



FIG. 49.-THE WATER POWER OF THE PORTRUSH RAILROAD.



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FRONT COVER: On August 6, 1950 the late Allen Toohey photographed Winnipeg Electric Railway Car 416 on Portage Ave. in Winnipeg. Photo from the CRHA Archives, E. A. Toohey Collection No. 50-253.

#### **OPPOSITE:**

This was the original hydroelectric power generating station used to power the pioneer electric railway at Portrush, Northern Ireland in 1883. This pen and ink drawing is from an 1889 book entitled The Electric Motor and its Applications, from the collection of Fred Angus.

# The Centennial of



## **Electric Traction**



## **The Centennial** of **Electric Traction** By Fred Angus

One hundred years ago the industrial world was in the age of steam. Since the late eighteenth century the steam engine had been developed and improved, and by 1879 it had been brought to a high degree of perfection. Stationary engines provided the motive power for machines in factories, steam-powered ships were rapidly replacing sailing vessels, while countless numbers of locomotives were in operation on the swiftly-expanding railway networks of the world. This age of steam was to continue until almost the middle of the twentieth century, but competition with other means of motive power has now greatly lessened the importance of steam, especially on the railways where steam locomotives are now rare. Most of the locomotives now in use in the world depend, directly or indirectly, on electric power, and it was in 1879 that the first practical application of this power to railways was made, this being the first real challenge to the supremacy of steam.

It was at the Industrial Exhibition at Berlin Germany in 1879 that the famous experiment was made. The firm of Siemens & Halske constructed a small narrow-gauge electric locomotive drawing power from a third rail and pulling a train of cars on a 500 metre line which carried passengers about the exhibition grounds. This original locomotive has been preserved and was exhibited at the West German pavillion at Expo-67 in Montreal.



FIG. 48.—SIEMENS' DYNAMO WITH DOLGOROUKI ENGINE.

Diagram of the Siemens dynamo powered by a Dolgorouki engine as used in 1879 to power the first successful electric locomotive. (The Electric Motor and Its Application)



The first electric railway in Canada running at the Toronto exhibition. This line started in 1884, but the photo dates from the period 1885 to 1890, since power is here supplied by overhead wire. (Public Archives of Canada C3206)



#### Western Office: • • • PHENIX BUILDING, CHICAGO, ILL.

An 1893 advertisement depicting two early electric cars supplied to Canadian Companies by the J.G. Brill Company. The cars of the Westminster and Vancouver company (a forerunner of the B.C. Electric) were about the first double-truck street cars in Canada. The detail in these hand-drawn illustrations is very impressive. CANADIAN 201 RAIL

The idea of electricity as motive power was, of course, not new in 1879. Ever since the experiments of such pioneers as Farady in the early 1830's it had been known that electricity and magnetism were mutually interconvertable, and that such magnetic force could be made to do useful work. Numerous crude electric motors were made starting as early as 1832, and even a rudimentary electric locomotive had been demonstrated near Washington, D.C. in 1851. Many of these early motors resembled contemporary steam engines in which solenoids replaced the cylinders, the reciprocating motion and linkages being retained, all depended on expensive batteries for their electric energy, and so were inefficient, uneconomical, and unreliable. It is no wonder that all these early experiments were unsuccessful, but the researchers of that time were true pioneers and paved the way for later successes. During the third quarter of the nineteenth century electrical technology made great progress, and the first practical uses of electric power were Of course electricity had been used for telegraph as far back made. as 1844, but applications using any appreciable power had to wait until the invention of a suitable generator or dynamo. Such a machine had been invented by 1870, and in limited use for such purposes as



The St. Catherines Merritton and Thorold was one of the first electric railways in permanent operation in Canada. Here is one of their first electric cars, obviously a converted horse car, photographed in 1887. (Trolley Car Treasury)

CANADIAN 202 RAIL

arc lights and electroplating. The next step was an historic one. In 1873 it was discovered that a generator could be reversed to become a motor, so dispensing with the cumbersome reciprocation motion, and using instead smooth rotary operation. The story is that a generator was connected in parallel to an operating unit, and was discovered to be spinning by itself before it was even belted to its steam engine: Whether this story is true or not, a practical motor had now been found, and the stage was set for the rapid growth of the electric power industry.

