

PACIFIC
GREAT
EASTERN
RAILWAY
1940.

Canadian Transportation

Pacific Great Eastern Railway

Analysis shows that this British Columbia property is a very efficiently operated transportation undertaking, and that while traffic density has increased materially over the past decade and a half, the great need for the future, as on North American railways generally, is for greatly increased traffic volume

IN order to have an adequate understanding of the motives and circumstances which brought about the construction of the Pacific Great Eastern Railway it is necessary to study the trend of public opinion in British Columbia during the four years preceding the outbreak of the Great War in 1914.

Briefly, however, it may be stated that the prevailing reasons were:—

First. To provide Vancouver with a terminus of The Grand Trunk Pacific Railway.

Second. To obtain access to that vast interior plateau which offered additional opportunities for the settlement of agricultural and grazing lands, and the development of known mineralized and timbered areas. Furthermore the extension of this railway into the Peace River country would place Vancouver in direct contact with an agricultural area capable of supporting a large population, and the successful colonization of the prior two decades in Western Canada had developed a spirit of optimism and belief in the future.

The Pacific Great Eastern Railway

Province of British Columbia, 35, Statutes of 1912 and amending acts; date of organization, February 27th, 1912. The Railway Company, by its charter, was empowered to build and operate a railway from Vancouver to North Vancouver, thence westerly to Howe Sound, thence along Howe Sound to Squamish, thence northeasterly to Lillooet on the Fraser River, thence northerly to a junction with the Grand Trunk Pacific Railway at Prince George, a total distance of approximately 480 miles, thence an extension of the railway from Prince George to a point on the easterly boundary of the Province, near the Dominion Peace River Block, a further distance of approximately 330 miles.

The Howe Sound and Northern Railway, which was incorporated on April 25th, 1907, under the name of the Howe Sound, Pemberton Valley and Northern Railway Company, and of which seven miles had been constructed north from Squamish, was acquired by purchase,

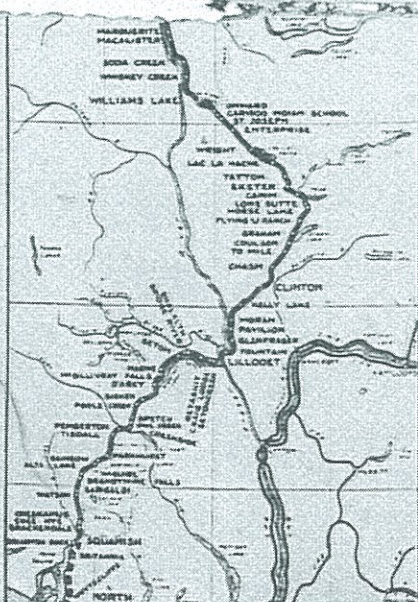
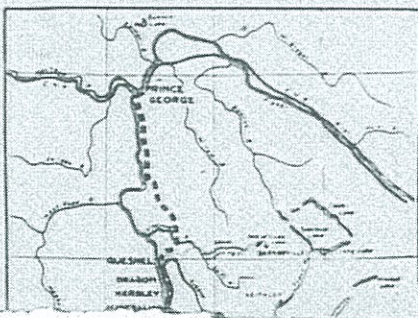
causing conditions which brought about the collapse of the Grand Trunk Pacific, the Grand Trunk, and the Canadian Northern railways. These three railways were taken over by the Dominion Government and merged into one railway system, the Canadian National Railways. The necessity, therefore, of providing a connection with, and terminus for, the Grand Trunk Pacific Railway at Vancouver no longer existed, as the merger, the Canadian National Railways, already possessed a terminal of

the former Canadian Northern Railway at Vancouver.

In 1918 the P.G.E. Ry. Company was unable to proceed further with its undertaking and the B. C. Provincial Government was confronted with the problem, after guaranteeing the expenditure of several millions of dollars, of either completing the construction of, and operating, the railway, or abandoning the whole project.

The abandonment of the railway programme was not an economic possibility, since capital invested in a railway is practically lost, if that enterprise is abandoned, there being no salvage other than that obtainable from the equipment and rails. A railway cannot be converted into a highway without enormous additional expense, and with no hope of future revenue to pay interest on even the additional capital required for the conversion.

In the meantime, too, settlers had moved into the territory served by the P.G.E. Ry., and whole communities and mining industries were dependent upon the railway for their connection with



In these circumstances the Provincial Government, as a matter of public policy, decided to carry on, and, on April 23rd, 1918, took formal possession of the P.G.E. Ry. undertaking. On September 28th, 1918, a contract was let to construct the extension of the railway from the then end of track at Chasm, Mile 178, to the present northern terminus of the railway, and the operating department of the P.G.E. Ry. assumed control over the entire mileage, as at present operated, to Quesnel, Mile 347, on October 22nd, 1921.

When the Provincial Government took possession of the P.G.E. Ry. in 1918, this railway was virtually a colonization road, although built to conform to the standards of the two great railway systems of Canada. As a colonization railway it has suffered more than the usual vicissitudes of railways of that character. The greatest need of this railway is tonnage, which can only be obtained by means of increasing popula-

interior plateau when offered additional opportunities for the settlement of agricultural and grazing lands, and the development of known mineralized and timbered areas. Furthermore the extension of this railway into the Peace River country would place Vancouver in direct contact with an agricultural area capable of supporting a large population, and the successful colonization of the prior two decades in Western Canada had developed a spirit of optimism and belief in the future.

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Unfortunately, war broke out in 1914,



The Route of the Pacific Great Eastern.

practically lost, if that enterprise is abandoned, there being no salvage other than that obtainable from the equipment and rails. A railway cannot be converted into a highway without enormous additional expense, and with no hope of future revenue to pay interest on even the additional capital required for the conversion.

