley being now given by steam trains 27 and 28, which en route from Newcastle to Fredericton and vice versa, on the Nashwaak Subdivision, operate from Stanley Jct. to Stanley and return; 15,812 and 15,813, gasoline cars built by Ledoux, Jennings, Ltd., are operating between Victoria and Milne's Landing, 26.6 miles, on Cowichan Subdivision, Vancouver Island Lines, British Columbia District; 15,814, a Service gasoline car, and 15,815, a Ledoux, Jennings gasoline car, are operating between Trenton, Picton and Napanee, Ont.; 15,816, the large gasoline car ordered by the G.T.R. from National Steel Car Corporation, and described in Canadian Railway and Marine World for February, is not yet completed. In addition the Canadian National Rys. have had 2 small gasoline cars built at the Fort Rouge shops, Winnipeg, and these have been numbered 15,700 and 15,701.

Toronto Viaduct Situation.

While there has been a considerable amount of discussion lately with respect to what is likely to be done about the construction of a viaduct along the Toronto waterfront by the railways and the city, the matter is no nearer a settlement. R. F. Gough, one of the Canadian National Rys. directors was reported to have said in July: "A meeting of the C.N.R. directors will be held in Toronto on Aug. 20 when various matters of interest to the people of Toronto will be considered by the board, and particularly the question of grade separation on the waterfront, together with such steps as can be taken to open for public travel as soon as possible the new union station. It would be premature for me to express any opinion with respect to the action of the board in advance of this meeting, however I feel that I am not going too far when I say that the board is anxious to carry out any obligations into which it has entered, and I believe that the policy which it will eventually determine upon will be satisfactory to the people of Toronto. I have the interests of Toronto very much at heart, and in addition to fulfilling my full responsibility as a director of the C.N.R., I am always anxious to do whatever will best serve the interests of the city. Toronto is one [illegible] important cities on the [illegible] only able to attend the meeting for a short time, having business elsewhere, probably in connection with the inspection of the Home Bank, of which he was Vice President, and apparently the viaduct question was not dealt with. Following the meeting, Sir Henry Thornton was reported to have said that the question was one for settlement by the Toronto Terminals Ry. Co., that he believed that the C.P.R., as well as the C.N.R., is anxious to have it settled so that the new union station may be opened; but the matter is a big one and requires a great deal of deliberation before any conclusion can be reached. Within a year it would probably be possible to say what the railways would do.

Railway Earnings.

Canadian National Railways.

Canadian Railway and Marine World is again unable, as in August, to publish its usual comparative monthly table of C.N.R. earnings, owing to changes which have been made in the form in which they are furnished. The following figures have been supplied by the C.N.R. Publicity Department for the "Amalgamated System." Apparently they include the total revenue and expenses of some of the subsidiary companies which were not included formerly.

	Earnings	Expenses	Net	Increase
May	$20,992,772	$19,092,414	$1,900,358	$ 925,126
June	20,475,146	19,354,672	1,120,471	1,244,282
For 6 months ended June 30	$116,778,673	$115,266,441	$1,512,232	$4,438,229
Increases	$14,208,039	$ 9,769,810	$4,438,229	....

Another statement issued by the C.N.R. Publicity Department states the gross revenues for the Canadian National Rys., including the Central Vermont Ry., for June were $21,216,499.11, operating expenses, $20,039,053.85, net revenue, $1,177,445.26.

The C.N.R. Publicity Department states that the Canadian National Rys. gross earnings for July were $20,976,770, against $19,383,721 in July, 1922; that for the 3 weeks ended Aug. 21 they were $14,772,289, against $13,682,338 for the same period in 1922, and that from Jan. 1 to Aug. 31 they were $152,559,165.90, an increase of $16,967,497.18 over same period in 1922.

Operating ratios	1923	1922
January	102.57	110.48
February	116.55	107.71
March	102.10	98.92
April	89.95	107.09
May	90.95	94.72
June	94.53	100.88
For 6 months ended June 30	98.71	102.85

The C.N.R. official figures, as reported to the Dominion Bureau of Statistics for May, for practically Canadian lines only, are given on pg. 420 of this issue.

Canadian Pacific Railway.

Following are monthly gross earnings, working expenses and net profits for 1923, compared with those for 1922. The discrepancies between these figures and those issued by the Dominion Bureau of Statistics are owing to the fact that the Bureau

Self-Propelled Cars on Steam Railways.

The large gasoline motor car ordered by the G.T.R. management from the National Steel Car Corporation, before the co-ordination of the G.T.R. with the Canadian National Rys., was described fully in Canadian Railway and Marine World for February, when it was pointed out that this was the largest self propelled car ordered for operation on Canadian steam railways. The car was practically completed recently with the exception of the interior finishing, and a trial run was made between Hamilton and Niagara Falls, under the supervision of R. J. Needham, Mechanical and Electrical Engineer, Central Region, Toronto. It is reported that the trial was successful. Afterwards the car returned to the builder's plant at Hamilton, Ont., for completion of the interior fitting.

Particulars of the conversion of a gasoline-electric car which was operated formerly between Winnipeg and Transcona, Man., into a storage battery car, at the Niagara, St. Catharines and Toronto Ry. shops at St. Catharines, Ont., were given in a preceding issue of Canadian Railway and Marine World. As a gasoline-electric car, the power plant consisted of a G.E. gasoline engine, coupled with generator, the engine having 8 cylinders, and developing up to 175 h.p., the dynamo being rated at 80 k.w. There were only 2 motors, G.E. type 205B, the drive being to the leading truck axles. The car is now equipped with 250 Edison A-12-H storage batteries, and 4 G.E. type G-261 ball bearing motors of 25 h.p. each. At the time of writing (Sept. 15) the conversion is practically completed, and it is expected that the car will be restored to its former run very soon.

The Canadian National Rys. are having an additional storage battery car built at St. Catharines, and have plans for building 4 more. A standard frame for all battery cars to be acquired in future is being developed, and the frame of the car being built conforms more or less closely to the specifications that will be adopted as standard. The standard frame will be designed to be adaptable to three types of body construction, viz.: 1. A car body divided into a space with seating accommodation for 44 passengers, a 16-passenger smoking compartment and a small baggage compartment. 2. A body without baggage space, to provide total seating capacity for 70 passengers in a main compartment, and in a smoking compartment with accommodation for 20 or 24 passengers. 3. A body with accommodation approximately equally divided as between milk and passengers, with seating capacity for 34.

increases or rate reductions.

Self-Propelled Cars on Steam Railways.

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is not due to the varying quality of the steam coincident with the conditions (maximum load) which most often causes low water.

The least considered of all conditions in connection with the steam car is probably the comfort of the operator, and in this respect this type of equipment is unpopular, on account of the extreme heat, which may be overcome, and also the noise of the oil flame. The latter is by far the most serious, and is apparently impossible to control when using high velocity jets of steam for atomizing.

Space does not permit a further study of the steam plant, but the following general data of a steam car now being tested may be of interest:—

Space required for boiler plant	640 sq. ft.
Heating surface	direct 385-s.h. 44
Gross weight of car	60,000 lb.
Net weight of complete power plant without oil and water	13,000 lb.
Quantity of water supply	200 U.S. gall.
" oil "	180 U.S. gall.
Oil rate per car mile average	1.0 gall.
Boiler pressure	800 lb.
Superheat (average)	200° F
Engine dimensions	6½ bore 8 in. stroke
Gear ratio between crank shaft and axle	1 to 1.46

(3) The Heavy Duty Gas Car.—Dimensions and description: Length, 55 ft.; weight, 60,000 lb. loaded; engine dimensions, 6-cylinder—6¾ in. stroke; power, 116 h.p., at 800 r.p.m.; 225 h.p. at 1,600 r.p.m. Transmission, 4 speeds forward, 3 reverse. Geared to give 56 m.p.h. forward at 1,400 r.p.m. in high, and 37 in third speed. This class of car has not been tested to the point where any accurate data may be given, but it is evident that gas consumption will be at least twice that of a class A car per car mile.

The problem of handling through transmission and clutch the mechanical drive from a heavy duty gas engine of possibly 200 horse power has not yet been solved, unless it is through the medium of the oil transmission, so successfully used in navy work. The extreme complication of this transmission or magnetic control makes it doubtful at the present time whether gas power plants will successfully exceed 70 horse power.

(4) The Gas Electric Car.—Earlier in this paper mention has been made of the gas-electric car, which came into prominated, 0.25 gall. per mile. It is thought that there may be a possibility of a smaller capacity constant speed gasoline engine (the equal of average running power consumption approximating 25 horse power for cars weighing 60,000 lb. loaded) driving a generator charging a limited battery capacity. Theoretically this might provide the starting torque desired, and at the same time eliminate the undesirable features of the large power plant, but it could not be an economic consideration where cheap power could be purchased.

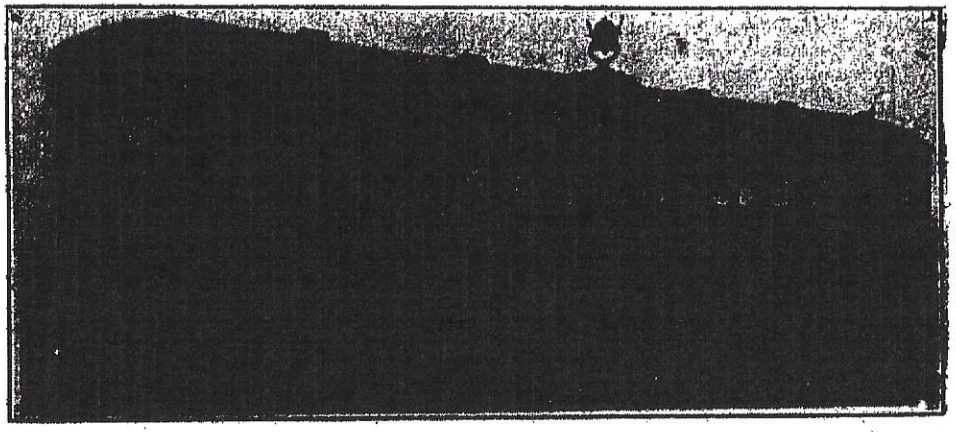
The Ball and Roller Bearing.—As it is impossible, in the space of a paragraph or two, to even partially cover the question of low friction bearings, it is the intention to briefly indicate why the ball or roller bearing has been one of the most important factors in the development of the motor coach and may possibly be a greater factor in future railway developments in other equipment. Exhaustive tests indicate that the ball bearing has reduced starting friction, under summer conditions, to approximately 15% of that of plain bearings, or in other words has reduced friction of approximately 20 lb. per ton to 3 lb. per ton. At the same time average rolling friction at speeds up to 30 miles per hour has been reduced by approximately 40%, or from 3.6 lb. per ton to 2.2 lb. per ton.

dle all the power developed by same, but such are not sound, on account of the greater inertia to be overcome at starting, requiring a momentary torque much in excess of anything experienced in automobile work. There is also the condition in this country, and the northern states, of having to operate cars in snow storms, resulting in clutch slippage, and shocks to transmission, much in excess of that experienced in automobile service.

The method of transmitting the power to the wheels has been generally as follows:—

(1) Through a standard transmission to one driving axle, which supports the entire two-wheel rear truck, and which can move in a vertical plane only. While this is the simplest method of driving, it is not the opinion that it will ever be generally acceptable to the railways, as railway experience indicates that safety and good riding qualities are almost proportionate to the number of wheels in the trucks. This is particularly applicable to cars operating on cheaply maintained lines.

(2) To both axles of front four-wheel truck, by gearing and universal connections, from a transmission located behind the truck. Experience on some railways is showing that this method of transmitting the drive is very successful, and although the number of universal



Electric Storage Battery, Passenger Car, Canadian National Railways.

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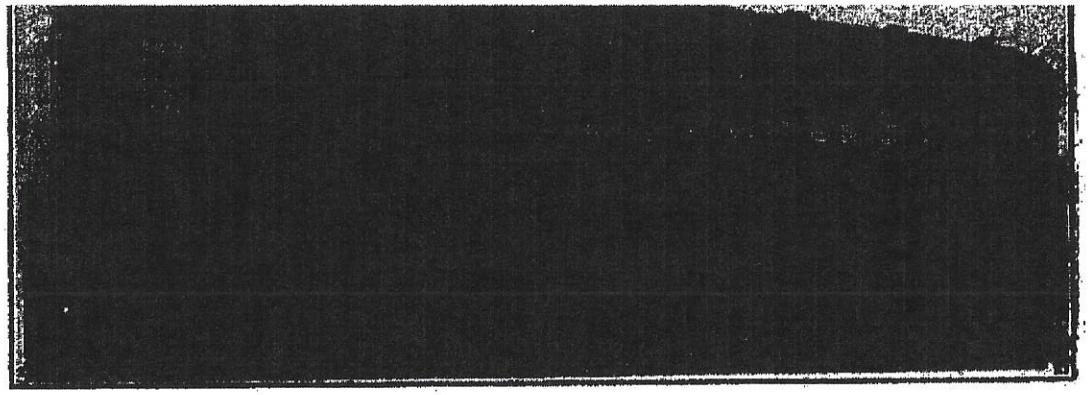
(4) **The Gas Electric Car.**—Earlier in this paper mention has been made of the gas-electric car, which came into prominence about fifteen years ago, and which has been practically discarded, for reasons mentioned, namely, unreliable power plant and general complication of equipment. The first mentioned cause of failure has undoubtedly been overcome, and reliable constant speed units are in general use for generating purposes. If it were possible to eliminate the starting troubles when using types of engines suited for low grade and cheap fuels, there would be no doubt about the general use of this type of equipment, on account of unit power costs. The difficulties mentioned are such an important factor in the successful operation of a motor coach in certain localities that we must necessarily turn to the gasoline engine for generating power.

