Canadian Rail

JANUARY 1977

Three Hundredth Issue

THE BIGGEST BRIDGE

CP RAIL's
Lethbridge Viaduct.

George A. Moore

Photographs from the collection of
and prepared by Mr. Barry Russell.

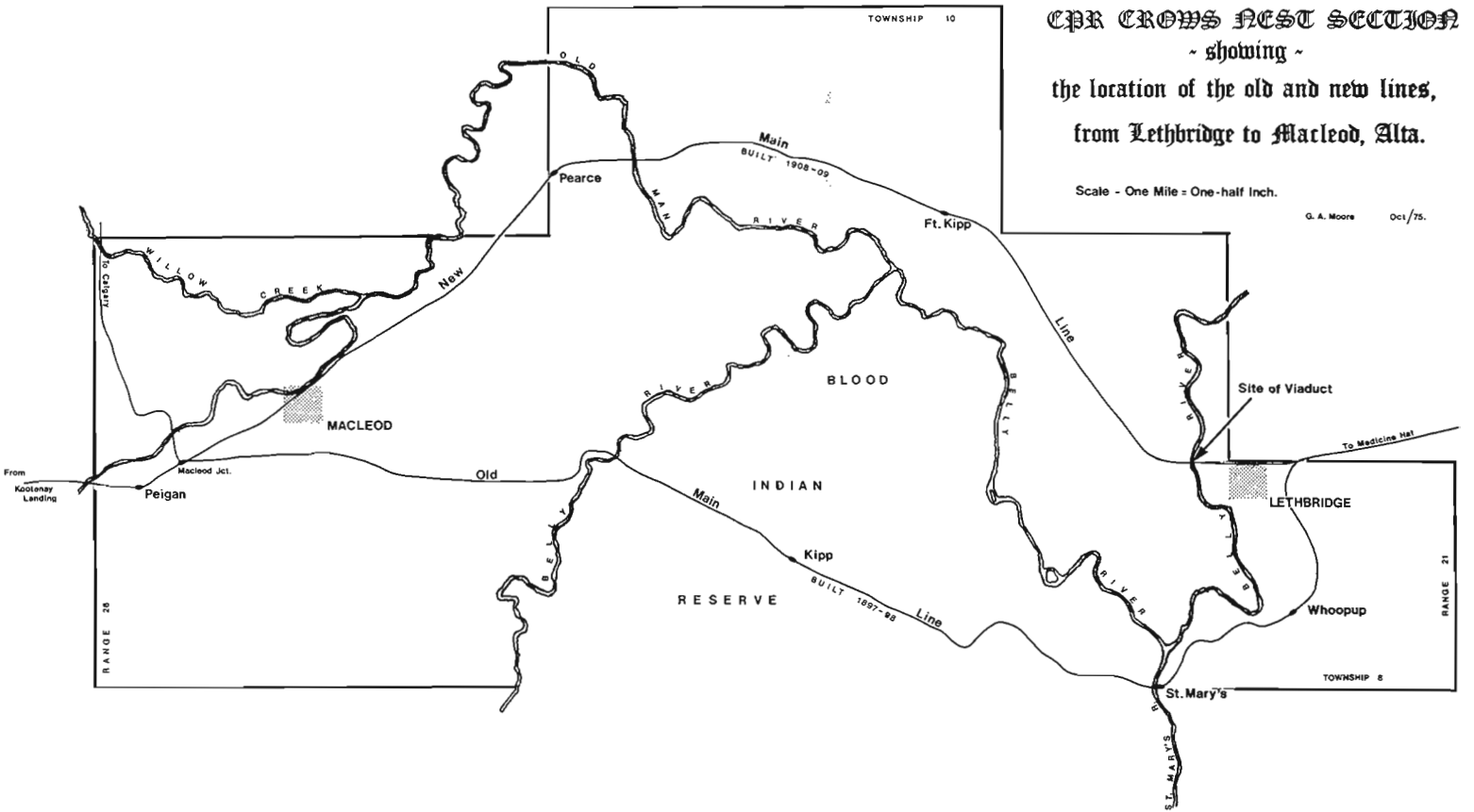
On the twenty-ninth of June, Anno Domini 1897, a charter (60-61 Vic. Ch 5) was granted to the Canadian Pacific Railway Company of Montreal, authorizing the construction of a line of railway from Lethbridge, Alberta, via the Crow's Nest Pass to Nelson, British Columbia, about 240 miles to the west. The original portion of this line from Lethbridge Junction to Macleod (Fort Macleod), Alberta, was some 37 miles in length and was connected to the Town of Lethbridge by a $1\frac{1}{2}$-mile long spur track. The latter portion of the Crow's Nest branch was constructed in 1897-98.