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When the Provincial Government took possession of the P.G.E. Ry. in 1918, this railway was virtually a colonization road, although built to conform to the standards of the two great railway systems of Canada. As a colonization railway it has suffered more than the usual vicissitudes of railways of that character. The greatest need of this railway is tonnage, which can only be obtained by means of increasing population and business along the present line, and by reaching out and exploiting new fields for settlement and the resulting tonnage. Since the construction of the railway there has been no systematic

settlement of the country tributary to this railway on account of the prevailing public prejudice against immigration due to the unemployment problem, and the generally unsettled conditions of the post war period.

What is generally known as the North Shore portion of the P.G.E. Ry., extending from North Vancouver to Whytecliff, a distance of 12.7 miles, was constructed in the years 1913 and 1914, and was opened for traffic on July 2nd, 1914. The service on the North Shore line was discontinued on November 28th, 1928, and the rails and fastenings from Mile 2.5 to 12.7 were subsequently removed. The portion of the line from Lonsdale

incorporates a 600 ft. continuous deck truss (a 300 ft. center span with two flanking spans of 150 ft.) with a 60 ft. deck plate girder on the south approach and two 80 ft. deck plate girders on the north approach, on concrete piers and abutments. The bridge at the Deep Creek crossing is 1,194 ft. long and 286 ft. high, and incorporates one 60 ft., three 70 ft., four 80 ft. and six 100 ft. deck plate girders on steel and concrete.

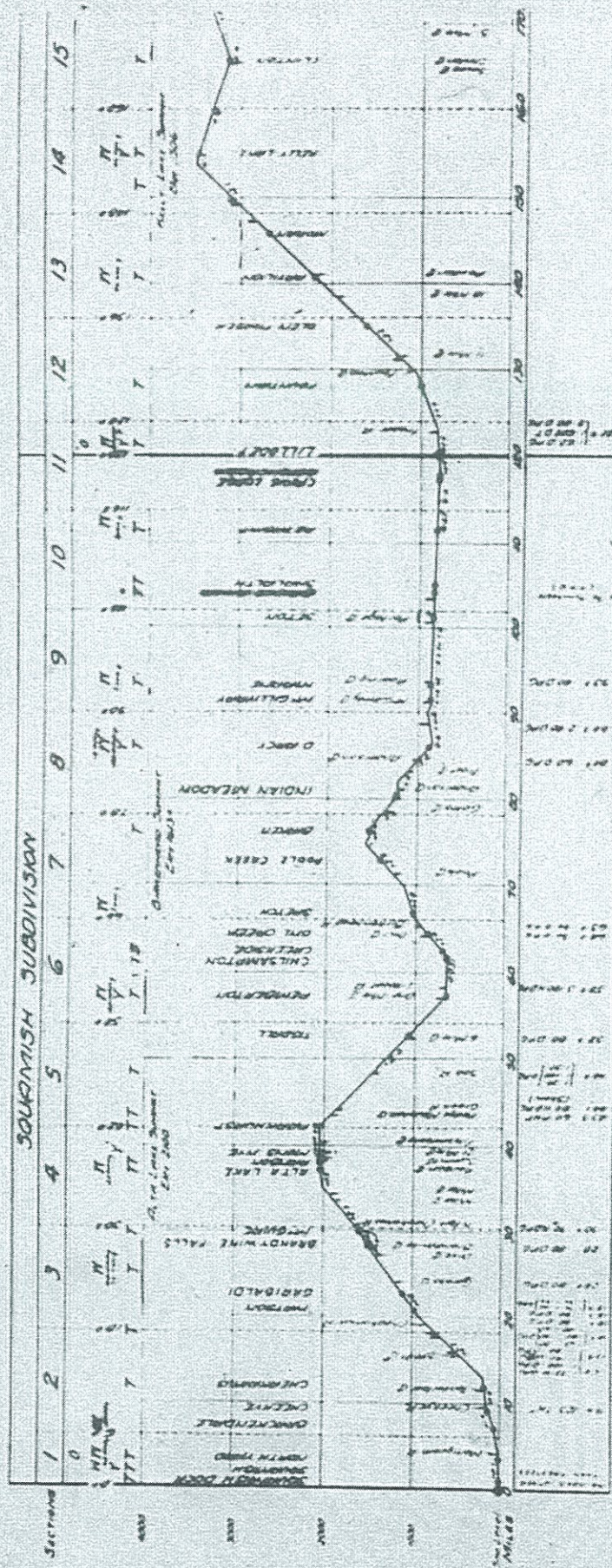
Tunnels—There are ten tunnels on the property.

Other Facilities—There are 15 water tanks of 40,000 gall. capacity, and five water tanks of similar capacity for the use of work trains. There are nine wyes

the tug boat "Point Ellice", with tonnage of 171.77 gross and 45.25 net. These craft are employed in the transport of freight cars between Vancouver and Squamish.

Operations

Auxiliary Services—In addition to the operation of the marine units specified, the company owns and operates a hydro-electric plant and waterworks system at Squamish, providing power and light for the shops and industries and also supplying the needs of the residents of the district. The company owns and operates a hydro-electric plant at Lillooet, providing power and light for the shops and station buildings, and also



Profile, Pacific Great Eastern Ry., South End.

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avenue to Capilano, 2.5 miles, and serving industries, was leased to the Vancouver Harbour Board.

Corporate and Administrative Offices

The corporate offices of the P.G.E.R. are in Victoria, B.C., while the administrative office is in Vancouver.

Physical Characteristics

The line is built to standard gauge, viz., 4 ft. 8½ in. The rails are 70 lb. on the maximum gradients and 60 lb. on other portions of the line. The maximum gradients are 2.2 ft. per 100 ft., compensated for curvature, and the maximum curvature is 12 degrees. All curves over two degrees are spiralled.