The firm of Siemens & Halske had been established in Germany as far back as 1847, and had long been a leader in electrical development. Its major activity had been in the field of telegraphy includment. Its major activity had been in the field of telegraphy includ-ing undersea cables, but the firm was in the forefront of electrical applications of all kinds. It is no wonder that the idea of electric power applied to railways should be considered by this firm. Some experiments along this line had been tried as far back as 1867, but were abandoned due to the severe overheating of the generators then unside the severe overheating of the generators then available. By 1879, however, a more practical motor and generator was available, and the time was ripe to attempt to build an operating electric locomotive. A standard Siemens generator acting as a motor, was mounted sideways on the frame of the small locomotive, and was connected to the wheels. Power, at a potential of 150 volts was supplied by another generator which was coupled to a Dolgorouki steam engine. This power was carried to the locomotive by means of a light third rail, the running rails acting as the return circuit. Total power of the locomotive was about two horsepower, and it could reach a speed of eight miles an hour. The unit was a success from the start, and during the run of the exhibition its train carried about 100,000 persons.

Following the success of the exhibition locomotive of 1879, work went ahead on commercial applications. Another electric line was set up at an exhibition in Paris in 1881, and on May 12, 1881 the first permanent electric railway in the world went into service at Lichterfelde near Berlin. Both these lines were equipped by Siemens & Halske, and both employed electric cars rather than a locomotive hauling motorless trailers. It is said that cars on the Lichterfelde line could reach a speed of 24 miles an hour if no one Other small lines were set up at exhibitions official was looking! around this time, and in 1883, Siemens & Halske provided the equipment for the Volks Railway along the waterfront at Brighton, England. This line is still running after almost a century, and is the oldest operating electric railway in the world. The most ambitious of these early projects was the eight mile tram line from Portrush to the Giant's Causway in Northern Ireland. This Siemens-equipped line was notable in that it was by far the longest electric railway constructed up to that time, and it was the first to use hydroelectric power. The opening of the Giant's Causway line on October 12, 1883 was reported around the world; the Montreal Star published a detailed account of the event on its front page'. By 1883, therefore, the practicability of the electric railway had been established beyond a doubt and within a decade electric lines would be commonplace.

Until 1883, most of the operating electric railways used Siemens equipment, but ohter experimenters were also at work and made great developments in the 1880's. Such pioneers as Van Depole, Bently, and Knight, Daft, Edison, and, above all, Sprague gradually ironed out the multitude of difficulties and made electric operation more and



By the 1890's electric transportation was convenient and reliable. This two-car train of the Toronto Railway was photographed in 1893. (Public Archives of Canada PA 54556)



In the early 1900's large double-truck wooden street cars were placed in service to operate the rapidly growing electric lines. An important inovation was the Pay-As-You-Enter system first used in Montreal. No. 890 was the world's first P.A.Y.E. car, and went into service in May 1905. Notice the large rear platform which allowed passengers to board with a minimum delay. (C.R.H.A. Archives, M.U.C.T.C. Collection) CANADIAN 205 RAIL

more reliable. New motors were designed as motors rather than generators reversed, improved motor suspension and gearing, and more practical means of current collection were all designed and improved in this decade, paving the way for the great spread of electrification in the 1890's. Canada had some of the earliest electric lines in North America, the first being a third-rail line at the Toronto Exhibition in 1884. This line was equipped with overhead wire in 1885 and survived until 1892 when it was replaced by a regular street car service. 1886 saw Canada's first electric street car line; this was at Walkerville near Windsor, Ontario, and in 1887 the St. Catherine Merritton and Thorold Railway electrified its horse car line. Followir the successful Sprague electric. In Canada, the era of the electric railway may be said to have arrived beyond a doubt when the systems at Victoria, B.C. (opened February 22, 1890) and Vancouver, B.C. (opened June 26, 1890) were inaugurated as electric lines, never having had horse cars at all. By 1895, most Canadian cities had electrified, and by the turn of the century horse cars in Canada were a thing of the past.