The gas-electric system provides double ended control, and an efficient starting torque, but still retains all the complications of a dual power plant. The general data pertaining to a modern gas-electric plant is as follows: Size of car, 55 ft. length, 10 ft. width; seating capacity, 54, with 100 sq. ft. of baggage space; weight, loaded, 65,000 lb.; engine, 6-cylinder, governor controlled, bore 7 in., stroke 8 in., developing 150 b.h.p. at 900 r.p.m., driving a 100 k.w. 700 volt generator, which in turn drives two motors on forward truck. Fuel consumption, esti-



Electric Storage Battery, Passenger Car, Canadian National Railways.

Experience in this country indicates that the ball bearing is suitable for class A cars, but that designed areas and sizes for industrial work should be at least doubled for railway work, due to excessive shocks and side thrusts. It is not possible at this time to say whether side thrusts or vertical rail shocks are more destructive, but it is certain that for poor rail conditions the bearings should have a side thrust capacity of 100% of vertical load. For class B equipment, it may be necessary to use the roller bearings for vertical loads, with special bearings for side thrusts.

Transmission and Type of Drive for class A gas driven and class B (heavy duty gas driven).—While it has been advocated in this paper that the automobile engine is most suitable for the light motor coach, it is also admitted that experience indicates that standard automobile transmission, clutches, universal connections and driving gears are entirely inadequate for motor coach service, and are the cause of probably 75% of the breakdowns. In this respect, the appliances which have been developed as counter parts of the truck engine are generally much superior, due to greater size and strength per h.p. transmitted than automobile parts. The argument has been advanced that the parts are designed for the engine, and will handle connections is not reduced, the shafts are all short, and the entire driving forces are removed from the passenger carrying part of the cars, thereby reducing vibration.

(3) To a transmission located about the center of the car, and from there to nearest axle of each four-wheel truck, or to both axles of two-wheel trucks. The advantage claimed for this method of drive is that the entire weight of the car is available to give good adhesion (where the trucks are two-wheel type), but general experience indicates that this is not necessary, and is harder on the engine than an arrangement where part of the momentum of rotating parts may be taken up by slippage. Where four-wheel trucks are used this method gives better adhesive qualities than connecting to both axles of one truck, but seemingly not sufficient to warrant the extra complication of transmission.

(4) To the leading axle of rear four-wheel truck. The chief advantage of the drive to the rear truck is that the engine may be aligned in such a manner as to have its shaft center line pass through the center line of main driving axle, thus reducing wear on universals and friction to a minimum. The disadvantage is that it necessitates the use of one or more supplementary bearings, between the engine and the point where

the drive shaft is coupled to the front universal. The maximum lateral motion of a truck of 48 in. wheel centers and 18 ft. truck centers on an 80 ft. radius curve is shown by road check to average ¾ in. at a radius from center of 24 in., so that is is apparent that the swing of the truck has but little effect on the universals. The torque arms supporting the housings of such an arrangement should have both vertical and lateral swing. Only when the load on main axle is not sufficient for adhesion it may be conceived that driving power acts on the second axle. Under ordinary conditions transmitting power to the second axle generates no more friction than that due to the weight of rotating parts.

Methods of transmitting power from the front axle to the rear axle of rear truck may be sub-divided as follows

(a) Chain drive has the advantage of rapid wear, noise, and the complication of shields and covers, which more than overcome the advantage of the straight drive to the rear truck

(b) Gear drives to the second axle no doubt appear the best mechanical means of transmitting power, but it has with it all the disadvantages of rapid ... due to difficulty of adjustment of

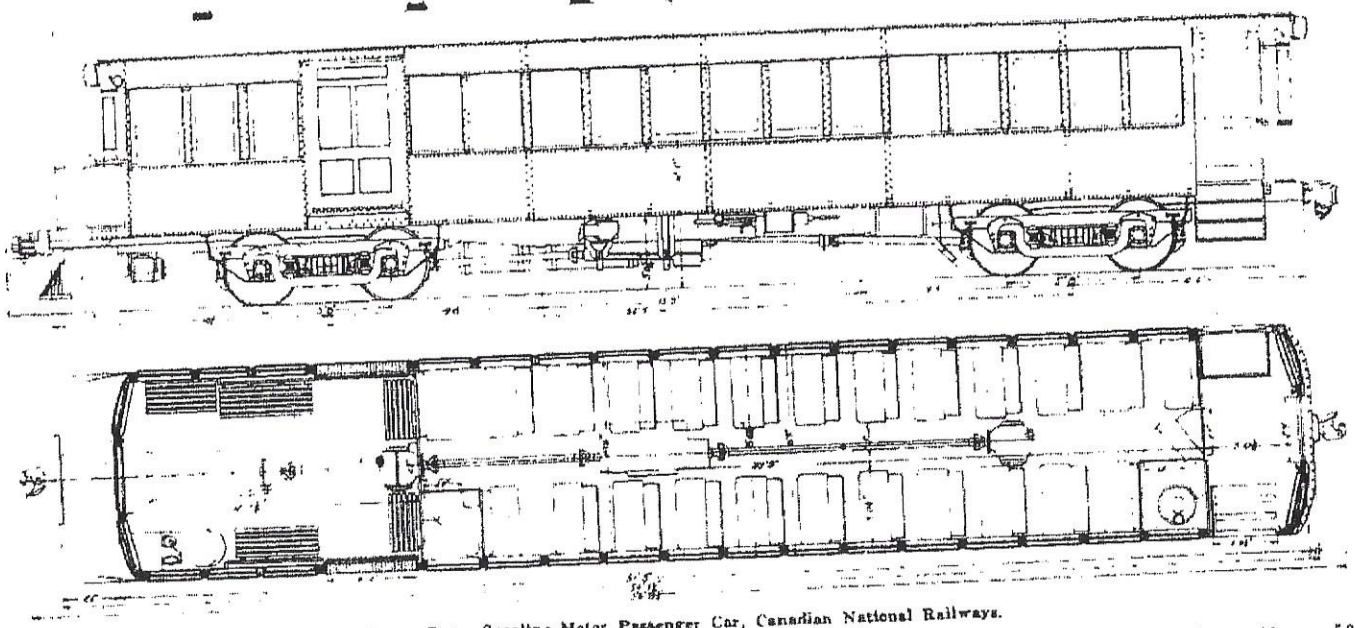
light weight) gas engine driven by automobile type engine 6-cylinders with the following general characteristics and limiting conditions:—1.6 h.p. per 1,000 lb. light weight of car at engine speed of 2100 r.p.m., giving a car speed of 35 to 40 m.p.h. Rolling friction 2.2 per ton weight on rail, and wind resistance of 5 lb. per square foot cross sectional area of car at 40 m.p.h. Weight of car per passenger seat maximum 750 lb. Weight of car per maximum h.p. 600 lb. Gear ratio between engine and wheel for ruling grades not exceeding 1.25%, 4.7 to 1. (In hard operating conditions this may be increased to 5.5 to 1).

Class B cars.—It is difficult to come to a general conclusion with regard to this class of equipment, as it appears that only one class of car has actually passed out of the experimental stage. One of the Canadian railways has found the battery car to be a thoroughly reliable and economical unit to operate, provided that the schedule will permit of charging time. Severe weather conditions have had but little effect on the operation, and the simplicity of the power controlling devices eliminates any chance of opposition from the operators.

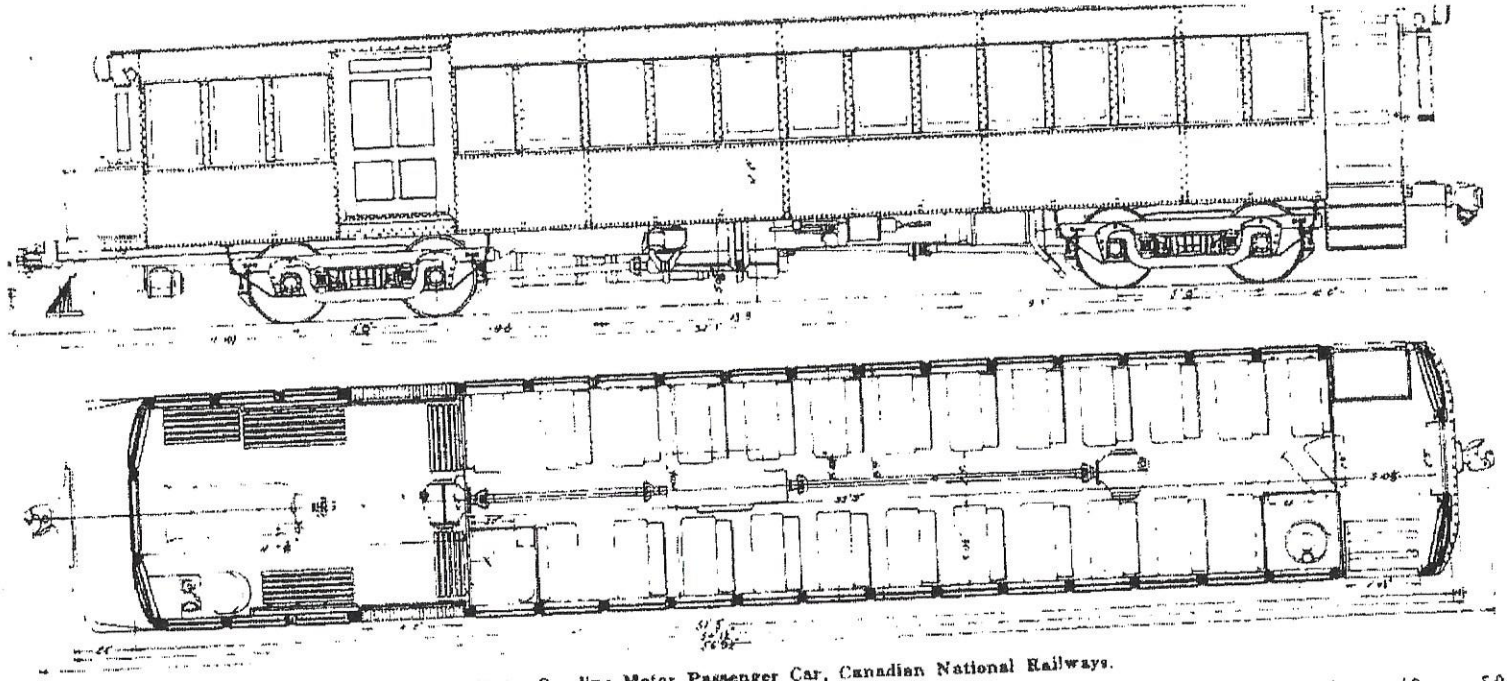
The foregoing paper was read before the American Society of Mechanical Engineers at its railway session in Montreal recently.

Discussion on Hudson Bay Railway.

F. W. Cowie, Consulting Engineer, Montreal Harbor Commission, in addressing the Engineering Institute of Canada's Montreal branch recently, referred favorably to the Hudson Bay Railway, and the ocean route thence to Liverpool, arguing that by using that route Western farmers would obtain cheaper rates for their grain, and that the European markets would be much nearer than by present transportation routes. These observations aroused considerable discussion, the opinion expressed being generally against the route. A. D. Swan said that the cost of building the railway and the necessary facilities would be heavy; the season would be short, and the cost of operation would be in excess of other routes, so that the estimate of a 24c rate per bushel from Saskatoon to Liverpool was too low and he believed would be as high as 40c or 50c a bushel. He favored the development of a route via Vancouver. H. Holgate ... the St. Law-



Heavy Duty, Gasoline Motor Passenger Car, Canadian National Railways.



Heavy Duty. Gasoline Motor Passenger Car, Canadian National Railways.

with it all the disadvantages of rapid wear, due to difficulty of adjustment of contact, and the maintenance of extra universals.

(c) Side rods and cranked wheels, in similar manner as locomotive driving wheels. Side rod drive to the second axle, while with many other locomotive developments is said to be crude and inefficient, in actual practice is a thoroughly reliable and easily adjusted and inspected arrangement, and is operating successfully at high and low speeds, and with no appreciable friction.

(5) Miscellaneous, including oil transmissions still being experimented with.