Bridges—Since construction days, four new bridges have been built on line diversions; 67 have been eliminated by rain filling, and 36 have been shortened. As at Dec. 31, 1939, there were 107 bridges on the line, 20 of which are steel bridges on concrete foundations. Bridges have been renewed in timber to a total of 76, some incorporating treated timber in concrete. Eleven bridges remain yet to be replaced or renewed. All of the bridges renewed or replaced to date have been built to Cooper's E. 55 loading. Two of the outstanding bridges on the property are those over the Fraser River, at mile 122.9, and the Deep Creek crossing, at mile 292.7. The Fraser River Bridge, at mile 122.9, has length of 820 ft. and height of 260 ft., and

and three turntables, and three fuel oil storage tanks.

Equipment

All of the 12 locomotives operated are ~~switchers~~ ^{switchers}; two Prairie type (2-6-0) locomotives; six Consolidation (2-8-0) locomotives and three Mikado (2-8-2) locomotives. The six wheel switcher, with 17 x 24 in. cylinders, develops 21,200 lb. tractive effort. The Prairie type locomotives, with 20 x 24 in. cylinders, develop 27,200 lb. tractive effort. The Consolidation locomotives are of two classes. There are two with 19 x 28 in. cylinders and 57 in. drivers, developing 30,000 lb. tractive effort, and four with 22 x 28 in. cylinders and 57 in. drivers, developing 36,300 lb. tractive effort. The Mikado locomotives, with 22 x 28 in. cylinders and 51 in. drivers, develop 43,675 lb. tractive effort.

There are 46 passenger service cars, viz., four motor rail cars, 16 first class, two diners, nine sleepers, nine baggage and express, and six other cars in passenger service.

There are 254 freight service cars, viz., 49 box, 123 flat, 45 stock, 10 coal, 10 tank, 6 refrigerator and 11 other. There are 73 company service cars, including seven cabooses.

The P.G.E. Ry. is also an operator of marine equipment, having the car ferry "P.G.E. No. 2", with tonnage of 841.09 gross and 817.74 net. Also operated is

supplying the needs of the town residents. Also, the company owns and operates a waterworks system at Williams Lake, supplying the shops and station buildings and also looking after

Railway Operation—On account of the P.G.E.R. low volume of traffic, the operating conditions are unusual, differing in marked degree from the conditions on other Canadian railways, and the traffic is difficult to handle economically.

Of the 36 railways operating in Canada in 1937, only 11 had route mileage of over 100, and only eight, including the P.G.E.R., had route mileage of over 200. None of these seven other roads are statistically compared with the P.G.E.R., on account of the sparsity of traffic and the high percentage of total mileage in maximum gradients on the P.G.E.R. On the Squamish-Lillooet engine district, of 120.4 miles, there are 38 miles of adverse 2.2% grades to northbound traffic and 27 miles of similar grades to southbound traffic, all operated as 2.2% grades. On the Lillooet-Williams Lake engine district, of 156.3 miles, there are 26 miles of adverse 2.2% grades operated as such, with additional mileage operated as 1% grade, to northbound traffic, with operation as 1% grades for southbound traffic. On the Williams Lake-Quesnel engine district, of 70.3 miles, operation is for 1% grades in both directions. The total line

mileage is 347. Northbound, there are 64 miles of maximum gradients, this being 18½% of the total mileage of 347, and southbound there are 27 miles (7¾% of the whole distance) of maximum gradients. Thus, in the round trip mileage there are 91 miles (13% of the total distance of 694 miles) of maximum gradients.

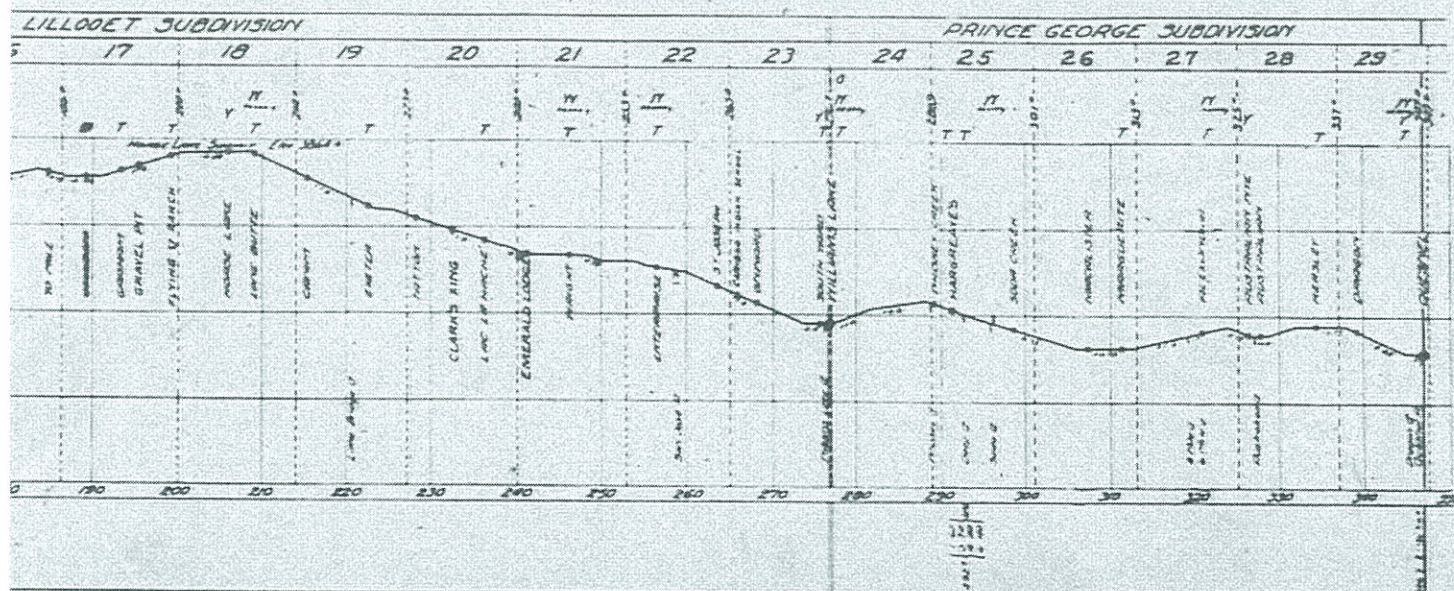
During 1938 and the preceding nine years, and for eight months of the year, the traffic has been handled by two way-freights and two mixed trains per week between Squamish and Lillooet, and two mixed trains, handling way-freight, per week between Lillooet and Quesnel. If freight trains arriving in Lillooet from

inaugurated this year if the tonnage is in evidence. If the traffic density was double what it now is, the P.G.E.R. could be operated as a 1% with the aid of pusher engines, and turn around movements, at a greatly lowered cost of operation.