From the information available, it seems to have taken a very short time for CPR management to reach the conclusion that the original line from Lethbridge Junction to Macleod had more than a few shortcomings. One can only conclude that the location surveys for this section had been concluded rather hastily, or that a bridge of the magnitude of that which would be built, one day, was impossible to envision as a reasonable alternative in those early days.

The original line also included seven-degree curves and had a ruling grade of 1.2%, or 63.4 feet to the mile. The main disadvantage however seemed to reside in the fact that the line included twenty separate bridges, all of wooden construction, with an aggregate length of 2.8 miles! One of these bridges was 2,933 feet in length and some were as high as 100 feet. They crisscrossed a rugged terrain, the geography of which included steeply banked streams and ravines, and required constant supervision and vigilance, particularly during periods of high water, on account of the nature of the soil in this region.

↗ LIKE A GIANT INSECT POISED ON A TWIG OF A GREAT CREEPING VINE, THE huge travelling crane moves slowly out over the completed bents of the Lethbridge Viaduct, towards the west bank of the-then Belly River in November 1908.

← THE CENTRE LINE ACROSS THE VALLEY OF THE BELLY RIVER HAS BEEN LOCATED and the pile-driver is driving the foundation piles for the concrete foundations for the piers. The view is taken looking west across the valley; the date is November 27, 1907.


CPR CROWS NEST SECTION
~ showing ~
the location of the old and new lines,
from Lethbridge to Macleod, Alta.
Scale - One Mile = One-half Inch.
G. A. Moore Oct/75.
TOWNSHIP 10
TOWNSHIP 8
RANGE 26
RANGE 21
OLD MAIN LINE BUILT 1908-09
NEW MAIN LINE BUILT 1897-98
Pearce
Ft. Kipp
Kipp
Site of Viaduct
To Medicine Hat
LETHBRIDGE
MACLEOD
Macleod Jct.
Peigan
From Kootenay Landing
Old
Whoopup
St. Mary's
WILLOW CREEK
To Cigarette
OLD MAN RIVER
BELLY RIVER
BELLY RIVER
BELLY RIVER
ST. MARY'S RIVER
BLOOD INDIAN RESERVE

Some time during 1903-04, following a brief five years of operation on the original line, the Canadian Pacific discovered that the majority of the bridges between Lethbridge Junction and Macleod were in need of extensive rebuilding. The estimated cost of this work was $ 1,065,000. In view of the rapidly increasing traffic, not to mention the added condition that the Company's charter stipulated that the Crow's Nest branch should originate in the Town of Lethbridge, instead of the Junction, an intensive search for a new and improved route between Lethbridge and Macleod began to gather momentum. Reduced grades and better track alignment were the ultimate goals, together with the elimination of as many as possible of the original wooden bridges. The surveys continued throughout 1904 and 1905, and a new location for the line was finally developed. The map accompanying this article illustrates the relative locations of the original and relocated lines.

The ruling gradient on the new line was 0.4% which was a considerable reduction from the former maximum. One result was a reduction of 401.5 feet in the total rise and fall. The new line was also 5.26 miles shorter and the maximum curvature was a mere three degrees, compared to the seven degrees of the original. Some 37 curves were eliminated. The estimated cost for the relocation of the line was $ 2,048,700 and in the light of an anticipated 20% increase in traffic over the Crow's Nest branch, the cost of the new line was considered as completely justified by CPR management.

The principle advantage of the relocated line was the subsequent saving in maintenance costs on the bridges. There were only two bridges on the new line, compared to 20 on the original.