Summary.—In summarizing, the writer realizes that in dealing with such a subject there is no doubt a very great difference of opinion amongst railway men regarding what will fulfil the requirements of the service best. It is apparent to any engineer that there will be important developments in railway motor cars, both in so far as design and field of service are concerned, and therefore the conclusions which we may note here may be considered as preliminary only.

Class A cars (30,000 lb. maximum controlling devices eliminates any chance of opposition from the operators.

The chief obstacles in the development of this type of units is first cost, and in some regions high power costs, but it is felt that the great advantage of double ended operation, without complication, more than offsets any serious disadvantages.

In conclusion it seems safe to say that there is a fairly large field for the motor coach in railway work, and that it will not be developed from without, but rather from within, slowly, conservatively, by motor manufacturers and railway engineers, as the travelling public will never tolerate from the railway companies the difficulties and disappointments which have been visited on them personally by the automobile manufacturers. The railway engineer, to do his part in this problem, must be familiar, not only with operating conditions, but also with the labor problems which are sure to arise in such a development, making it necessary and advisable to give consideration to the employe operating this equipment, and to the public using it.

believed would be as high as 40c or 50c a bushel. He favored the development of a route via Vancouver. H. Holgate was in favor of improving the St. Lawrence navigation route so that large grain boats from the upper lakes could reach Montreal. G. H. Duggan said that every dollar that had been expended by the Government on the Hudson Bay Ry. and on the proposed terminals at Port Nelson had been wasted, and the sooner the whole thing was dropped and forgotten the better it would be for Canada.

Liquor Transportation on Canadian National Rys.—On motion of H. H. Stevens, Vancouver Center, B.C., the House of Commons passed an order recently for a copy of all correspondence, letters, telegrams and other documents passing between the Prime Minister, the Minister of Railways, and H. R. Grant of Sydney Mines, N.S., or other persons, having reference to the transportation of liquor, over Canadian National Rys. or other lines under the control of the Canadian National Rys., into Nova Scotia.

Traffic Orders by Board of Railway Commissioners.

Specifications for Cheese Boxes.

General order 377, April 6. Re application of Canadian Freight Association, on behalf of railway companies, under the Railway Act, 1919, sec. 322, for approval of a proposed supplement no. 20 to Canadian Freight Classification 18, adding to the specifications for wooden cylindrical cheese boxes, certain regulations as to the fastening of the covers thereof. Whereas notice has been given by the railway companies in The Canada Gazette, as required by the Railway Act 1919, and to the mercantile organizations enumerated in general order 15?, Nov. 4 1915, and upon consideration of the submissions filed, and the report and recommendation of its Chief Traffic Officer the Board orders that the proposed supplement be approved.

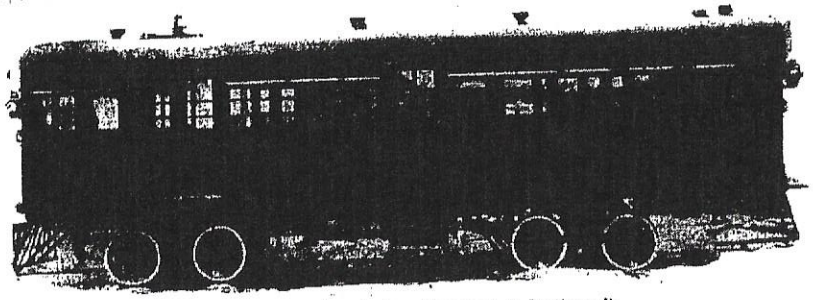
Self Propelled Cars on Steam Railways.

The Quebec, Montreal & Southern Ry received on Nov. [illegible] from the Canadian Car & Foundry Co., Ltd., Montreal, [illegible] two self propelled gasoline passenger cars ordered to [illegible] at [illegible] which is given below. [illegible] approximately [illegible] are long enough to [illegible] The underframing is of the same type as that of the car previously delivered to the Q. M. & S. Ry. by the same builders, as described in Canadian Railway and Marine World for Oct. 1922, and the truck and drive arrangement are also similar. Illustrations of the latter, as applied to a car built for the Canadian National Rys., were given in Canadian Railway and Marine World for Aug. 1922.

The car is equipped with a small platform at the back, providing easy access to the marker lamps. The car body is [illegible] construction, the sheathing [illegible]

T-6 motor of 50 h.p. The second car, no. 52, was expected to be delivered about April 12.

Car 51, together with the gasoline car delivered to the Q. M. & S. in 1922 by the same builders, is being operated as train 50, St. Lambert to Fortierville, Que., 109.69 miles, as train 51, Fortierville to St. Lambert, on Mondays, Wednesdays and Fridays, and as train 52, St. Lambert to Nicolet, 78 miles, and train 53, Nicolet to St. Lambert, on Tuesdays, Thursdays and Saturdays. Car 52 will be operated as train 60, Sorel to Noyan Jct., 86.04 miles, daily except Sunday, train 61, Noyan Jct. to Sorel, daily, except Saturday and Sunday, and train 62, Noyan Jct. to Sorel, Saturdays only.



Self Propelled Car, Quebec, Montreal & Southern Ry.

Maritime Provinces Delegates' Interview Sir Henry Thornton.

A delegation of 16 from the Maritime provinces headed by J. E. Master, President Maritime Board of Trade, Moncton, N.B., and including Premier Armstrong of Nova Scotia, Premier Veniot of New Brunswick, J. E. McLeary, General Manager Halifax Shipyards and several mayors and presidents of trade boards of trade, interviewed Sir Henry Thornton, President Canadian National Rys. at Montreal, April 2, in connection with the C.N.R.'s Atlantic Region. Western terminal with a view of having the region extend from the Atlantic coast to Montreal, instead of to Riviere du Loup and Monks, Que., as fixed by the management recently.

Following the interview, which was private, a statement was issued at the C.N.R. general offices, as follows: "Capt. J. E. Master, President of the Maritime Board of Trade, presented to Sir Henry Thornton the position of the maritime delegates in the terms of the resolution passed at the Amherst convention on March 2, as follows: 'Whereas, the decision of the C.N.R. to make the Atlantic Region extend from Montreal to Riviere du Loup or Monks, Que., instead of to the Maritime provinces, as formerly, has been made without any consultation with the Maritime provinces, and is considered by the Maritime provinces to be a discrimination against the Maritime provinces; and that copies of this resolution be furnished the Maritime members of the House of Commons, the governments of the three maritime provinces and the boards of trade of the maritime provinces.'

"The situation was fully discussed, all the delegates expressing their views. President Masters outlined the position of the maritime provinces to Sir Henry Thornton, pointing out the very deep interest that this question had aroused in the minds of the maritime people, especially with regard to any change that might involve the breaking up of the Intercolonial Ry. with its western terminal at Montreal. A general discussion followed, the many and varied aspects of the question being set forth. Sir Henry Thornton stated that the decision regarding the creation of the Atlantic Region had been made only after very careful study of the situation. He did not think that the interests of the maritime provinces would be affected adversely. He told the deputation that the whole question would be reviewed, and if it were found that an injustice had arisen, or was likely to arise, he would be prepared to furnish a remedy promptly. With regard to the manner in which the working of the region as at present constituted was being carried on the delegation expressed its appreciation.

In connection with the foregoing, it may be mentioned that Mr. Baxter, St. John, N.B., asked in the House of Commons recently: "Is it true, as reported in the press, that J. A. Sinclair, a member of the Canadian National Rys' Board, stated to members of the delegation of the St. John Board of Trade, which attended a conference at Amherst, N.S., that it was news to him that Cochrane and Brockville were not to be the western terminal of the Atlantic Division, as that was the understanding at the last meeting he had attended,' or words to that effect? If Mr. Sinclair has been substantially correctly reported, why was a matter of such importance dealt with in his absence?" The acting Minister of Railways, Mr. Graham, replied: "The Government has no information as to the correctness of the report in question."

Dominion Express Co. Withdraws from Canadian Government Railways, Etc.

T. E. McDonnell, Vice President and General Manager, Dominion Express Co., issued notice, April 27, that, to accommodate the Dominion Government's wishes, the company's service will be withdrawn from government railways at [illegible] of May, and be extended to em-

anadian Railway and Marine World

February, 1923

Gasoline Motor Passenger Car for Grand Trunk Railway.

levelopments which have taken the self propelled car field on n railways in 1921 and 1922, as in Canadian Railway and World from month to month, ost important, and it certainly evident that the self propelled established for itself a definite the rail transportation industry. eration of branch lines by steam ives and train has long been a proposition, and electrification of ines has been, and is, an econ- undesirable undertaking, by of the very feature which made operation unprofitable, viz., light lensity. In the self propelled car, ent to handle the traffic offering profit, or with a large decrease in ting loss, has been developed, and se it is economically justified, it is oable to expect that even greater opment will take place in the self lled car field in the future than in ast. That such will be the case, arly indicated by the G.T.R. man- ent's action in ordering a gasoline car which will be of large capa- and which will be driven by a power with an output greatly in excess ything yet attempted along similar in the Canadian or U.S. railway

The car will be completely equip- with the standard A.R.A. car and notive devices, and with safety ap- ces in accordance with Interstate merce Commission regulations. The ls and trucks will be of heavy con- tion, in order to hold the track well, furnish riding comfort at high ds. The body will be made of special s, to afford lightness with strength, efficient design will afford low center durability. The car will have the following dimensions:

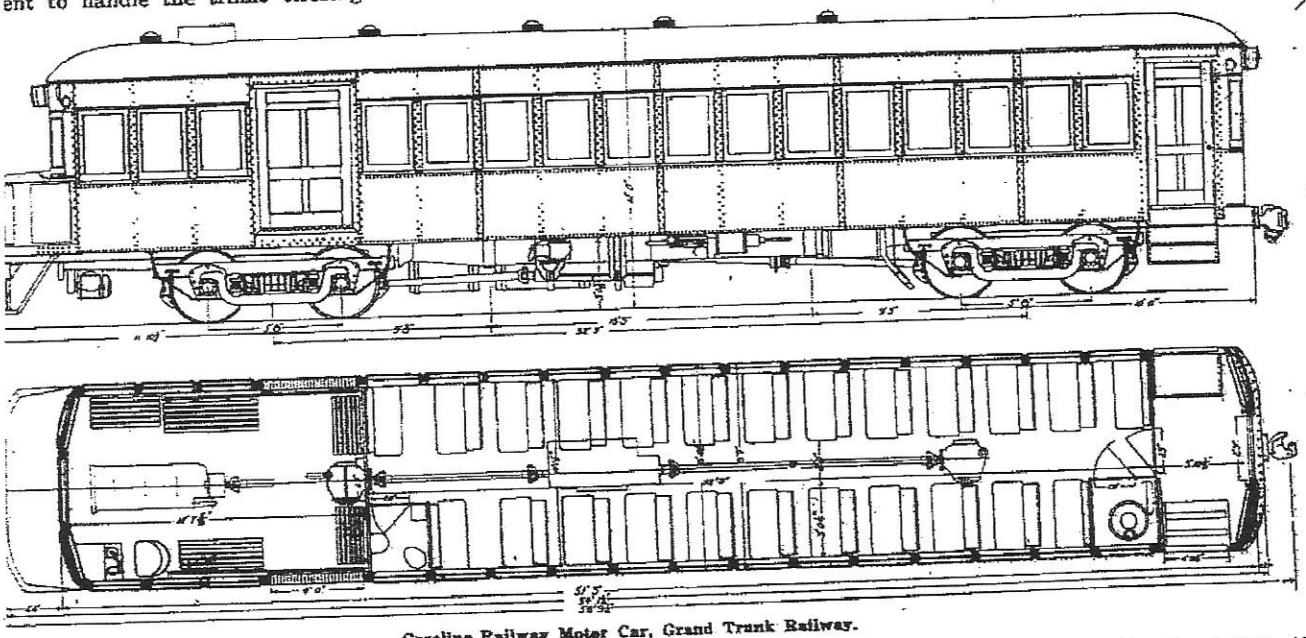
Length over end sills	54 ft. 1½ in.
Width over side sheathing	8 ft. 9 in.
Height top of rail to floor	3 ft. 9⅝ in.
Height top of rail to roof	12 ft. 0 in.
Height top of rail to center of couplers	2 ft. 10½ in.
Center to center of bolsters	32 ft. 3 in.
Truck wheel base	5 ft. 8 in.
Seating capacity, passenger compartment	48
Seating capacity, baggage compartment	10
Total capacity, standing and seated	100
Baggage allowance	10,000 lb.
Weight	40,000 to 45,000 lb.

Underframing.—The center sills will be of the fish belly type, continuous from end sill to end sill, spaced 36 in. apart, with 5/16 in. web plate, with 3 x 3 x ⅜ in. top and 3½ x 3 x ⅜ in. bottom angles. The bolsters, arranged for roller side bearings, will be built up of pressed steel diaphragms, with 9 channel center fillers and 14 x 5/16 in. top and bottom cover plates. The center plate will be of cast steel. The cross bearers will be of pressed steel diaphragms with 6 x ¼ in. top and bottom cover plates, and the floor supports will be three 6.7 lb. rolled steel Z bars securely riveted to the center and side sills. The side sills will be of 5 x 3 x ⅜ in. rolled steel angles riveted to bolsters and cross bearers.