There are great variations in temperature and weather conditions along this railway, from conditions of extreme humidity, heavy rains and snow fall in the coastal region to light rains and snowfall in the dry belt of the interior—in summer from 70 Fahr. to 110 Fahr. in the shade, and in the winter from 40 Fahr. at the coast to 45 below zero Fahr. in the interior plateau.

Passenger Traffic—Comparisons. of passenger train mileage and all indices related to passenger train mileage can be made between the different years shown on attached exhibit "A" up to and including the year 1935, and comparisons can be made as between the year 1936 and later years, but no comparisons can be made as to the years 1935 and 1936 with those indices related to passenger train mileage, on account of a ruling of Dr. R. H. Coats, Dominion Statistician, as follows:—

"Effective January 1st, 1936, the classification of 'mixed and special' as applied to trains and to locomotives and car miles run in mixed and special



Profile, Pacific Great Eastern Ry., North End.

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Squamish have a load which is over the capacity of the mixed train locomotive, this particular load is taken through by freight engine to Kelly Lake (Mile 155) the summit of the maximum gradient, and from thence on to Quesnel this ton-

handled by one locomotive as in operation.

During the winter months traffic is handled between Squamish and Lillooet generally by one way-freight per week, or as required by available tonnage, but the frequency required by the public convenience renders impossible the heavier train loading which otherwise would occur. Two mixed trains per week handling way-freight are also run between Squamish and Lillooet and between Lillooet and Quesnel during the winter months.

All passenger service, except specials and summer excursions, is handled by mixed trains. These methods of handling traffic, although the most economical under existing traffic conditions, affect operating comparisons with other railways, where such conditions do not prevail, and of necessity increase the cost of service.

During the summer months of 1939, on account of the increased mining activity at the northern end of the line, it was possible to run one way-freight per week through from Squamish to Quesnel, and the same service will be

Traffic and Mileage Statistics—The mileage of the P.G.E. Ry. as at 1938 was not put into operation until October 22nd, 1921, and the operating results for 1922, 1923 and 1924 were abnormal and unfit statistically to compare with later years. One of the cost indices used by

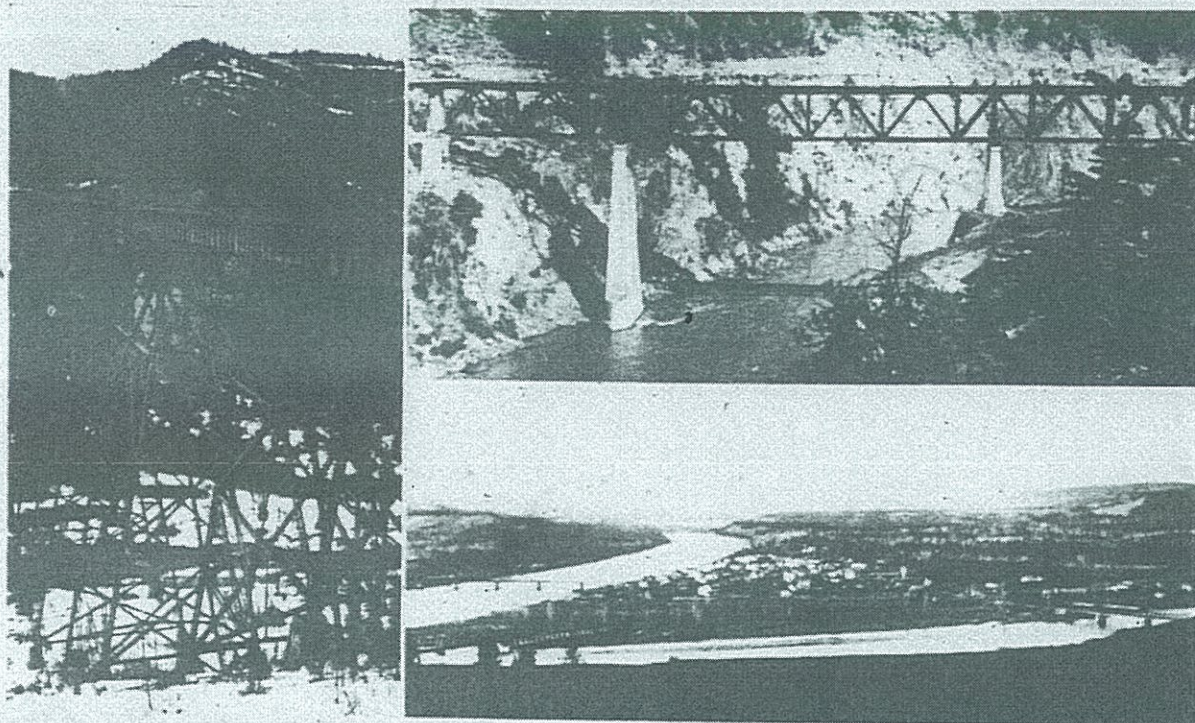
to the B.C. Government of June, 1922, was the train mile cost of 1921, which was \$8.67. In 1923 the train mile cost was \$6.70; in 1925, \$5.03; 1927, \$4.37; 1933, \$3.38; and 1938, \$3.82. In 1923 the average distance haul of one revenue ton was 38 miles, in 1925, 52.5 miles, as compared with 111 miles in 1927 and 176.9 miles in 1938.