In the 1890's, electricification of main line railways was begun, and such improvements as mutiple-unit control allowed the operation of trains of electric cars on rapid-transit lines. In both these new developments electric power began to challange steam, unlike the pre-1895 installations which mostly replaced horse cand, to a certain extent, cable power. By 1900 the possibility of large scale replacement of steam by electricity was considered to be very likely, but such development was slower than anticipated due to such causes as two world wars, a major depression, and, on the positive side, further great advances in steam locomotive technology.



In the 'teens of this centry, steel cars began to replace wooden cars. This impressive looking two-car train was built by J.G. Brill for the Montreal Tramways Co. and began service in 1914. Boththese cars continued to operate until 1958. (C.R.H.A. Archives, M.U.C.T.C. Collection)



The greatest development in the street cars of the 1920's was the use of light-weight steel cars, much lighter than the trams of the 'teens, but almost as strong. Smaller motors and wheels allowed lower floors and fewer steps to climb, while lighter weight meant less power consumed and less wear on the track. Car No. 1985 was built for the Montreal Tramways Co. in 1929, and was actually the very last street car to run in regular service in Montreal on August 30, 1959. (C.R.H.A. Archives, M.U.C.T.C. Collection)

![](_page_14_Picture_0.jpeg)

In the 1930's the P.C.C. car changed the face of street car systems across the continent, and helped to delay abandonment in many cases. Such cars were built from 1936 to 1951 and used in large numbers. Canada's first P.C.C.s were built for Toronto in 1938. No. 4034 shown here at the Canadian Car & Foundry Co. in Montreal was one of this first lot and was photographed new in November 1938. C.R.H.A. Archives, Can-Car Collection C 5914)

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CANADIAN	208	 RA	

Over the years many major railways have electrified, especiall in Europe, but in North America the long distances and relatively infrequent service make the capital cost of the installation prohibitive in many cases. The answer was to employ electric locomotives which carry their own generating equipment, and the result was, of course, the ubiquitous diesel-electric locomotive which had now ousted steam from most of the rails of the world. While it is not unusual to consider a diesel as an electric locomotive, it is exactly that, the only difference being that the current is generated in the same unit where it is used instead of being transmitted to the locomotive by overhead wire or third rail.

In the field of the first application of electric traction, the street railway, the mid-years of the twentieth century were disasterous as city after city converted to the all-conquering bus. Recently it appears that the street car may be commencing a renaissance as new designs are developed for North America after more than thirty years of dormancy. While Canada has only one street car system left, that one, the Toronto Transit Commission, it is presently taking delivery of new trams of an advanced design, and are planning for street car operation for the twenty-first century. One may hope that, as oil sources become more and more scarce, other cities may adopt the pollution-free electric car either in the form of the traditional tram, or under such modern-sounding names as electric light-rail rapid transit.

In the history of the world a single century is not really a very long time, yet it is in that time that the electric railway has developed. As we consider the vast extent of the electric railway in its various forms, it is difficult to realize that there are still people living today who were alive on that day when the world's first practical electric locomotive made its first run. It is even more difficult to imagine what the next hundred years will bring.

![](_page_15_Picture_4.jpeg)

![](_page_16_Picture_0.jpeg)

The final development of the P.C.C. in the post-war years of the 1940's is shown by Toronto car No. 4399 photographed on a flat car in June 1949. The provision of standee windows is the only outward change from cars built a decade earlier! After this design, street car development in North America was nonexistant until the new "L.R.V." design of the 1970's (C.R.H.A. Archives, Can-Car Collection C7051

![](_page_17_Picture_0.jpeg)

This is the ultimate in recent street-car technology, Toronto Transportation Commission's new "L.R.V." shown here undergoing road tests on August 1, 1978. Photo Courtesy Ted Wickson.

### ACROSS CANADA TRACTION CHECKUP

We are pleased to present a nostalgic look at Electric Traction in Canada thirty years ago as photographed through the lens of the Late Allen Toohey. All photographs courtesy CRHA Archives, from the E.A.Toohey Collection.