The sideframing will include side posts, which will be fabricated of rolled steel angles placed back to back, riveted to the side sills and side plates. The corner posts will also be rolled steel angles placed back to back, and the end posts will be rolled steel I beams. The side plates will be rolled steel angles, continuous from end to end of car, and the sides of the body will be straight, sheathed outside with no. 16 patent levelled sheet steel, riveted to the side posts, side sills and belt rail. The joints in the side sheathing will be covered ilar manner to the sides, and the car will be insulated with ¾ in. salamander.

The roof will be of the single arch type. The carlines, of flat steel bars bent to the roof contour, will be riveted to the side plates by angle connections, and will have wooden furring bolted on for the application of the ceiling and roof boards. The roof boards will be of ½ in. thick poplar, tongued and grooved, laid longitudinally and nailed to the carline furring. The roof boards will be covered with canvas well bedded in white lead.

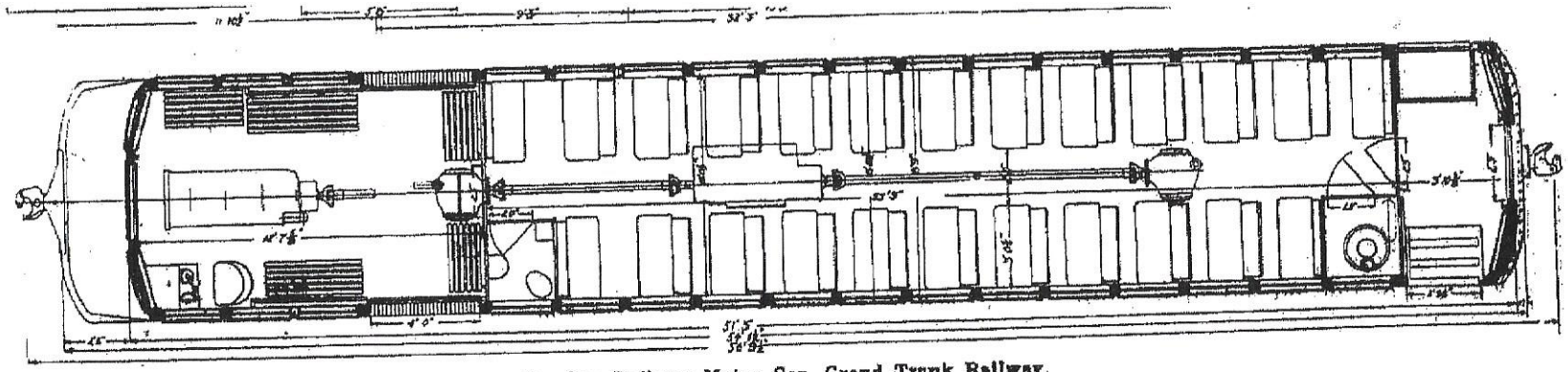
The floor will be of double ¾ in. tongued and grooved long leaf yellow pine, laid longitudinally, with a layer of tar paper applied between the two courses. Asbestos lumber insulation, ⅛ in. thick, will be applied under the floor and held in place with metal strips.



Gasoline Railway Motor Car, Grand Trunk Railway.

Doors and steps.—There will be a single sliding door at each side of the car in the baggage compartment, with a 4 ft. opening; a passenger compartment door on each side at the rear end of car, arranged to swing in, with a 2 ft. opening, and a swinging door in the rear vestibule for use when a trailer is attached. The doors will have glass in the upper panels, protected with vertical steel bars. At each baggage compartment door, a steel stirrup will be riveted to the side sill. At the passenger compartment doors, stationary oak steps, with steel hangers and fenders, will be provided, the step treads to be equipped with 3 in. safety tread. The step openings will be provided with trap doors.

The interior of the car will be divided by a partition equipped with a swinging door, giving a 22 in. clear door opening into a passenger and a baggage compartment. The seats in the passenger compartment are arranged transversely, as



Gasoline Railway Motor Car, Grand Trunk Railway.

with profit, or with a large decrease in operating loss, has been developed, and because it is economically justified, it is reasonable to expect that even greater development will take place in the self propelled car field in the future than in the past. That such will be the case, is clearly indicated by the G.T.R. management's action in ordering a gasoline motor car which will be of large capacity, and which will be driven by a power plant with an output greatly in excess of anything yet attempted along similar lines in the Canadian or U.S. railway field. The car will be completely equipped with the standard A.R.A. car and locomotive devices, and with safety applinaces in accordance with Interstate Commerce Commission regulations. The wheels and trucks will be of heavy construction, in order to hold the track well, and furnish riding comfort at high speeds. The body will be made of special steels, to afford lightness with strength, and efficient design will afford low center of gravity. The drive will be of simple construction, designed with heavy overload capacity, and with a special view to bearings, will be built up of pressed steel diaphragms, with 9 channel center fillers and 14 x 5/16 in. top and bottom cover plates. The center plate will be of cast steel. The cross bearers will be of pressed steel diaphragms with 6 x ¼ in. top and bottom cover plates, and the floor supports will be three 6.7 lb. rolled steel Z bars securely riveted to the center and side sills. The side sills will be of 5 x 3 x ⅜ in. rolled steel angles riveted to bolsters and cross bearers.

The sideframing will include side posts, which will be fabricated of rolled steel angles placed back to back, riveted to the side sills and side plates. The corner posts will also be rolled steel angles placed back to back, and the end posts will be rolled steel I beams. The side plates will be rolled steel angles, continuous from end to end of car, and the sides of the body will be straight sheathed outside with no. 16 patent levelled sheet steel, riveted to the side posts, side sills and belt rail. The joints in the side sheathing will be covered with sheet steel splice plates. The front and rear ends will be sheathed in a sim- courses. Asbestos lumber insulation, ⅛ in. thick, will be applied under the floor and held in place with metal strips.

Doors and steps.—There will be a single sliding door at each side of the car in the baggage compartment, with a 4 ft. opening; a passenger compartment door on each side at the rear end of car, arranged to swing in, with a 2 ft. opening, and a swinging door in the rear vestibule for use when a trailer is attached. The doors will have glass in the upper panels, protected with vertical steel bars. At each baggage compartment door, a steel stirrup will be riveted to the side sill. At the passenger compartment doors, stationary oak steps, with steel hangers and fenders, will be provided, the step treads to be equipped with 3 in. safety tread. The step openings will be provided with trap doors.

The interior of the car will be divided by a partition equipped with a swinging door, giving a 22 in. clear door opening into a passenger and a baggage compartment. The seats in the passenger compartment, arranged transversely, as shown in the accompanying drawing,

will be upholstered in green plush, and the seat backs will be equipped with bronze grab handles. The inside finish will be in cherry, with the ceiling, and the side lining below the window sills in the passenger compartment, of ¼ in. agasote. A wood housing, flashed with galvanized iron, will be provided over the engine, and an air duct connected to this housing will take the fumes from the engine. The interior will be equipped with a lavatory, complete with hopper, wash stand and mirror, and a drinking water fountain with gravity tank. Each side of the body will have 16 windows, and each end of the body 3 windows. The window sash will be of cherry. All side sash and sash over the radiators will raise, and the vestibule sash will be arranged to drop. All windows will be equipped with storm sash. Sash fixtures will be of bronze, and window sill capping will be of no. 16 sheet steel. Window shades will be applied to all windows, and will be of silk faced pantasote. Additional interior equipment will include a conductor's bronze bell, with loose hammer attachment at the front end, connected with a bell chain the full length of the car, and two fire extinguishers will be provided, to be carried in the baggage compartment. An emergency tool box will also be provided.

Exterior equipment will include a light weight locomotive type pilot fitted to the front of car, five ventilators on the roof, one opening into the baggage compartment and the other four into the passenger compartment, front coupler of A.R.A. engine type, attached to cast steel radiator support, rear coupler with A.R.A. head with riveted wrought yoke and spring draft gear, air sanding apparatus, Westinghouse semi-automatic air brake system with clasp brakes, Westinghouse air compressor driven by power take-off from transmission, and standard classification and marker lamp and flag brackets.

The trucks will be of the pedestal type, with swing motion bolster, as shown, the truck frames to be of 6 in. structural channels, with structural angle transoms, securely riveted. The pedestals and equalizer spring caps will be of cast steel. There will be 2 forged steel equal- mounted in brackets on the letter board as shown.

The power plant.—The engine will be a Sterling, Dolphin type, 6-cylinder gasoline engine, with cylinders 5¾ in. bore and 6¾ in. stroke. The power rating will be as follows: at 800 r.p.m., 116 h.p.; at 1,000 r.p.m., 144 h.p.; at 1,200 r.p.m., 180 h.p.; at 1,400 r.p.m., 205 h.p.; at 1,600 r.p.m., 225 h.p. The cylinders of this type of engine, cast in pairs, are of the overhead valve type with detachable cylinder heads, and are made of high tensile strength special cylinder iron. The water jackets extend to the base flange, affording uniform cooling, and the cylinder wall is skirted into the upper base, so as to give the piston guidance the full length of the stroke. The upper base is a single iron casting, and the main bearings, carried in this upper base, are strongly ribbed and attached to the cylinders, relieving the outer shell of explosion stresses. The lower base is a single casting of semi-steel, with integral lugs for supporting and attaching the engine to the foundation. The lower base extends the full length of the engine, enclosing the flywheel, and the flywheel housing clears the inside of the foundation. The pistons are of aluminum, the piston pins of steel, and the long connecting rods, of I beam section, are of special steel, drop forged and double heat treated. The rods are 14 in. long on centers. The main bearings are 3½ in. long and 2½ in. diam. The intermediate and end main bearings are unusually large, while all bearings are line reamed and worked in by hand. The crankshaft is a drop forging of chrome nickel steel, equipped with counterbalance weights opposite the throws, dynamically balanced, and has a tensile strength of 115,000 lb. A characteristic of these engines is the large valve area; there are 2 inlet and 2 exhaust valves for each cylinder, and the fact of the water jacket being continuous around the seat ensures uniform cooling. The rocker arms are drop forged, the push rods, enclosed, are of steel, fitted with large roller for cam action, the camshafts are drop forgings, the push rod guides are of bronze, and removable, the crankshaft and camshaft gears are steel drop forg- and are helical, and the other timing

pension. This will be arranged so that the entire frame, engine and clutch can be removed through the end of the car by unbolting the front striking plates. The clutch will be of the multiple disc type, running in oil, and the universals, of the all-metal type, will be such that all angles will be reduced to less than 5 degrees on 23 degree curves. The transmission will provide for 4 speeds forward and 3 reverse, and will be of sliding gear type, with a special arrangement cutting off the load when changing gears. The rear truck will be direct connected without gears in high speed. As the drive will be through the leading axle of the rear truck and the trailing axle of the front truck, power will be transmitted to the trailing axle of the front truck through a jackshaft, which may be thrown out of engagement when little tractive effort is necessary. The gear ratios will be as follows: low, 5.19 to 1; 2nd, 2.7 to 1; 3rd, 1.67 to 1; high, 1 to 1.

The drive will be through spiral bevel gearing pressed on the driving axles, with keys. The gearing will be enclosed in cast steel 2-part housings, with ball bearings on the axles, all parts running in oil or grease. The ratio of the bevels will be approximately 3 to 1, giving a speed of 36 m.p.h. at 1,000 r.p.m. of the engine. To relieve the shock of starting and stopping, the gear housings will be fitted with cast steel torque arms, rubber cushioned and suspended to the truck equalizer bars. The car will have sufficient tractive power to pull a trailer of equal capacity or a loaded 50-ton box car. With the gear ratios as above indicated, the following speeds will be obtainable:

R.P.M. of motor.	Miles per hour. High.	3rd speed.	2nd speed.	1st speed
1800	63	37.8	23.4	12.15
1400	49	29.4	18.2	9.45
1200	42	25.2	15.6	8.1
1000	35	21	13	6.75
800	28	16.8	10.4	5.4
400	14	8.4	5.2	2.7

The first, second and third speeds will be reversible. The car is being built by the National Steel Car Corporation, Hamilton, Ont.

Fast Runs on Michigan Central Railroad.

the passenger compartment, [illegible] agasote. A wood housing, flashed with galvanized iron, will be provided over the engine, and an air duct connected to this housing will take the fumes from the engine. The interior will be equipped with a lavatory, complete with hopper, wash stand and mirror, and a drinking water fountain with gravity tank. Each side of the body will have 16 windows, and each end of the body 3 windows. The window sash will be of cherry. All side sash and sash over the radiators will raise, and the vestibule sash will be arranged to drop. All windows will be equipped with storm sash. Sash fixtures will be of bronze, and window sill capping will be of no. 16 sheet steel. Window shades will be applied to all windows, and will be of silk faced pantasote. Additional interior equipment will include a conductor's bronze bell, with loose hammer attachment at the front end, connected with a bell chain the full length of the car, and two fire extinguishers will be provided, to be carried in the baggage compartment. An emergency tool box will also be provided.