This railway first entered upon operating conditions fairly comparable with those of 1927 and later years in the year 1925, but up to and including 1926 the fiscal years were as at June 30th, and the statistical years as at December 31st. It is, therefore, impossible to deduct the operations of a detached portion of the line in North Vancouver (discontinued in November, 1928) so as to arrive at a comparable basis with later years. In 1927, however, the accounting system was changed, so that the end of the fiscal year coincided with the statistical year as at December 31st. Therefore, the costs and statistics of 1927 can be brought down to a parity for purposes of comparison with the indices of later years.

trains will be cancelled and a revenue earning train shall be classed as a freight train when the number of freight cars in the train is in excess of the number of passenger cars, and a passenger train when the number of passenger cars is equal to or in excess of

While this ruling does not affect the statistics of normal railway traffic, and simplifies the apportionment of mixed train mileage and other related indices, it causes a distinct break in these indices for the years 1935 and 1936 on the P.G.E. Ry. as mixed trains generally contain a greater number of freight cars than passenger cars. Ninety-seven per cent. of the passenger train mileage on the P.G.E. Ry. in 1935 was developed on mixed trains, while in 1936 no passenger train mileage was returned under the heading "mixed trains" in compliance with the ruling of January 1st, 1936, referred to. Mixed passenger train mileage on the Canadian Pacific Railway in 1935 only amounted to 3 per cent. of the total passenger train mileage.

A reference to Exhibit "A" attached will indicate the effect of the ruling of January 1st, 1936. While average receipts per passenger per mile (Item 29) dropped gradually from 4 cents per mile in 1927 to 3.2 cents in 1933, indicating the lowering of rates, the average revenue per train mile (Item 30) rose from \$3.96 in 1927 to \$5.26 in 1933,



Bridges on the
Pacific Great
Eastern Ry.

The scene at the left shows the Deep Creek bridge, Mile 292.7. That at the upper right shows the bridge over the Fraser River, Mile 122.9, while that at the lower right shows two river crossings, the river in the forefront being the Quesnel, and that in the left middle background, the Fraser.

declined to \$4.66 in 1934, but showed the tremendous increases of \$9.42 and \$11.82 in 1937 and 1938 due to the ruling. Item 31, passengers per train mile, and Item 32, number of cars per train mile, are also affected. Utilizing, however, the indices not affected by the ruling:—

Item 25, The number of passengers carried—This is an increase from 1927 of 33,333 to 40,510 in 1934, but dropping to 23,011 in 1938. On account of the increase of the average distance carried (Item 28) from 58 miles in 1927 to 82 miles in 1938, the passenger density (Item 27) only dropped from 5,598 in 1927 to 5,409 in 1938. The peak of

on account of the increased distance of haul, produced 28% more ton mileage than in 1933. This is illustrated in Exhibit "B".

A change took place in traffic between 1925 and 1933. A short haul logging traffic had ceased, and whereas in 1925 forest products tonnage constituted 77% of the total revenue tonnage moved, in 1933 forest products tonnage amounted to only 49%. In 1925 manufactures and miscellaneous tonnage constituted only 8% of the total revenue tonnage, but in 1933 this subdivision of tonnage had risen to 31% of the total revenue tonnage moved, indicating a large in-

crease. The staff employed in 1933 was 29% less than the staff employed in 1925, and 13½% less than the staff employed in 1927. The 1938 staff was the same numerically as that of 1933.

The largest item in the expenses of railway operation is the cost of fuel for locomotives. As compared with 1925, the 1933 all service locomotive mileage had, despite the increased ton mileage, increased only 4%, and as compared with 1927, the all service locomotive mileage had decreased 0.5%. 1938 as compared with 1933, the all service locomotive mileage had decreased 8½%, due in measure to the completion of the

are also affected. Utilizing, however, the indices not affected by the ruling:—

Item 25, The number of passengers carried—This is an increase from 1927 of 33,333 to 40,510 in 1934, but dropping to 23,011 in 1938. On account of the increase of the average distance carried (Item 28) from 58 miles in 1927 to 82 miles in 1938, the passenger density (Item 27) only dropped from 5,598 in 1927 to 5,409 in 1938. The peak of

was reached in 1934, when the Bridge River boom was at its height. This receded to 23,011 in 1938, but the increase in distance carried from 64 miles in 1934 to 82 miles in 1938 only lowered the density (Item 27) from 7,532 to 5,409. The increase in distance carried was the result of mining activity in the Cariboo, tributary to Quesnel, the northern terminus, Mile 347.

Freight Traffic—Referring again to Exhibit "A". In freight traffic 1933 as compared with 1925, the revenue ton mileage increased 63%, the revenue train load increased 36%, with an increase in revenue freight train mileage of 20%.

In 1938, as compared with 1933 the revenue ton mileage increased 28%, the revenue train load increased 12% with an increase in revenue freight train mileage of 14%.

The revenue tonnage handled in 1933 was 27% less than the revenue tonnage of 1925, but the lesser tonnage of 1933, on account of the longer haul, produced 63% more ton mileage than in 1925. Again, the revenue tonnage of 1938 was 15% less than the revenue tonnage of 1933, but the lesser tonnage of 1938,

1925 and 1933. A short haul logging traffic had ceased, and whereas in 1925 forest products tonnage constituted 77% of the total revenue tonnage moved, in 1933 forest products tonnage amounted to only 49%. In 1925 manufactures and miscellaneous tonnage constituted only 8% of the total revenue tonnage, but in 1933 this subdivision of tonnage had risen to 31% of the total revenue tonnage moved, indicating a large increase in l.c.l. movements and increased revenue. In 1938 as compared with 1933, 1938 forest products tonnage had decreased, and whereas in 1933 forest products tonnage constituted 49% of the total revenue tonnage moved, in 1938 forest products tonnage amounted to only 18%. In 1933 manufactures and miscellaneous tonnage constituted 31% of the total revenue tonnage moved, but in 1938 had risen to 43% of the total revenue tonnage.