![](_page_18_Picture_2.jpeg)

Halifax Birney Car 118 standing in the yard outside the car barn on May 30, 1949. Soon after street car service ended. (49-321)

![](_page_19_Picture_0.jpeg)

Quebec Railway Light and Power City Car 813 on St. Paul street on the Champlain Route on February 28, 1948. (48-57)

![](_page_20_Picture_0.jpeg)

Montreal Tramways Co. 869 in the yard at Hochelaga car barn on April 22, 1950. This car built in 1907, was one of the first all-steel street cars in the world. (50-84)

![](_page_21_Picture_0.jpeg)

An impressive five-car train on the Montreal and Southern Counties Railway, at Edison Avenue, St. Lambert on June 5, 1950. The front cars are 504 and 514 followed by three cars of the 600 series. (50-138)

![](_page_21_Picture_2.jpeg)

Canadian National Railways Nultiple-unit train headed by Car M-l posed at Val Royal on May 24, 1952, these cars then new, are still in service. (52-087)

![](_page_22_Picture_0.jpeg)

Ottawa Street Car 654 at Preston and Albert Streets on June 6,1948.  $\left(48{-}241\right)$ 

![](_page_23_Picture_0.jpeg)

Toronto car 2144, a former Toronto Civic Railway Car, on Weston Road July 17, 1948. Just before that line was abandoned. (48-322)

![](_page_24_Picture_0.jpeg)

Centre-entrance Car 202 of the Saskatoon Municipal Railway as seen on August 7, 1950. (50-265)

![](_page_24_Picture_2.jpeg)

Edmonton No. 81 Approaching the High-Level Bridge on August 8, 1950. (50-281)

![](_page_25_Picture_0.jpeg)

B.C. Electric Interurban Car 1211 heads a two-car train on Vancouver's Main Street on August 10, 1950. The B.C. Electric operated the longest Interurban Line in Canada. (50-328)

# The business car

DONALD R.McuUEEN OF LONDON ,ONTARIO WAS CONSIDERATE TO SUBMIT THE following up-dated list of orders presently on hand at the Diesel Division of General Motors in London, Ontario.

C-396 C-397 C-398 C-399 C-400	35 20 10 2	GP40-2L(W) SD40-2 GP40-2L(W) SW1001 G26CW	A3428-A3462 A3463-A3482 A3483-A3492 to EMD	CN CP RAIL CN NHB EGYPT	9633-9667 5758-5777 9668-9677 7601-7602	del del cano del bid	77 76 celled 76 lost
C-401 C-402	2	GP38-2 MP15DC	A3493-A3494 to EMD	TEXAS GLF. QI&T	054-055	del del	76 77
C-403 C-404 C-405	6 24 16	F 40PH SD 40 – 2 SD 40 – 2	A3495-A3500 A3501-A3524 A3525-A3540	TATOA(GO) CP RAIL Ont. Hvdro	510-515 5837-5859 5860-5864	del del del	78 78 78
C-406	5	GP7L-M	A3541-A3545	6P RAIL ACR	5779-5789 100-104	del del	78 78
C-407 C-408 C-409	20 19 20	SD40-2 HBU-4 slugs GL22MC	A3566-A3584 A3585-A3604	CN NZGR	260-278 1601-1620	del del in	78 78 79
C-410 C-411	3 19 20	G22CU GT22LC	A3605-A3607 A3608-A3626 A3627 A3656	CdF TOGO IVORY COAST	CC1651-53 CC2201-19	in in	79 79 70
C-412 C-413	25	SD40-2	A3657-A3681	CP RAIL	5790-5799 5900-5914	in	79
C-414 C-415 C-416 C-417	2 4 65 30	SW1001 GP38-2 G22W-AC G22CU	to EMD A3684-A3687	Sask. Pwr. DEVCO EGYPT PAKTSTAN	1001-1002 216-219	del in in	78 79 79 80
C-418 C-419 C-420	35 12 2	SD40-2 G26CU-AC GT22LC		CP RAIL BANGLADESH SENEGAL		in in in	79 80 79

May we also take this opportunity to thank our member and friend Mr. Ian Webb of London, Ontario who also submitted similar information.