Exterior equipment will include a light weight locomotive type pilot fitted to the front of car, five ventilators on the roof, one opening into the baggage compartment and the other four into the passenger compartment, front coupler of A.R.A. engine type, attached to cast steel radiator support, rear coupler with A.R.A. head with riveted wrought yoke and spring draft gear, air sanding apparatus, Westinghouse semi-automatic air brake system with clasp brakes, Westinghouse air compressor driven by power take-off from transmission, and standard classification and marker lamp and flag brackets.

The trucks will be of the pedestal type, with swing motion bolster, as shown, the truck frames to be of 6 in. structural channels, with structural angle transoms, securely riveted. The pedestals and equalizer spring caps will be of cast steel. There will be 2 forged steel equalizer bars on each side of the trucks, resting on top of the journal boxes, with cast steel equalizer spring seats. The truck bolsters will be built up of structural channels and plates, with cast steel center plates and roller side bearings, and the bolster spring caps, seats and rockers will be of cast steel. The trucks will be equipped with 36 in. diam. steel tired wheels, with cast steel spoke centers, and the o.h.s. axles will be arranged for roller bearings. The journal bearings will be of the Stafford roller type, with roller end thrust, and the journal boxes will be cast steel. Each truck will be equipped with 2 triple elliptic bolster springs and 4 helical equalizing springs.

Heating.—The car will be heated by a hot water heater, which, together with the coal box, will be located in a separate compartment between the baggage room and lavatory. Hot water pipes will be located along each side of the car, under the seats.

The lighting equipment will include a U.S.L. type F generator with chain drive from the engine, and a 16-cell U.S.L. battery. There will be 2 lamps in the baggage compartment, 8 pendant lamps in the passenger compartment, and 2 rear vestibule lamps. Each end of the car will be equipped with a headlight,

will be as follows: at 800 r.p.m., 110 h.p.; at 1,000 r.p.m., 144 h.p.; at 1,200 r.p.m., 180 h.p.; at 1,400 r.p.m., 205 h.p.; at 1,600 r.p.m., 225 h.p. The cylinders of this type of engine, cast in pairs, are of the overhead valve type with detachable cylinder heads, and are made of high tensile strength special cylinder iron. The water jackets extend to the base flange, affording uniform cooling, and the cylinder wall is skirted into the upper base, so as to give the piston guidance the full length of the stroke. The upper base is a single iron casting, and the main bearings, carried in this upper base, are strongly ribbed and attached to the cylinders, relieving the outer shell of explosion stresses. The lower base is a single casting of semi-steel, with integral lugs for supporting and attaching the engine to the foundation. The lower base extends the full length of the engine, enclosing the flywheel, and the flywheel housing clears the inside of the foundation. The pistons are of aluminum, the piston pins of steel, and the long connecting rods, of I beam section, are of special steel, drop forged and double heat treated. The rods are 14 in. long on centers. The main bearings are 3½ in. long and 2½ in. diam. The intermediate and end main bearings are unusually large, while all bearings are line reamed and worked in by hand. The crankshaft is a drop forging of chrome nickel steel, equipped with counterbalance weights opposite the throws, dynamically balanced, and has a tensile strength of 115,000 lb. A characteristic of these engines is the large valve area; there are 2 inlet and 2 exhaust valves for each cylinder, and the fact of the water jacket being continuous around the seat ensures uniform cooling. The rocker arms are drop forged, the push rods, enclosed, are of steel, fitted with large roller for cam action, the camshafts are drop forgings, the push rod guides are of bronze, and removable, the crankshaft and camshaft gears are steel drop forgings and are helical, and the other timing gears are of phosphor bronze. On the exhaust side of the engine is a bronze water circulating pump, with positive shaft drive. An oil circulating pump of gear type, driven from the camshaft through spiral gears, is also provided, as is also an oil supply pump of the plunger type, attached to the top of the base and driven through worm gearing on the camshaft. With the engine, a special type gasoline pump will be provided. The gasoline will be carried in two 50-gallon tanks supported beneath the car body. The engine will be equipped with a northeast generator with U.S.L. battery for ignition. In these engines lubrication is by pressure feed through the camshaft, the pump taking oil from the tank in the lower base casting. The oil is returned to the supply tank by 2 scavenging pumps, which pick it up through strainers from either end of the engine. It is claimed that the engine will operate on a 45% grade without affecting the lubrication. The engine will be equipped with a northeast type 32-volt starting system with gears enclosed.

A Stromberg carburetor will be employed. The engine and clutch will be mounted on a frame hung between the center sills, with standard 3-point sus-

all angles will be reduced to less than 5 degrees on 23 degree curves. The transmission will provide for 4 speeds forward and 3 reverse, and will be of sliding gear type, with a special arrangement cutting off the load when changing gears. The rear truck will be direct connected without gears in high speed. As the drive will be through the leading axle of the rear truck and the trailing axle of the front truck, power will be transmitted to the trailing axle of the front truck through a jackshaft, which may be thrown out of engagement when little tractive effort is necessary. The gear ratios will be as follows: low, 5.19 to 1; 2nd, 2.7 to 1; 3rd, 1.67 to 1; high, 1 to 1.

The drive will be through spiral bevel gearing pressed on the driving axles, with keys. The gearing will be enclosed in cast steel 2-part housings, with ball bearings on the axles, all parts running in oil or grease. The ratio of the bevels will be approximately 3 to 1, giving a speed of 36 m.p.h. at 1,000 r.p.m. of the engine. To relieve the shock of starting and stopping, the gear housings will be fitted with cast steel torque arms, rubber cushioned and suspended to the truck equalizer bars. The car will have sufficient tractive power to pull a trailer of equal capacity or a loaded 50-ton box car. With the gear ratios as above indicated, the following speeds will be obtainable:

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The first, second and third speeds will be reversible. The car is being built by the National Steel Car Corporation, Hamilton, Ont.

Fast Runs on Michigan Central Railroad.

That the M.C.R.'s Canada Division is continuing to live up to its reputation in connection with motive power performance, is shown by some runs which were made lately. We are officially advised that on Dec. 26, 1922, train 15 made the trip between Bridgeburg and Windsor, 224 miles, in 205 min., the 114 miles from Bridgeburg to St. Thomas being done in 110 min., and the 110 miles between St. Thomas and Windsor in 95 min. The average speed between Bridgeburg and St. Thomas was 62.18 m.p.h., and between St. Thomas and Windsor, 69.46 m.p.h. We are further advised that on Dec. 30, train 15 covered the distance between St. Thomas and Windsor in 99 min., the average speed being 66.66 m.p.h. There is nothing unusual about such runs as the above on the M.C.R., as they are made very frequently. When trains depart late from their terminals, locomotive men are permitted to make up lost time, with the result that very often an apparently exceptional run is made.

The G.T.R. Repair Shop at Mimico, Ont., terminal yards, was destroyed by fire, Jan. 3, the damage being estimated at $10,000.

d, subsidies have been voted for this mileage out of Roberval.

The Canadian Northern Montreal Tunnel and Terminal Co. has been incorporated under the Dominion Companies Act, with a capital of $50,000, and office at Toronto, for the purpose of laying out and operating railway, tramway and steamship terminals, transportation warehousing and storage facilities, tunnels and approaches, yards, stock yards, grain elevators, steamships, piers, docks, drydocks, ship basins, etc., and in connection therewith to carry on a number of other businesses, and to do whatever may be incidental or necessary to be carrying out of the company's main objects. The operations of the company to be carried on throughout Canada. The provisional directors are:—G. G. Ruel, S. P. Biggs, A. J. Mitchell, J. B. Robertson, F. J. Buller, all of whom are connected with the Toronto offices of Mackenzie, Mann and Co., Ltd.

Canadian Northern Quebec Ry.—Quebec press reports, Aug. 14, state that the company has purchased a considerable area of land at Limoilou, Que., for the purpose of extending its yards and terminals at Quebec. The land is situated behind the Q. and L. St. J.R. station in Limoilou, just across the St. Charles River from Quebec.

The Board of Railway Commissioners has extended until Sept. 15 the time for the completion of the C.N.Q.R. across Notre Dame St., Montreal, and the joining of the Montreal St. Ry. and the Montreal Harbor Commissioners' tracks.

With respect to the projected terminals in Montreal, press reports state that electricity will be used as a motive power for the traffic on account of the tunnel under Mount Royal. A. W. Smithers, Chairman of the Board, G.T.R., stated in Montreal, Aug. 8, that he had not heard anything of a proposal that the G.T.R. and the C.N.R. should join in the building of a big terminal station there.

The new short line between Montreal and Hawkesbury, Ont., will be finished this fall. The substructure for the bridge over the Back River at Montreal will be started at an early date. The contract for this work had not been let up to Aug. 20.

The Canadian Northern Montreal Land Co. has been incorporated under the Dominion Companies Act, with a capital of $2,500,000, and offices in Toronto, for the purpose of acquiring lands, wharves, docks, warehouses, etc., to acquire land for townsites, and to develop the same, and to carry on in connection various businesses, including those of shipowners, wharfingers, forwarders, and agents. The provisional directors are, G. G. Ruel, R. H. M. Temple, A. J. Reid, S. P. Biggs, and R. F. Ormsby, all of Mackenzie, Mann and Co.'s offices, Toronto.

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Agent at Vancouver, B.C., and it is also stated that H. Swinford, General Agent there, will retire on March 31, and be succeeded by Mr. Jaynes.

Pacific Great Eastern Ry.—T. KILPATRICK, formerly Superintendent, District 1, British Columbia Division, C.P.R., Revelstoke, B.C., from which position he resigned in Nov., 1912, is reported to have been appointed General Manager, P.G.E.R., vice A. B. Buckworth, reported appointed Deputy Minister of Railways for British Columbia.

Self Propelled Cars on Steam Railways.

The Canadian National Rys. management has ordered the construction of a storage battery car at the Niagara, St. Catharines and Toronto Ry. shops at St. Catharines, Ont., and the plans are being prepared. The car will be numbered 15,804, and will be equipped with Edison batteries and 4 G.E. 261-A motors of 25 h.p. each.

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When the two conversions mentioned above have been completed, the C.N.R. will have 5 storage battery cars in operation, nos. 15,800; 15,801, bought from Railway Storage Battery Car Co.; 15,802 and 15803, bought from Cambria & Indiana Rd., and 15,804. At present car no. 15,801 is operating between Toronto and Beaverton, Ont., on the schedule given in a preceding number of Canadian Railway and Marine World, and nos. 15,802 and 15,803 are being overhauled at St. Catharines. Car 15,802 will have 266 cells and 4 Westinghouse V-65 A-3 motors of 25 h.p. each, and will be placed on the Bathurst-Campbellton run, in the Maritime District. Car 15,803 will be fitted with Exide batteries and will be placed on the Brockville-Westport run, on the Ontario District.

Gasoline car service between Cross Creek and Stanley, on the Nashwaak and Stanley Subdivisions, Edmundston Division, Maritime District, which was furnished by car 15,111, has been discontinued for the winter, service now being furnished by steam train.

Vancouver Transportation Building.—A press report states that the construction of a building, designed especially for transportation company offices, and

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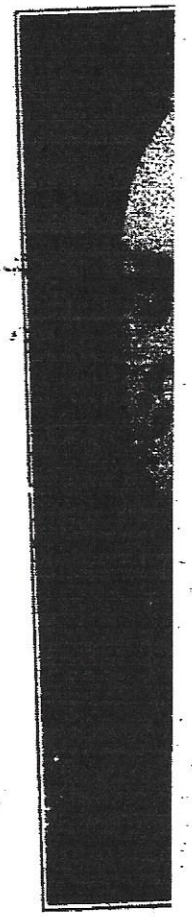

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appointed Commercial Agent, Canadian National-Grand Trunk Rys., there. Office, 54 Federal Life Bldg.

G. F. TARBELL, heretofore Travelling Freight Agent, has been appointed East-bound Agent, Boston, Mass. Office, Old South Building, 294 Washington St.

W. E. WEEGAR, heretofore Trainmaster, District 30, Ottawa Division, Ontario Lines, Ottawa, has been appointed acting Superintendent, Barrie Division, Ontario Lines, during the absence on account of illness of P. J. Lynch, Superintendent. Office, Allandale, Ont.

Northern Pacific Ry.—W. H. JAYNES, who is stated in a press report to have been chief clerk to Assistant General Freight Agent at Portland, Ore., is said to have been appointed Assistant General Agent at Vancouver, B.C., and it is also stated that H. Swinford, General Agent there, will retire on March 31, and be succeeded by Mr. Jaynes.