There has been also an appreciable rise in the percentage of animal and mines products tonnage. In 1927 animal products tonnage constituted 13½% of the total revenue tonnage moved, but in 1938 this subdivision of revenue tonnage had risen to 16% of the total revenue tonnage. Mine products tonnage had risen from 7½% in 1927 to 12¼% in 1938. The rise in animal products tonnage is illustrated in Exhibit "C" attached, showing shipments of cattle, sheep, hogs, calves and horses from 1924 and four succeeding years, including 1938.

This increased traffic movement was handled with a reduced staff of employees. The average number of em-

ployees in 1938.

The largest item in the expenses of railway operation is the cost of fuel for locomotives. As compared with 1925, the 1933 all service locomotive mileage had, despite the increased ton mileage, increased only 4%, and as compared with 1927, the all service locomotive mileage had decreased 0.5%. 1938 as compared with 1933, the all service locomotive mileage had decreased 8½%, due in measure to the completion of the bridge filling programme, and the decreased revenue mileage after 1937. The consumption of fuel in 1933 had increased, as compared with 1925, 11%, but 1933 as compared with 1927, the increase was only 2¼%. From 1933 to 1938 inclusive, the consumption of fuel per 100 locomotive miles has been practically the same each year as the consumption of 1933. All service mileage and fuel consumption comparisons are illustrated in Exhibit "D" attached.

Costs and Revenues—Exhibit "A" indicates that the total train mile cost in 1933 was 32½% lower than the train mile cost of 1925, and 22½% lower than that cost in 1927, and that the total expenses of the railway decreased 33% as compared with 1925, and 27% as compared with 1927. In the next five-year period, the train mile cost increased 11½% between 1933 and 1938, and total expenses increased 16½%.

In revenues, 1927 and 1933 comparisons, while the average receipts per passenger per mile decreased 2%, the revenue per passenger train mile increased 32%, indicating that while passenger rates had been reduced the number of passengers per train increased

35%, resulting in increased revenues per passenger train mile of 32%. Comparisons between 1933 and 1938 are distorted by the ruling of January 1st, 1936, before referred to.

In freight traffic, 1927 and 1933 comparisons, the average receipts revenue ton mile increased 5½%, the average revenue per revenue freight train mile increased 24½%, indicating that while rates had been reduced, a change in traffic had occurred, on account of the increased tonnage loaded car of 17%, an increase in per train of 12½%, an increase in of 6% and the increase in h.c. freight carried, there had resulted an increase in revenue per revenue freight train mile of 24½%. The operating revenue had increased from \$474,395.98 in 1927 to \$557,980.52 in 1933, an increase nearly 15½%, and the operating expenses had decreased from \$664,635.77 in 1927 to \$480,988.42 in 1933, a decrease of 27½%.

In freight traffic 1933 and 1938 comparisons, the average receipts per revenue ton mile decreased 8%, and the average revenue per revenue freight train mile increased 4%, indicating that while rates had still further been reduced, and although the tonnage per loaded car mile decreased 6%, there was an increase in number of cars per train mile of 11%, and an increase in the haul of 50%, which resulted in an increase in revenue per revenue freight train mile of 4%.

The operating revenues increased from \$557,980.52 in 1933 to \$672,152.30 in 1938, an increase of nearly 10%, and the operating expenses also increased from \$480,988.42 in 1933 to \$575,754.50, an increase of 19½%.

In 1934 there was the lowest operating ratio, of 80.95%, and in 1936 an oper-

The foregoing comparisons indicate that as compared with 1925 and 1927 the years following showed a large increase in both passenger and freight traffic with no corresponding increase in train mileage, or other service performed by the railway.

	1925	1927	1933	1938	1938
42068.98	60396.40	62779.39	62335.93	51541.27	
111.07	118.00	120.44	146.88	176.96	
495941	444028	548042	624932	919726	
625291	637375	591315	955616	1436183	
245680	323354	546205	1250135	1124598	
2035199	3531834	3091240	2927720	1886728	
1170477	2190663	2784576	3397527	3948621	
4672588	7127054	7561378	9155930	9115790	

Exhibit "C"
Eastern Railway Company.
1934, 1936 and 1938.

	Cars	Hogs	Calves	Horses	Total
	Head	Cars	Head	Cars	Cars
1925	164	1	85	15	377
1927	369	1	147	109	485
1933	67	8	319	142	431
1938	8	6	331	25	463
1938	76	6	684	128	791

Exhibit "D"
Eastern Railway Company.

	1925	1927	1933	1937	1938
per 100 locomotive miles, for the years indicated.	155644	162794	161699	172293	149066
	7665.47	8711.73	8842.33	9189.43	7940.09
	4.93	5.35	5.47	5.33	5.36

Exhibit "E"
Traffic density, train mileage, and operating ratios of 1933.

Route	Traffic Density	Train Mile Cost	Operating Ratio
buying, or advertising			85 per cent
selling passenger and ton mileage, and these statistical averages together provide the most important efficiency indices when making yearly comparisons of the operations of one railway. That is, if the class of commodities carried, the capacity of cars used, and the number, tractive power and speed of the locomotives operated, are similarly proportioned throughout the yearly aggrega-			

efficiency of different railway systems is apt to lead to erroneous conclusions unless all the factors influencing operations on each railway are known and are given full consideration, and weighted to commensurate importance in the movement of passengers and tonnage.