![](_page_27_Picture_0.jpeg)

SUNDAY APRIL 22, 1979 DID NOT PASS UN-NOTICED IN EDMONTON ALBERTA as that city celebrated the first anniversary of its highly successful light rail transit (LRT) system. Anniversary posters and ceremonies marked the event. While Toronto maintains Canada's most extensive streetcar system and has been instrumental in the development of their moderm UTDC streetcars, Edmonton is the model of a totally new 20th. century LRT line. Photo courtesy D.Wayne Brow. CANADIAN 221 RAIL

FOR SOME MONTHS CONRAIL HAS BEEN CLAIMING THAT IT NEEDS FREEDOM from I.C.C. economic regulation if it is to achieve

its congressionally-mandated goal of financial selfsufficiency. The Federal Railroad Administration and the U.S. Railway Assn. are working together on a study that will propose alternatives to Conrail, these could include chopping major chunks off Conrail's route map, or subsidizing those portions of its system that seem to be perpetual losers.

Conrail is to submit to the USRA a five-year business plan based on the lowest traffic forecasts Conrail has ever made. Thoughts of a new Conrail come at a time when it is almost certain that the existing railroad has no chance of improving its desperate financial condition without either a structural or regulatory change. Despite pouring \$1.7 billion into its rail plant, Conrail has not improved its service as much as federal planners had hoped, and costs have not dropped, as also hoped. (Business Week)

ALAN S. BOYD, PRESIDENT OF AMTRAK, TOOK ISSUE RECENTLY WITH THE Carter Administration's proposal to limit the passenger rail system's right to offer ticket discounts for its services. Transportation Secretary Brock Adams criticized such fare reductions since the government is paying two-thirds of the cost of carrying the average passenger. (New York Times)

WHEN THE PRESENT VIA TRANSCONTINENTAL SERVICE CAME INTO EFFECT, consists included "cross-over" cars - one on Train 3 Montreal-Winnipeg, thence Train 1 via Calgary to Vancouver; likewise a car on Train 1 Toronto-Winnipeg, and on Train 3 Winnipeg-Vancouver via Edmonton. The assignments were on ex-CP Rail Manor series Montreal-Vancouver, and a Chateau series, Toronto-Vancouver. Many members living along the route have been asking what happened to the Manor car, as it hadn't been seen for a long time. Actually, so many Manor sleepers were bad-order from various causes, including freeze-ups, they had to be replaced with ex-CN "E" series 4-section, 8-roomette, 4-bedroom cars. Until these CN sleepers had their braking systems modified, they could not be run with the ex-CP stainless steel equipment. Accordingly, the CN cars from Montreal stayed on the Super-Continental through to Vancouver, and the CP Chateaux remained on The Canadian, Toronto-Vancouver, and the passengers transferred at Winnipeg. But the Manor cars are now back in their intended service, and the CN cars are being modified so as to be compatible with the CP equipment and its Rolakron braking feature.

And speaking of the transcontinental service, look for new changes in mid-June, when everything is reversed and Trains 3-4 Supercontinental operate via Toronto-Capreol-Winnipeg-Edmonton Vancouver, and Trains 1-2 "The Canadian" use the CP Rail route between Montreal and the west coast (except use CN Stations at Montreal and Winnipeg, of course).

CANADIAN	222	RAIL	

"BURLINGTON PUTS ZIP IN COMMUTING" - SO SAYS THE CHICAGO "TRIBUNE", pointing out that the 5.00 pm commuter train covers the 28 miles between Chicago's Union Station and Naperville,

Ill. in only 32 minutes, for an average speed of 53.25 mph. Four other trains on various lines do better than 36 mph. In the Montreal area, we do have one CP Rail commuter train that covers the 40 miles from Windsor Station to Rigaud at an average of 32 mph, with 11 stops. And that is a slight improvement over the same train's schedule in the summer of 1951, when it averaged 30 mph, with 10 stops. Of course, today we have diesel power and lightweight double-deck cars; then we only had Pacific's and wooden coaches.