One of these was to become famous world-wide. This was the crossing of the-then Belly River at Lethbridge, known today as CP RAIL's Lethbridge Viaduct. In its rebuilt form, it is some 5,327 feet in length, with a maximum height of 314 feet from the river bed to the rail base. The east end of the mammoth trestle is a short 3,800 feet west of the present CP RAIL station in Lethbridge. The second and only other bridge on the new line spanned the Old Man River valley and is 1,900 feet long and 146 feet high.

The viaduct over the-then Belly River was located at what was considered to be the best possible location for a high-level crossing in the immediate vicinity of Lethbridge. The soil at this point was of a desirable mixture of various types of clay and gravel. Seams of coal were intermixed with the soil and the old coal mine workings, the remains of the mining operations conducted by Galt's North West Coal and Navigation Company from 1882 to 1895, were still in evidence on the east side of the valley under the proposed location of bridge piers 21, 22 and 23. The coal seam measured an average of seven feet in thickness and was situated at about the same elevation as the flat alongside the river. Special attention had to be paid to these old mine workings to assure the stability and security of the bridge. Shafts were sunk to explore the conditions of these underground workings and, where there was any doubt, the workings were filled with concrete to eliminate the possibility of collapse of the foundations of the bridge piers at a later date.

While the details of construction of the viaduct are admirably illustrated in Mr. Russell's photographs, some basic facts and figures deserve mention and I will attempt to provide a description of the design and principles utilized in the construction.

CANADIAN PACIFIC RAILWAY PILE DRIVER NUMBER 300022 WAS PHOTOGRAPHED in the storage yard of the Canadian Bridge Company, east of the bridge site near Lethbridge. The photograph was taken in 1906-07.

The viaduct was erected on a tangent (no curvature), with an 0.4% ascending grade westward. Several designs were considered during the preliminary studies to determine the most economical type of bridge. It should be understood that, while the emphasis surprisingly was not placed on economics by the Company, sound engineering principles and capital costs did not suffer therefrom. As will be noted below, safety was a prime consideration in the final selection of the bridge type. The design which was finally selected was a steel viaduct, consisting of forty-four plate girder spans, each 67 feet 1 inch long, twenty-two plate girder spans each 98 feet 10 inches in length and one rivetted deck lattice truss span, 167 feet in length. These spans were supported by thirty-three rigidly-braced, rivetted steel towers. The bridge superstructure was erected on concrete pedestals which were in turn supported by concrete piles.

Due to the severe winds experienced during the survey and construction periods and with additional consideration to the unusual height of the viaduct, it was decided to use a "through" girder, as opposed to the "deck plate" type of girder, to prevent derailed cars from running off the bridge deck. It was reasoned that a railway car, in falling from the rails on the viaduct, might strike and dislocate the tower legs and bracing with diasaterous consequences, due in part to the increasing width of the towers nearer their bases.