Under the heading of maintenance of way expenses, regardless of traffic, the track and structures of a railway must be kept up to a standard ensuring the safe operation of trains. The elements of nature cause ties to decay, wash-outs of embankments, cuttings, bridge foundations and culverts. Wear on account of traffic does not appreciably affect station and other buildings, and accounts only in part for the deterioration of bridge structures. Repairs and renewals of fences, road crossings, signs, cattle guards, and telegraph lines are not affected by traffic.

In like manner it may be said of maintenance of equipment expenses, that cars are worn out almost as much by carrying a half as a full load, locomotives deteriorate little more from hauling heavy loads than light loads, and both cars and locomotives are often replaced as much on account of them being obsolete as from wear and tear.

Traffic expenses are only lightly affected by changes in traffic.

Transportation expenses for superintendence, station service and supplies, and other expenses made between different railways.

In order to compare the operations of the P.G.E.R. with those of seven other Canadian railways which, with the P.G.E.R., are the only Canadian railways having route mileages over 200 miles, exhibit "E" has been prepared to illustrate comparison on the railways noted, in route mileages, traffic densities, train mile costs and operating ratios for the

of 21.2%.

In freight traffic 1933 and 1938 comparisons, the average receipts per revenue ton mile decreased 8%, and the average revenue per revenue freight train mile increased 4%, indicating that while rates had still further been reduced, and although the tonnage per loaded car mile decreased 6%, there was an increase in number of cars per train mile of 11%, and an increase in the haul of 50%, which resulted in an increase in revenue per revenue freight train mile of 4%.

The operating revenues increased from \$557,980.52 in 1933 to \$672,152.30 in 1938, an increase of nearly 10%, and the operating expenses also increased from \$480,998.42 in 1933 to \$575,754.50, an increase of 19½%.

In 1934 there was the lowest operating ratio, of 80.95%, and in 1936 an operating ratio of 81.39%. The sharp rise in total operating expenses in 1937 resulting in an operating ratio of 89.93% and 94.05% in 1938 was occasioned by extraordinary expenses in the increased cost of snow and ice removal, floods, track and tie renewals, extra locomotive and equipment repairs, and decrease in miscellaneous and credit transportation.

Table "D" P.G.E.R. Railway Company.

per 100 locomotive miles, for the years indicated.				
1925	1927	1933	1937	1938
155644	162794	161699	172293	148066
7665.47	8711.73	8842.33	9189.43	7940.09
4.93	5.35	5.47	5.33	5.35

Table "E"

The density, train mileage, and operating ratios of 1933.

Route	Traffic Density	Train Mile Cost	Operating Ratio
buying, or developing			
selling passenger and ton mileage, and these statistical averages together provide the most important efficiency indices when making yearly comparisons of the operations of one railway. That is, if the class of commodities carried, the capacity of cars used, and the number, tractive power and speed of the locomotives operated, are similarly proportioned throughout the yearly aggregations from which the averages are produced, then these averages become positive indications of efficiency of operation. While these statistical averages used in the preceding comparisons clearly indicate the comparative conditions of traffic on the P.G.E.R. for the years enumerated, their use as bases of comparison in studying the operating			

are worn out almost as much by carrying a half as a full load, locomotives deteriorate little more from hauling heavy loads than light loads, and both cars and locomotives are often replaced as much on account of them being obsolete as from wear and tear.

Traffic expenses are only lightly affected by changes in traffic.

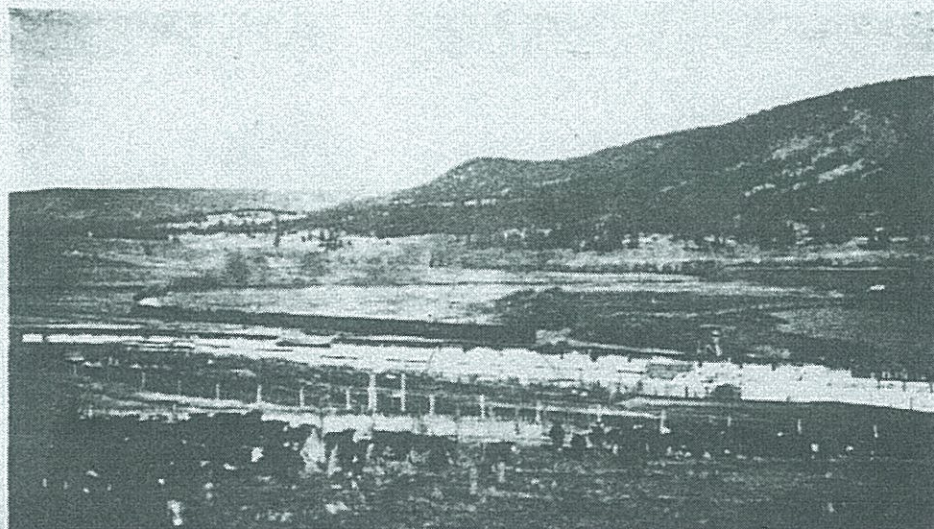
Transportation expenses for superintendence, station service and supplies. Expenses made between different railways.

In order to compare the operations of the P.G.E.R. with those of seven other Canadian railways which, with the P.G.E.R., are the only Canadian railways having route mileages over 200 miles, exhibit "E" has been prepared to illustrate comparison on the railways noted, in route mileages, traffic densities, train mile costs and operating ratios for the year 1933. It will be noted that for 1933 the train mile cost of the P.G.E.R. was:—33½% lower than the train mile cost of the Algoma Central; 4% lower than the train mile cost of the Canadian National; 46% higher than the train mile cost of the Can. Southern; 25% higher than the train mile cost of the Northern Alberta; 9% higher than the train mile cost of the Temiskaming & N. O.; 25% higher than the train mile cost of the Wabash in Canada.