There are differences in the fare structure, too. There are no subsidies for commuter traffic in the Montreal area. Tickets for the 31.9 mile ride between Montreal and Hudson are \$4.95 one-way, \$75.70 for a monthly flash card, with three trains each way on week-days. For the 29.6 miles between Chicago and Modena, Rock Island/RTA fares are \$1.60 one way, \$41.40 monthly flash card, and there are 13 trains each way on week-days. Comparing a 15-mile journey, around Montreal you pay \$2.95 one-way, or \$60.00 a month, Chicago commuters pay \$1.60 single or \$29.55 a month. (J.D. Welsh)

AND COMMUTERS IN THE BIG APPLE RATE A MENTION, TOO. THE IRT IS operating a "Diamond Jublee Special" consisting of four subway cars built in 1917 and 1922. The line was opened in 1904. And Long Island R.R. passengers are happy - the line has finally retired its last steam-heated coaches - they were cold in winter and hot in summer. (New York Times)

THE D & H OPERATED "ADIRONDACK" PASSENGER TRAIN WILL NO LONGER BE the same with the loss of its long-time conductor, Charles Brierley. Charlie, aged 76, died January 21st. He joined the D&H in 1920 and had been employed continuously as a trainman and conductor up until the time of his death. In 1976, in honor of his long service, one of the D&H coaches in the "Adirondack" was renamed the C.J. Brierley.

(D&H Newsletter)

MAJOR C. WARREN ANDERSON OF SUSSEX, N.B., AND A LONG-TIME MEMBER of this Association, was recently honored by the American for State and Local History. His Certificate of
Commendation was awarded for "his achievement in preserving and illuminating the history of the steam locomotive in New Brunswick".
Mr. Anderson, 82, has had a life-long interest in railways and has one of the finest collections of railway artifacts and photographs in Canada. He worked for the Canadian National Railways and is a member of local, national and international railway historical societies. He has written many papers and articles on various aspects of railway history.

> (The Saint John Evening Times-Globe, and R.D. Thomas)

THE NORTHERN ALBERTA RAILWAYS CO. HAS A NOBLE HISTORY, AND AFTER 50 years engaged in an industry that once was thought to be stagnant, if not dying, is a remarkably healthy organization. In recognition of the Company's past and to draw attention to its future, plans are being made to mark the Golden Anniversary of the Company in several ways. The golden coach 18001 will be used to display railway historical items and show railway films at fairs and public gatherings throughout the territory served by the railway. In addition, a refurbished section handcar will be mounted on a trailer and made available for parades and exhibits. It is proposed also to name each of the locomotives in theNAR fleet after north country historical figures, towns and rivers. Each unit in each number series will carry a name of significance to northern Alberta and B.C., in the same manner that sleeping cars were designated in years past.

(NAR Headlight, via The Marker)

THE ROYAL HUDSONS ARE STILL GOING STRONG'. FOLLOWING HER TRIP TO Montreal and other eastern cities in 1978, ex-CP 2860 will be visiting Alberta and Washington. The B.C. Government wants to show their neighbours what "Good Times '79" is all about. And further south (or deeper south) The Southern Railway announces that ex-CP 2839 will be hauling excursion trains in Virginia, The Carolinas, Tennessee and Georgia.

(Tourism British Columbia: Southern Ry. News Release)

CN/CP - A NEW UNIT TRAIN OPERATION COMMENCED OPERATION RECENTLY in Northern Ontario for Kimberly-Clark Limited. The train of woodchip cars and bulkhead flats originates at Exton, just west of Nakina on CN's mainline. CN handles the loaded train to Manitouwadge, where it is turned over to CP for movement to Terrace Bay, on the CP mainline just east of Schreiber. The train operates three times a week and consists of two trainsets of 47 cars each. At Manitouwadge, then CN hands over a loaded set, CP delivers the empty set.

(Dave Scott in CRHA T&Y Divn. "Turnout"

Wooden Car No. 16 of the Calgary Municipal system going down into the underpass under the C.P.R. Tracks on August 8, 1950 (50-290)

![](_page_31_Picture_0.jpeg)