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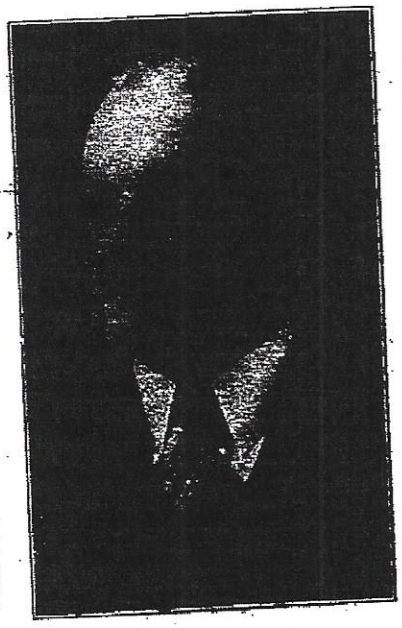
Death of Hon. W. C. Kennedy.

Hon. William Costello Kennedy, Minister of Railways and Canals, died at Naples, Florida, Jan. 17, from heart failure, while recuperating from the effects of two operations in Montreal for gall stones. The first operation took place Aug. 26, and the second, Sept. 20, 1922, and for some time the worst was feared, but his partial recovery was due to his extraordinary vitality. He left the hospital in Montreal on Nov. 20, and stayed at Stratford, Ont., with his sister, until Dec. 26, when he went to his home in Windsor, Ont., leaving there on Jan. 3 with Mrs. Kennedy for Florida.

He was a son of Wm. and Julia (Costello) Kennedy, was born at Ottawa, Ont., Aug. 27, 1868, and educated at separate school, and De La Salle Institute, Toronto. He began his business career with the London & Canadian Loan & Agency Co., Toronto, in 1887, remaining in its service until 1897, when he engaged in gas and oil business at



Hon. W. C. Kennedy, M.P.

Windsor, Ont. He was President, Windsor Gas Co., 1903 to 1917, and afterwards became a gas and oil operator. He was President, Windsor Board of Trade, 1909 to 1910; trustee, Windsor Board of Education, 1913 to 1918; councillor, Ojibway, 1913 to 1918. He was elected to the House of Commons for [illegible] and again

at the armories, from 2 to 9 p.m., after which it was removed to his house. The funeral took place at Windsor, Jan. 24, the Governor General being represented, and the Prime Minister and other members of the cabinet acting as honorary pall bearers. Among those present were: Right. Hon. Arthur Meighen, ex-Prime Minister; Hon. F. B. Carvell and Calvin Lawrence, Board of Railway Commissioners; Alex. Johnston, Deputy Minister of Marine; G. W. Yates, Assistant Deputy Minister of Railways and Canals; Sir Joseph Flavelle, ex-Chairman, Board of Directors, G.T.R., and a number of officials of the Canadian National, Canadian Pacific and Grand Trunk Rys.

Grain in Store at Elevators.

The Dominion Bureau of Statistics, Internal Trade Branch, reports that for the week ended Jan. 5, the quantity of grain in storage increased as follows: Oats, 203,684 bush.; barley, 553,018; flax, 34,525; rye, 201,865. Wheat decreased 548,236 bush.

Western country elevators' decreases were: Wheat, 1,146,109 bush.; flax 6,780; rye, 10,460; and increases: oats, 239,157; barley, 53,064. Receipts for the previous week were 3,985,985 bush. and shipments 5,853,473.

Interior terminal elevators increases were: Wheat, 255,824 bush.; oats, 35,364; flax, 1,241; rye, 7,263. Barley decreased 1,251 bush.

At public and private terminal elevators at Fort William and Port Arthur, there were increases in all grains: Wheat, 3,127,412 bush.; oats, 317,869; barley, 194,179; flax, 40,064; rye, 210,090; a total increase of 3,889,614 bush. Total receipts at Fort William and Port Arthur, from Sept. 1, 1922 to Jan. 5, 1923, were 226,516,639 bush., and at Vancouver, B.C., 7,650,587.

Winnipeg private terminal elevators showed increases of wheat, 7,903 bush.; oats, 20,601, and barley, 553, decrease.

In eastern public elevators, the increases were: Wheat, 1,111,480 bush.; oats, 72,669; barley, 149,691. Rye decreased 36,832 bush. The total receipts of all grains were 1,033,036 bush. by ship, and 1,200,882 by rail; and shipments were, 1,075,809 by ship, and 1,251,119 by rail.

The quantity of U.S. grain in store at Canadian eastern public elevators was 3,131,383 bush., compared with 6,135,237 for the same period last year. At U.S. lake ports, Buffalo and Duluth, there were decreases: Wheat, 3,756,864 bush.; oats, 372,760; and increases: Barley 152,631, and rye 666. At U.S. Atlantic seaboard ports, there were decreases: Wheat, 147,882 bush.; oats, 109,216; and increases: Barley, 5,257 bush.; rye, 31,138.

Sir Robert D. Reid's Estate. — Miss Harriet D. Reid, daughter of the late Sir

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The Canadian National Rys. now have 11 self propelled cars, as follows: no. 15,800, formerly a gasoline electric car, operating between Winnipeg and Transcona, but now at the Niagara, St. Catharines & Toronto shops at St. Catharines, Ont., for conversion into a storage battery car; 15,801, storage battery car now operating between Toronto and Beaverton; 15,802, the larger of the two battery cars bought from Cambria & Indiana Rd., now being overhauled at St. Catharines, preparatory to being run between Bathurst and Campbellton, N.B.; 15,803, the other battery car bought from Cambria & Indiana Rd., now operating between Brockville and Westport, Ont.; 15,805, steam car which was operating between Trenton, Picton and Napanee, Ont., but not operating at the time of writing; 15,810, a small gasoline car, with Winton chassis and 6-cylinder engine, which was operating between Souris and Elmira, Prince Edward Island Ry., but which has been replaced by steam train service during the winter; 15,811, a small Ledoux, Jennings gasoline car, operating on the Stanley Branch, Maritime District; 15,812, Ledoux, Jennings gasoline car, operating between Victoria and Sooke, Vancouver Island; 15,813, Ledoux, Jennings gasoline car, also operating between Victoria and Sooke; 15,814, Service gasoline car operating between Trenton, Napanee and Picton, Ont., and 15,815, a Ledoux, Jennings gasoline car, similar to 15,814, acquired recently, and also operating between Trenton, Napanee and Picton.

In addition to the above, construction will soon be started at the Niagara, St. Catharines & Toronto shops of storage battery car 15,804, which will be very similar to car 15,801, which was described and illustrated in preceding numbers of Canadian Railway and Marine World. This car will be of all steel construction, about 60 ft. long, and with seating accommodation for about 60 passengers. It will be equipped with 260 A-12-H Edison batteries, and 4 General Electric 261-A motors. The trucks, to be supplied by Canadian Car & Foundry Co., will be of the ball bearing type. S.K.F. ball bearings will be used.

Car 15,800, which was heretofore of the gas electric type, is undergoing radical change in being converted into a storage battery car. Its dimensions were as follows:—

Length over couplers	58 ft. 11 in.
Length over end sills	53 ft. 5⅝ in.
Truck centers	40 ft. 7 in.
Width over all at eaves	10 ft. 3½ in.
Height, rail to top of roof	12 ft. 6 in.
Truck wheel base	6 ft.

As a gasoline electric car, it was equipped with a power plant, consisting of a G.E. gasoline engine, coupled with generator, the engine having 8 cylinders, and developing up to 175 h.p., and the dynamo being rated at 80 k.w. It had only 2 motors, the drive being to the leading truck axles. The motors were G.E. type 205B. The gasoline engine, generator and motors, are being taken out, and will be replaced by 250 Edison A-12-H storage batteries and four G.E. type G-261A ball bearing motors of 25 h.p. each. The car will be arranged for [illegible] standard series tion, two new members in the form of sill extensions will be put in to secure added strength. The car is of all steel construction, with 4 sills of channel section; to secure additional strength and rigidity 5 transverse members of truss construction will be put in between the bolsters.

As a gas-electric car, the weight was about 44 tons, but it is anticipated that when the conversion into a storage battery car is completed, it will be only 35 tons. A large saving in weight will be introduced by replacing the old engine and generator set with batteries, while the 4 new motors will have an aggregate weight much less than the 2 old style motors. The new ball bearing trucks will be lighter than the trucks heretofore under the car. The car body will be arranged to have a seating capacity of nearly 100, and the interior will be in one compartment only. When the conversion is completed, the car will be returned to Winnipeg, to its run between Winnipeg and Transcona, 7.1 miles, on which it had been making 7 round trips daily. It is felt that the conversion into a storage battery car will introduce a large saving, as maintenance expenses were very heavy with the old equipment, and also because there is an abundance of cheap electrical power available.

Battery car 15,802, the overhaul of which at St. Catharines, preparatory to it being placed on the Bathurst-Campbellton run, is about completed, will be equipped with 277 Edison A-12-H batteries, 4 Westinghouse V65-A3 ball bearing motors of 25 h.p. each, and Brill 69E ball bearing trucks. The seating in this car, which was described in a preceding issue of Canadian Railway and Marine World, will be rearranged somewhat, and a smoking compartment and lavatory will be installed.

Battery car 15,803, now operating between Brockville and Westport, Ont., was overhauled at St. Catharines and turned out with 110 MVX Ironclad Exide batteries, 4 Westinghouse V65-A3 motors and Brill type 69E ball bearing trucks. The car is making 107 miles daily, the current being obtained from the hydro system at Brockville, and the batteries being charged during the night.

The gasoline car ordered by the G.T.R. from the National Steel Car Corporation will be numbered 15,816. It was described and illustrated in Canadian Railway and Marine World for February, pg. 49.

Hearing re Air Brakes for Self Propelled Cars.

Canadian Railway and Marine World for March contained a brief account of a hearing by the Board of Railway Commissioners on Feb. 7, at which railways were required to show cause why self-propelled cars should not be equipped with air brakes. At the hearing, C. E. Brooks, Chief of Motive Power, Canadian National Rys., in his evidence to show that hand brakes are safe and satisfactory on the smaller cars, said: "We know that, travelling at 30 m.p.h. under normal track conditions, we can stop, and have stopped, these cars in anywhere from 325 to 600 ft. We know there are cases where these cars have [illegible] feel that under ordinary maximum speed conditions, we can expect, even under unusual rail conditions, to stop within 600 ft., or in approximately 25 seconds."

A. L. Currie, Superintendent, Quebec, Montreal & Southern Ry., which has been operating a Ledoux, Jennings gasoline car, said: "The Q. M. & S. objects to an order requiring air brakes, especially for cars weighing less than 35,000 lbs., and less than 37 ft. long, for the following reasons: 1. Cost of car would be increased by approximately $1,100. 2. Weight would be increased by 1,000 to 1,200 lb., or over 5%, and thus increase gasoline consumption and cost of operation. 3. It would require drivers with knowledge of air brakes and appurtenances, who would have to be paid higher. 4. Additional car failures would be caused by additional strain put on drive shaft and electric starter. 5. While automobile engine has been developed until it is now reasonably free from failure, introduction of air compressing apparatus would complicate it and introduce causes of failure. 6. The great need of these small cars is to furnish service on branch lines, where experts cannot be provided, except at needless expense, to look after air equipment. 7. Cars being terminused away from repair shops, any air brake defect would cause great expense and delay. 8. Power of car would be detracted from and repairs to driving gear would be difficult. 9. It would be difficult to maintain adjustment of air brakes so as to maintain proper braking power. 10. Maintenance costs would be greatly increased. 11. In general, the use of air brakes would inject into the operation an appliance difficult to maintain in proper shape, and expensive as to operation and maintenance. 12. Even if air brakes were installed, hand brakes would still be necessary. 13. The driver of the present Q. M. & S. car, not equipped with air brakes, states he would just as soon have hand brakes. 14. The hand brakes will stop the car more effectively than air brakes. The power from the hand brakes goes on gradually and is not so apt as the air brakes to skid the wheels and so lessen the braking power. 15. The hand brake is positive in action, whereas something might occur to the mechanism of an air brake which would render it inoperative when required. 16. From tests made, it is felt that with hand brakes, the car may be stopped more quickly than with air brakes.

W. A. Newman, Mechanical Engineer, C.P.R., in speaking of the Ledoux, Jennings gasoline car the C.P.R. is operating on its Lasalle Loop Subdivision, said: "We have made a number of tests with the hand brake . . . . it was snowing on both days and the weather was cold. Sand was used at all stops. The tests on the level were taken at a maximum speed, 36 m.p.h. We stopped in 397 ft., or 13 sec. from the time the signal was given. At 7 m.p.h. we had two tests; in one we stopped in 23 ft. and in the other 19 ft., the time being 2½ and 3 sec. I have one test classified as an ordinary stop running at 35 m.p.h.; we stopped in 13 sec. in 468 ft. We had an emergency stop going at 36 m.p.h. and stopped in 9 sec. in 359 ft. We demonstrated to our own satisfaction that with [illegible]

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From the evidence quoted above it appears that the hand brake is a satis-

Some Recent Developments of the Railway Motor Coach.