In 1934 the train mile cost of the P.G.E.R. was less than the Algoma Central, the Canadian National and the Temiskaming and N. O., and only 8% higher than the Canadian Pacific Ry.

When comparisons are made with other railways, the P.G.E.R. suffers from the following handicaps:—

1. Very low traffic density.
2. High percentage of maximum gradients.
3. Sixty-five per cent. of the freight car mileage of the P.G.E.R. developed on mixed trains. On the Canadian National and Canadian Pacific this proportion was only 4½%, and the Wabash had no mixed train service.
4. High percentage of non-revenue traffic on account of low density. In 1933 the non-revenue traffic of the seven other Canadian railways noted, expressed in terms of train and car mileages, amounted to less than one per cent. of the total traffic, but the



Stock Yards on the P.G.E.R.
These yards are at Williams Lake, Mile 275.5.

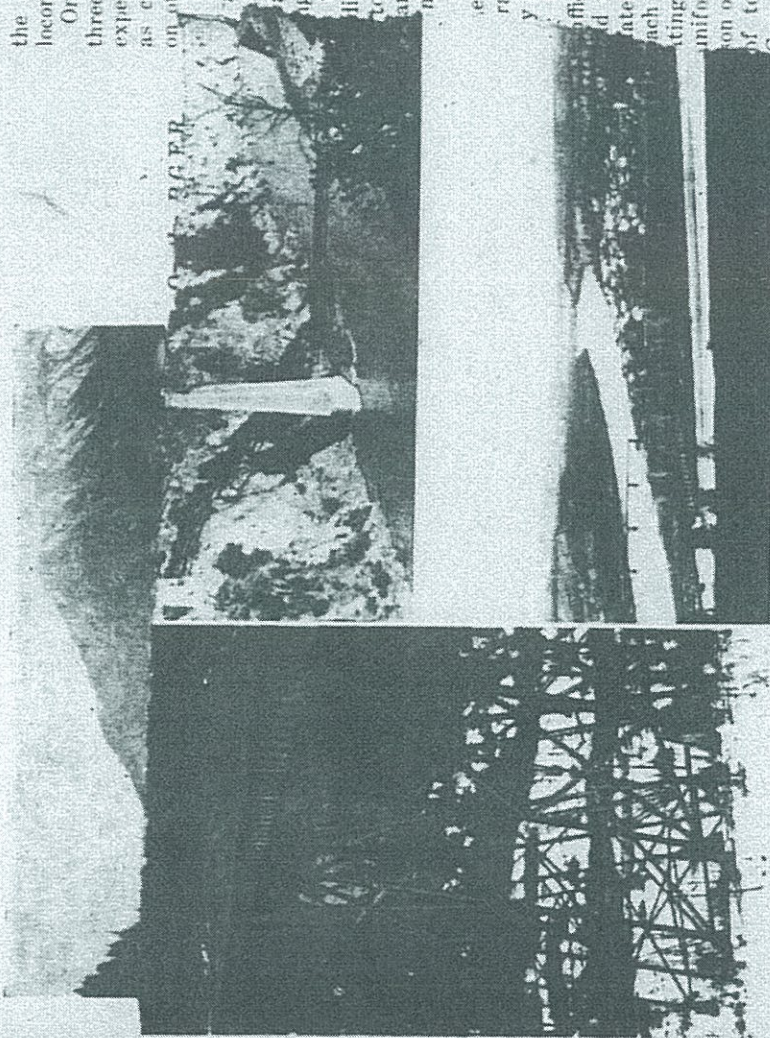
CANADIAN TRANSPORTATION

the same year was 5.47 tons per 100 locomotive miles.

On account of the sparsity of traffic three of the five subdivisions of total expenses of the P.G.E.R. are abnormal as compared with these items of cost on other Canadian railways.

Canada and the United States the operating expenses of railways are classified under five headings, and the averages of the five subdivisions of operating costs for all Canadian railways the fifteen years prior to and including 1933, expressed as percentages of total operating expenses are: Maintenance of Way and Structures, 20.8%; Maintenance of Equipment, 22.5%; Transportation, 49.3%, and general expenses, 3.4%. While the total operating expenses of an individual railway may vary from year to year according to fluctuations in the volume of traffic, the varying amounts of repairs and renewals, the difference in costs of material and labour, the proportion of each of these five subdivisions of operating cost to total expenses is generally uniform. Exhibit "F" gives a comparison of the percentage of each subdivision of total operating expenses of eight Canadian railways and all railways in Canada for 1933.

It will be noted that the Canadian National, Canadian Pacific, and Temiskaming subdivision percentages do not vary much from the general averages of all railways, and it may be logically assumed that when there is a large variation in these proportional sub-items of expenses, etc., it is due to some abnormal traffic condition. The P.G.E.R. maintenance of way costs are proportionally very high and those of the Canada Southern very low. These exceptional traffic conditions are illustrated in Exhibit "F", where it will be noted that the traffic density of the P.G.E.R. is only 1.2% that of the Canada Southern, 1.4% that of the Wabash, and 3.7% of the Canadian Pacific. On account also of



The scene at the left shows the Deep Creek bridge, Mile 202.7. That at the upper right shows the bridge at Mile 122.9, while that at the lower right shows two river crossings, the river in the foreground being the Fraser.

on account of the increased distances, the cost of fuel for locomotives. The tonnage of fuel consumption for individual railways is not given in "Statistics of Steam Railways of Canada", costs only are shown, and costs are useless for purposes of comparison as prices of fuel vary in different parts of Canada. The tonnage as well as costs of fuel consumption for all railways in Canada are shown in this publication. The average all service fuel consumption for all Canadian railways was 6.37 tons per 100 locomotive miles, and the all-service fuel consumption of the P.G.E.R. for

Exhibit "A"
Pacific Great Eastern Railway Company

TABLE I. A comparison of passenger and freight traffic statistics, operating revenues and expenses, years 1925, 1927.