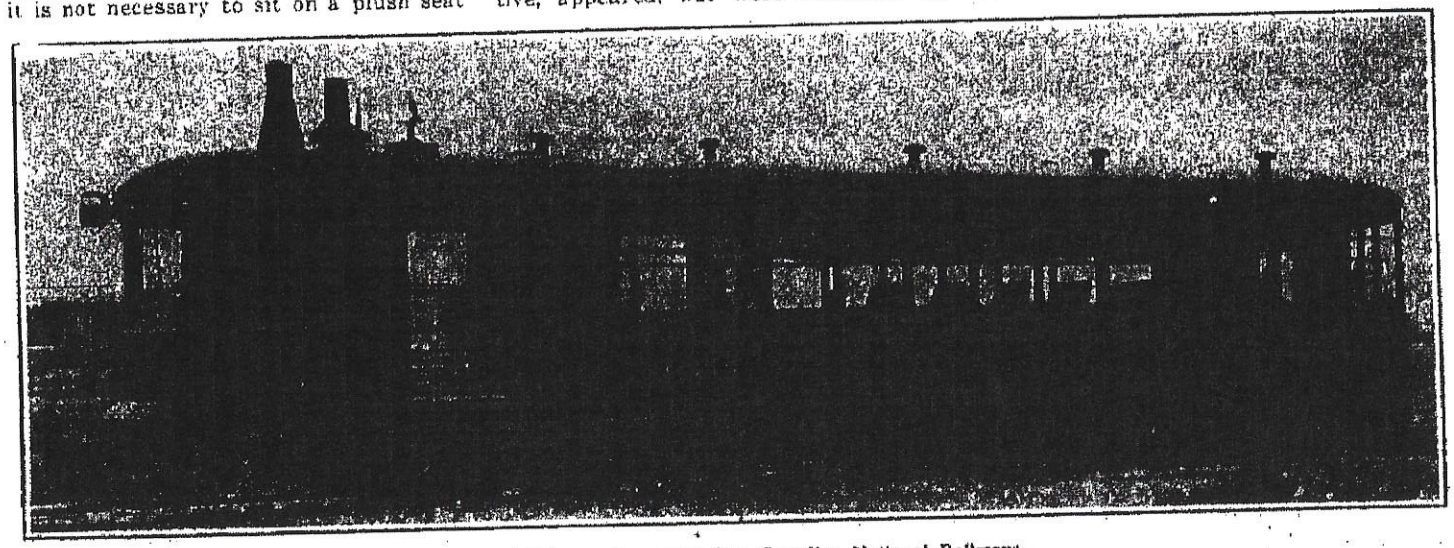
By C. E. Brooks, Chief of Motive Power, Canadian National Railways.

In commencing this paper the writer must ask for lenient consideration, as the subject named is not only in the early stages of development, but also covers such a large field and variety of equipment that it is necessary to curtail descriptive matter as far as possible and to make a certain number of rather bald statements unadorned by detail.

The motor coach is not a new departure in railway work, but is instead a branch of the work which on most railways had sunk back, from a promising start 15 years ago, into obscurity, due essentially to high maintenance and operating costs, and to the general idea that the motor car was a toy only. During the past three years the subject has been actively revived as a result of: Firstly: The ever increasing encroachment of the motor bus on railway earnings. Secondly: To the improvement in the design of the motor and its appurtenances. Thirdly: To the idea which the automobile is gradually giving the public, namely, that it is not necessary to sit on a plush seat main line trains. (4) To connect small summer resorts, golf clubs, etc., to branch line or through main line service. (5) To handle milk of a limited amount to a distributing or connecting point. (6) To provide connections to small suburbs.

Among the first real developments of the motor coach was the gas-electric car, the use of which spread rapidly fifteen years ago, but which, unfortunately, did not solve these problems successfully, on account of the high maintenance cost of the heavy duty gasoline motor driving the generator, the very uncertain service, the complications of the equipment, and the great weight of the motor coach itself. Indications are that the gas-electric system, with a modern gas engine generating plant, is making another bid for this class of work, and a brief description of such a unit is given farther on in this paper. About the same time steam units, having very considerable weight, and all the complications of the locomotive, appeared, but were discarded for of 15 to 25 miles per hour, including stops. Consider a 5 mile run between stops, 1 minute for stops, acceleration from 0 to 30 m.p.h. in 2 minutes on level track; 30 to 35 m.p.h. at end of third minute, an average speed of 35 m.p.h. for the next 3¾ miles, and half minute to travel 0.21 mile, and come to a stop, means that in order to run 5 miles and make one stop, the elapsed time is 10.9 minutes, or an average schedule speed, including stops, of 27½ m.p.h. This allows nothing for loss of time on gradients, slow orders, etc.

Generally speaking, class A units have been gasoline driven, and the experience of many railways points to this class of equipment being an economical and lasting development, which will be improved to the point of high grade automobile reliability within a very short time. Already, in many places, these cars have retrieved business which had been lost to bus lines on the highways, and also to the private owned car, and it has been the usual thing to find pas-



Self-propelled Steam Passenger Car, Canadian National Railways.

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Self Propelled Cars on Steam Railways.

The Canadian National Rys. now have 11 self propelled cars, as follows: no. 15,800, formerly a gasoline electric car, operating between Winnipeg and Transcona, but now at the Niagara, St. Catharines & Toronto shops at St. Catharines, Ont., for conversion into a storage battery car; 15,801, storage battery car now operating between Toronto and Beaverton; 15,802, the larger of the two battery cars bought from Cambria & Indiana Rd., now being overhauled at St. Catharines, preparatory to being run between Bathurst and Campbellton, N.B.; 15,803, the other battery car bought from Cambria & Indiana Rd., now operating between Brockville and Westport, Ont.; 15,805, steam car which was operating between Trenton, Picton and Napanee, Ont., but not operating at the time of writing; 15,810, a small gasoline car, with Winton chassis and 6-cylinder engine, which was operating between Souris and Elmira, Prince Edward Island Ry., but which has been replaced by steam train service during the winter; 15,811, a small Ledoux, Jennings gasoline car, operating on the Stanley Branch, Maritime District; 15,812, Ledoux, Jennings gasoline car, operating between Victoria and Sooke, Vancouver Island; 15,813, Ledoux, Jennings gasoline car, also operating between Victoria and Sooke; 15,814, Service gasoline car operating between Trenton, Napanee and Picton, Ont., and 15,815, a Ledoux, Jennings gasoline car, similar to 15,814, acquired recently, and also operating between Trenton, Napanee and Picton.

In addition to the above, construction will soon be started at the Niagara, St. Catharines & Toronto shops of storage battery car 15,804, which will be very similar to car 15,801, which was described and illustrated in preceding numbers of Canadian Railway and Marine World. This car will be of all steel construction, about 60 ft. long, and with seating accommodation for about 60 passengers. It will be equipped with 260 A-12-H Edison batteries, and 4 General Electric 261-A motors. The trucks, to be supplied by Canadian Car & Foundry Co., will be of the ball bearing type. S.K.F. ball bearings will be used.

Car 15,800, which was heretofore of the gas electric type, is undergoing radical change in being converted into a storage battery car. Its dimensions were as follows:—

Length over couplers	58 ft. 11 in.
Length over end sills	53 ft. 5⅝ in.
Truck centers	40 ft. 7 in.
Width over all at eaves	10 ft. 3½ in.
Height, rail to top of roof	12 ft. 6 in.
Truck wheel base	6 ft.

As a gasoline electric car, it was equipped with a power plant, consisting of a G.E. gasoline engine, coupled with generator, the engine having 8 cylinders, and developing up to 175 h.p., and the dynamo being rated at 80 k.w. It had only 2 motors, the drive being to the leading truck axles. The motors were G.E. type 205B. The gasoline engine, generator and motors, are being taken out, and will be replaced by 250 Edison A-12-H storage batteries and four G.E. type G-261A ball bearing motors of 25 h.p. each. The car will be arranged for double end operation, with standard series parallel controller at each end, and the ends will be altered to form standard vestibules, with a compartment for the motorman, at each end. To provide for [illegible] the sills [illegible] tion, two new members in the form of sill extensions will be put in to secure added strength. The car is of all steel construction, with 4 sills of channel section; to secure additional strength and rigidity 5 transverse members of truss construction will be put in between the bolsters.

As a gas-electric car, the weight was about 44 tons, but it is anticipated that when the conversion into a storage battery car is completed, it will be only 35 tons. A large saving in weight will be introduced by replacing the old engine and generator set with batteries, while the 4 new motors will have an aggregate weight much less than the 2 old style motors. The new ball bearing trucks will be lighter than the trucks heretofore under the car. The car body will be arranged to have a seating capacity of nearly 100, and the interior will be in one compartment only. When the conversion is completed, the car will be returned to Winnipeg, to its run between Winnipeg and Transcona, 7.1 miles, on which it had been making 7 round trips daily. It is felt that the conversion into a storage battery car will introduce a large saving, as maintenance expenses were very heavy with the old equipment, and also because there is an abundance of cheap electrical power available.

Battery car 15,802, the overhaul of which at St. Catharines, preparatory to it being placed on the Bathurst-Campbellton run, is about completed, will be equipped with 277 Edison A-12-H batteries, 4 Westinghouse V65-A3 ball bearing motors of 25 h.p. each, and Brill 69E ball bearing trucks. The seating in this car, which was described in a preceding issue of Canadian Railway and Marine World, will be rearranged somewhat, and a smoking compartment and lavatory will be installed.

Battery car 15,803, now operating between Brockville and Westport, Ont., was overhauled at St. Catharines and turned out with 110 MVX Ironclad Exide batteries, 4 Westinghouse V65-A3 motors and Brill type 69E ball bearing trucks. The car is making 107 miles daily, the current being obtained from the hydro system at Brockville, and the batteries being charged during the night.

The gasoline car ordered by the G.T.R. from the National Steel Car Corporation will be numbered 15,816. It was described and illustrated in Canadian Railway and Marine World for February, pg. 49.

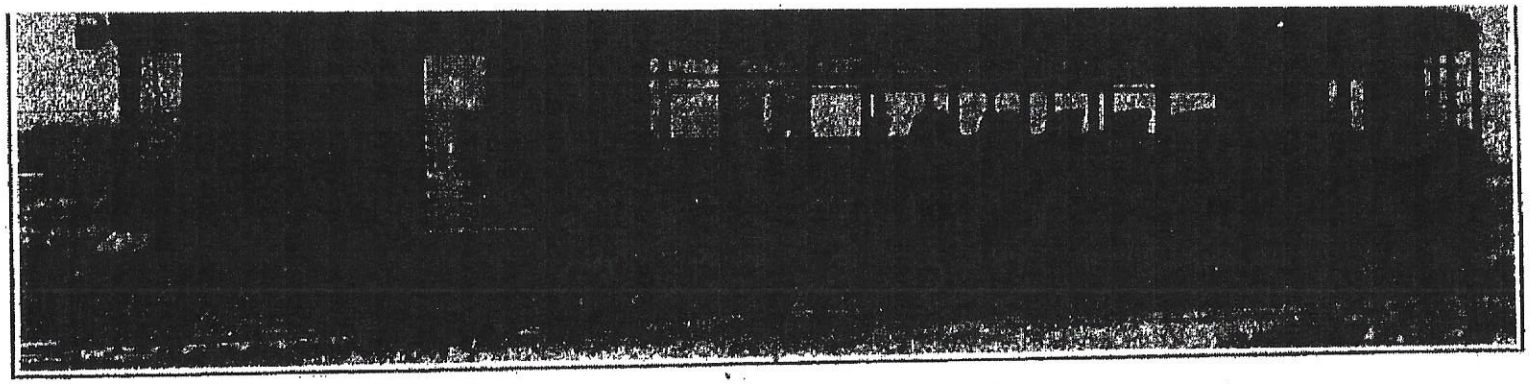
Hearing re Air Brakes for Self Propelled Cars.

Canadian Railway and Marine World for March contained a brief account of a hearing by the Board of Railway Commissioners on Feb. 7, at which railways were required to show cause why self-propelled cars should not be equipped with air brakes. At the hearing, C. E. Brooks, Chief of Motive Power, Canadian National Rys., in his evidence to show that hand brakes are safe and satisfactory on the smaller cars, said: "We know that, travelling at 30 m.p.h. under normal track conditions, we can stop, and have stopped, these cars in anywhere from 325 to 600 ft. We know there are cases where these cars have been tested on a descent of 1¼%, the car weighing 20,000 lb. and with approximately 8,000 to 10,000 lb. weight of passengers, and the car has been stopped in between 600 and 700 ft., when the initial [illegible] We feel that under ordinary maximum speed conditions, we can expect, even under unusual rail conditions, to stop within 600 ft., or in approximately 25 seconds."

A. L. Currie, Superintendent, Quebec, Montreal & Southern Ry., which has been operating a Ledoux, Jennings gasoline car, said: "The Q. M. & S. objects to an order requiring air brakes, especially for cars weighing less than 35,000 lbs., and less than 37 ft. long, for the following reasons: 1. Cost of car would be increased by approximately $1,100. 2. Weight would be increased by 1,000 to 1,200 lb., or over 5%, and thus increase gasoline consumption and cost of operation. 3. It would require drivers with knowledge of air brakes and appurtenances, who would have to be paid higher. 4. Additional car failures would be caused by additional strain put on drive shaft and electric starter. 5. While automobile engine has been developed until it is now reasonably free from failure, introduction of air compressing apparatus would complicate it and introduce causes of failure. 6. The great need of these small cars is to furnish service on branch lines, where experts cannot be provided, except at needless expense, to look after air equipment. 7. Cars being terminused away from repair shops, any air brake defect would cause great expense and delay. 8. Power of car would be detracted from and repairs to driving gear would be difficult. 9. It would be difficult to maintain adjustment of air brakes so as to maintain proper braking power. 10. Maintenance costs would be greatly increased. 11. In general, the use of air brakes would inject into the operation an appliance difficult to maintain in proper shape, and expensive as to operation and maintenance. 12. Even if air brakes were installed, hand brakes would still be necessary. 13. The driver of the present Q. M. & S. car, not equipped with air brakes, states he would just as soon have hand brakes. 14. The hand brakes will stop the car more effectively than air brakes. The power from the hand brakes goes on gradually and is not so apt as the air brakes to skid the wheels and so lessen the braking power. 15. The hand brake is positive in action, whereas something might occur to the mechanism of an air brake which would render it inoperative when required. 16. From tests made, it is felt that with hand brakes, the car may be stopped more quickly than with air brakes.

W. A. Newman, Mechanical Engineer, C.P.R., in speaking of the Ledoux, Jennings gasoline car the C.P.R. is operating on its Lasalle Loop Subdivision, said: "We have made a number of tests with the hand brake . . . . it was snowing on both days and the weather was cold. Sand was used at all stops. The tests on the level were taken at a maximum speed, 36 m.p.h. We stopped in 397 ft., or 13 sec. from the time the signal was given. At 7 m.p.h. we had two tests; in one we stopped in 23 ft. and in the other 19 ft., the time being 2½ and 3 sec. I have one test classified as an ordinary stop running at 35 m.p.h.; we stopped in 13 sec. in 468 ft. We had an emergency stop going at 36 m.p.h. and stopped in 9 sec. in 359 ft. We demonstrated to our own satisfaction that with our hand brakes we are accomplishing everything that can be accomplished with an air brake."

From the evidence quoted above it appears that the hand brake is a satis-



Self-propelled Steam Passenger Car, Canadian National Railways.

in order to travel short distances.

In order to enter into a discussion of present day developments, it will be necessary to briefly outline the service requirements, and in doing so the writer must be pardoned if he presents the motor coach as a "unit car," and not a train of cars, or a driving car hauling a trailer. The latter conditions may be possible on small interurban, or suburban, lines, but as a practical railway condition it is not being considered by many large railways. The reason for this is that up to the present time it has not generally been found to be economical to replace a necessary train service with a motor coach hauling one or more trailers, on account of motor capacity limitations.

On the other hand, high train mile costs for small returns have forced railway officers to turn to the motor coach for relief in the following classes of service: (1) To give a frequent passenger service on sparsely settled branch lines, or parts of main line adjacent to market towns or junction points. (2) To connect junction points, on important main lines, with the town or small city situated within a few miles of the main line. (3) To give a group of towns, situated on a main line or important branch lines, a frequent connecting service over and above through much the same reasons as the gas-electric car. Present day developments are generally to provide for traffic requirements, which, for the purpose of discussion, are sub-divided as follows:

Class A—A seating capacity of from 24 to 40 persons, and provision for approximately 100 sq. ft. of baggage space. (Note: In some classes of service the baggage space is given up and seating accommodation substituted.) The light weight of such a car to be from 18,000 to 30,000 maximum, or in other words, not to exceed 750 lb. per single seat (with baggage space) or 500 lb. per seat if no baggage space is allowed. Smaller cars have been made, and are in daily use, but the rapid development of traffic, after cars are put into service, indicates that the above mentioned sizes are reasonable limits.

Class B—Units seating from 40 to 60 passengers, and providing for baggage space, minimum 100 sq. ft., maximum 200. While the trend of construction has resulted in this class of car weighing from 800 to 1,200 lb. per single seat, it is thought that the weight must be kept down to the same limits as prescribed in class A above, in order to get any fuel economy and keep maintenance costs at a reasonable figure.

Speed Requirements.—Schedule speeds senger traffic develop to a marked extent after a service has been instituted. The failures have been rather heavy, due to conditions described later in this paper, to the over-exacting requirements of timetables, and to non-realization of the limitations of the gasoline motor. For the purpose of description class B units may generally be sub-divided as follows: (1) Storage battery; (2) H.p. steam, oil fired boiler; (3) Heavy duty gas engines; (4) Gas-electric.

Class A Cars—The Gasoline Engine Driven Motor Coach.—For cars described as class A, weighing approximately 30,000 lb. light weight, the general practice has been the use of the high grade truck engine—4 cylinder—and running at a maximum speed of approximately 1,600 r.p.m., developing a maximum of 70 h.p. Wherever this type of engine has been used, it has transmitted its power through clutches, transmissions and universals, to gears, most of which are of standard truck or even heavier design.

A general description of a typical power plant, such as mentioned above, is as follows: Engine, 4-cylinder 4¾ x 6 in.; pressure oiling system; pump water cooling system; primary and secondary transmission; primary ratio first speed, 4 to 1, third speed, 1 to 1. Secondary increases the ratio from 26 m.p.h. for

normal engine speed, to 35 m.p.h. The first provides for ruling grade, and the second for level track conditions.

To a much less extent, the automobile type six-cylinder engine of the following general description has been experimented with: Engine, 6-cylinder 3⅞ x 5 in., pressure oiling system; gear ratio 4.7 to 1 between engine and wheel; nominal engine speed at 30 m.p.h., 1,450 r.p.m.; horse power developed, 50 at 2,200 r.p.m.; maximum speed, 2,200; pump, water cooling system. In general its power has been transferred through standard automobile clutches, transmissions, etc., which are used with the same type of engine in automobile service.

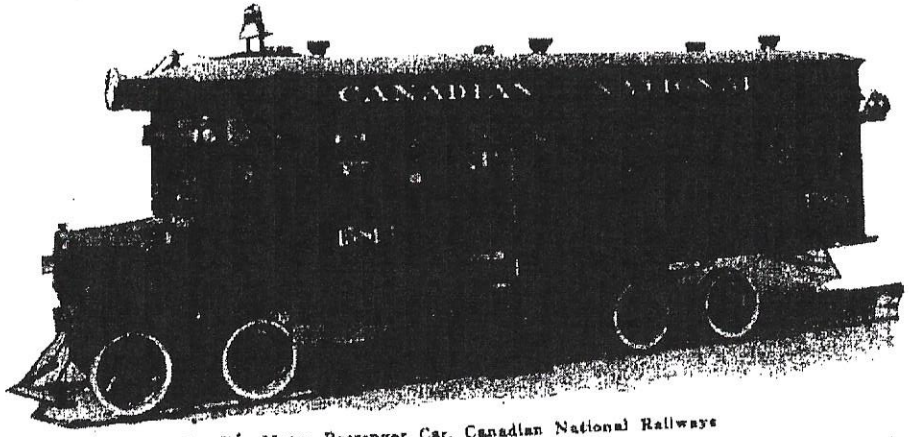
In so far as the actual power plant is concerned, it is the opinion of many that the automobile engine has, in almost every way, demonstrated its superiority over the truck engine for class A cars, and for general service, as described in the first part of this paper, due to the following main reasons: (1) Ability to run over rated speed without serious loss of balance and consequent excessive vibration, (2) Economy under light load conditions. Number 1 undoubtedly embraces conditions which are vital to the successful maintenance of any machine or engine, and it is the writer's intention to attempt to explain this from the everyday point of view, derived from experience rather than from the dynamics of the problem.

Practically any high grade automobile engine designed for a rated engine speed of approximately 1,450 at 30 m.p.h. with a gear ratio between 4 to 1, and 5 to 1, may be driven at engine speeds of 2,200 and car speeds from 50 to 60 m.p.h., without any noticeable serious vibration. Experience indicates that a relative flexibility cannot be expected from the truck engines, for any length of time, without serious engine trouble, possibly resulting in a complete break down of the service. When a motor coach is being operated on a railway where there are schedule connections to make, and where there are meeting points, designated by train orders, and by the time card, it is certain that, regardless of the framing of a schedule, which should not develop an engine speed over that coinciding with the rated speed of 35 m.p.h., the operator [illegible] by 15 or 20

lows: Car: Interior arrangement, to suit purchaser; weight, 60,000 lb.; length, 53 ft.; trucks, 2-4 wheel standard M.C.B. axles, except that journals are fitted with roller or ball bearings; electric motors, etc., 4-25 h.p. 250-300 volt, mounted with a gear ratio of 16 to 91, Standard series, and parallel controller and circuit breaker, installed at each end, and in baggage compartment; there are voltmeter, amp. hr. meter, underload circuit breaker and switches for control of air compressor and lighting. Storage batteries, 250 cell, capacity 450 a.h. amp hrs at 300 v or 135 k.w.h.; (Note 580 a.h. have been obtained with a minimum of 150 volts). Charging, d.c. 250 or 500 volts may be used for charging and the car is equipped with switches for arranging the battery cells in either series or parallel. Normal rate of charge 90 amps. Time required for a normal full charge 5 to 7 hours. Higher rate of charging may be followed provided temperature of battery does not exceed 115° F. Radius of operation, maximum of 140 miles on a full charge, figuring on level or rolling grade. Recommended not to exceed 100 miles or to get a boosting charge. Consumption of power 35 watt hrs per ton mile. Acceleration ½ m.p.h. per second. Maximum speed 45 m.p.h. on level track. As the car weighs approximately 60,000 lb. the figure [illegible] watt hours per ton

point which may make steam power the most satisfactory unit car power, and it may be well to consider these defects more in detail, as they appear to exist in modern equipment.

(1) Insufficient boiler capacity is a defect directly coupled with excessive weight of equipment. Boiler plants of approximately 70 boiler h.p. nominal rating have been applied to cars with a total net weight in running order of from 50,000 lb. to 60,000 lb., providing for 100 sq. ft. of baggage space. The total live load will bring this equipment up to a gross weight of approximately 65,000 lb. or a load of 650 lb. per boiler h.p. Experience indicates that for a boiler of this capacity the weight should be reduced by approximately 15,000 lb. and the writer has no hesitation in saying that this should be possible, as the entire power plant may be carried on the leading (driving) truck and the rest of the body lightened proportionately. Total absence of vibration should be a very great advantage in lightening the car equipment. Practically all the first cars of continental make indicated that high pressure and high superheat were necessary, in order to provide for a gear ratio sufficient for starting, and at the same time for a piston speed of 800 ft. per minute at 40 m.p.h. The engine developed to meet these conditions has no doubt



Gasoline Motor Passenger Car, Canadian National Railways

mile gives a consumption of 1.05 k.w.h. per car mile—level track and normal conditions.

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Class B Cars—(1) The Storage Battery Car.—The general dimensions and description of a typical unit are as fol-

Gasoline Motor Passenger Car. Canadian National Railways.

mile gives a consumption of 1.05 k.w.h. per car mile—level track and normal conditions.

General—Within the before mentioned radius of operation this car has been extremely satisfactory, and is being operated successfully, under low temperature conditions, with no appreciable trouble. The tractive effort of 2,400 lb. makes it possible to use a trailer, if necessary. Cost per car mile, including all maintenance and transportation charges, power, etc., 17c. The maintenance has been extremely light, and all indications are that the life of the batteries will be 8 to 10 years at least.

(2) **Steam Cars.**—The steam power plant was probably one of the first tried, of any kind of power, for self-propelled cars, but unfortunately its development has not kept pace with requirements. Medium pressure boiler plants of 300-400 boiler pressure, with comparatively low superheat (100° F.) were introduced to a considerable extent in continental practice several years ago, but the use of this type of car has not developed, due principally to excessive weight of the equipment, the inefficiency of the boiler plant, and the general complications of the equipment. Recent developments indicate that while the seriousness of these defects has been noted, and improved, they have not yet been overcome to the been a great mechanical success, but the boiler plant supplying it has not yet been developed to the point where it can exceed the schedule previously outlined, even under the most favorable conditions. The causes of this deficiency appear to be due to: (1) Insufficient header volume, resulting in carrying over an emulsion into the superheater units, with a consequent total loss of superheat and excessive water consumption, and (2) Unequal distribution of heat to all generating units, resulting in steam pockets, thereby destroying both circulation and evaporative qualities.

The problem of providing sufficient surface condenser for hot weather conditions, coupled with protective appliances which will be operated by thermostat in cold weather, has not been solved, with the result that under maximum conditions the water loss is as high as 45 lb. per car mile, necessitating replenishing at frequent intervals, with subsequent loss of time.

The automatic control of the oil flame has been highly developed, but is not yet perfected. Generally speaking, this automatic feature must have two distinct functions: (1) To cut off or reduce fuel supply when maximum h.p. is reached, and (2) To cut off fuel under low water conditions. The first named is undoubtedly perfectly developed, but the second