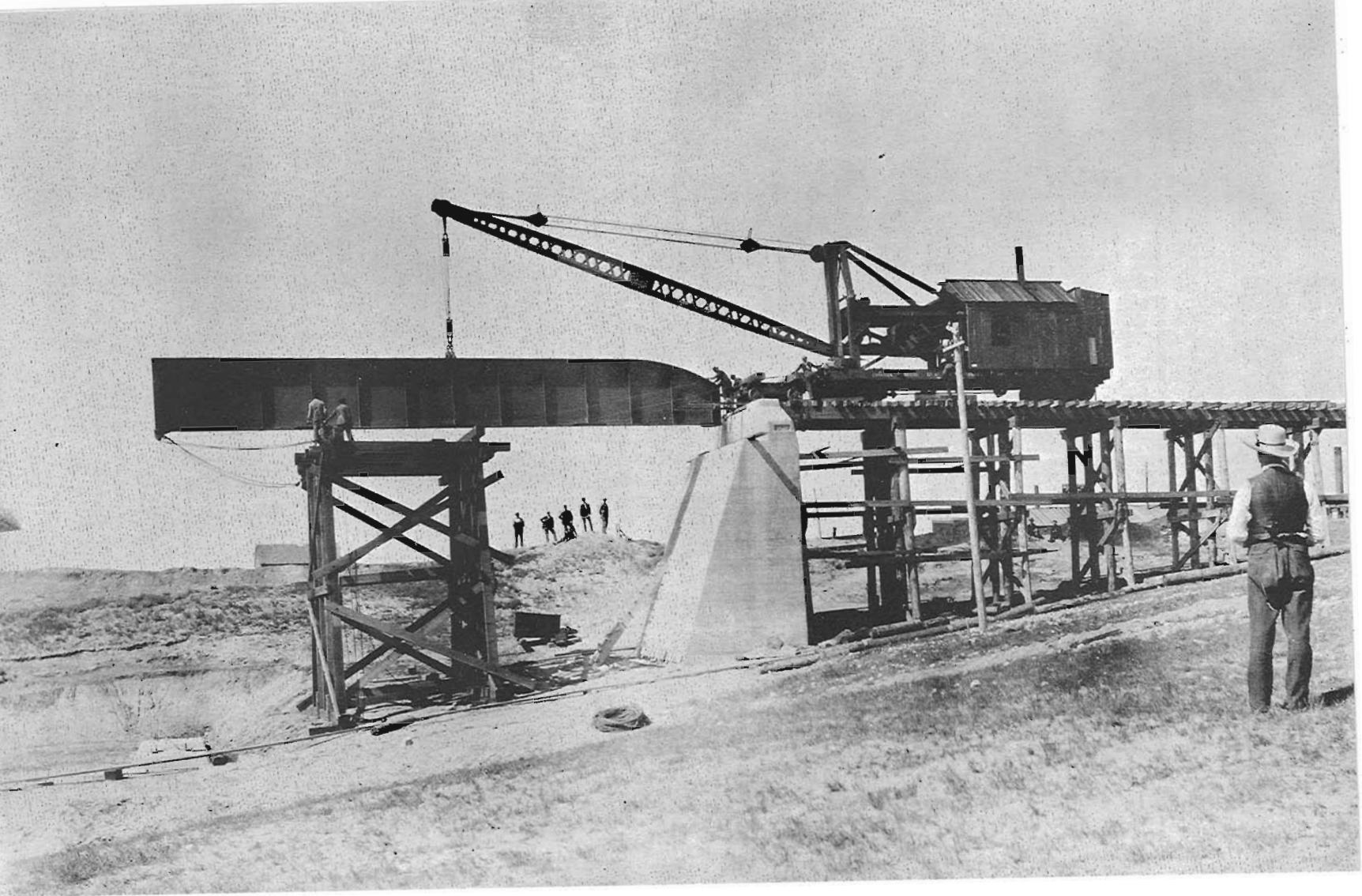
Consequently, this single consideration and decision increased the overall cost of the project considerably, but, as previously noted, the value of human life and limb was predominant in the mind of the Canadian Pacific's Engineer of Bridges, Mr. Charles Nicholas Monsarrat, when he was designing the structure.

On completion of the design work, construction was initiated and, during the first week of December 1907, a centre-line was located across the Belly River valley and the position of the concrete pedestals determined. High winds continued to be a problem and hampered the progress of engineers and transit-men working in the windswept valley. The standard 100-foot steel tape, normally used by these men, was totally useless in these winds. It was eventually replaced by a 100-foot wooden rod, specially prepared to counter the onslaught of the winds.

The contract for the excavation for the pedestals for the supporting structure was awarded to John Gunn and Sons of Winnipeg, Manitoba. Work commenced in October 1907, with a projected completion date of March 1, 1908. Nature had other things in mind, however,and, due to extreme flooding by the Belly and Old Man Rivers in the early part of 1908, as well as difficulties experienced with the foundations in the river valley, the substructure was not completed until February 1909, a month before the entire structure was due to be completed.

The flooding which occurred in June 1908, prior to the completion of excavation for the river piers, included a rise in the water level in the valley of 12 inches above the highest previous level measured in June 1902. The 1908 flood completely inundated the cofferdams, deposited sufficient silt to fill them and carried away a good portion of the contractor's equipment and structures, located at the site of the viaduct.

The contract for the fabrication and erection of the steelwork was awarded to the Canadian Bridge Company of Walkerville, Ontario , in October 1906. Specifications for the erection of the steelwork in-

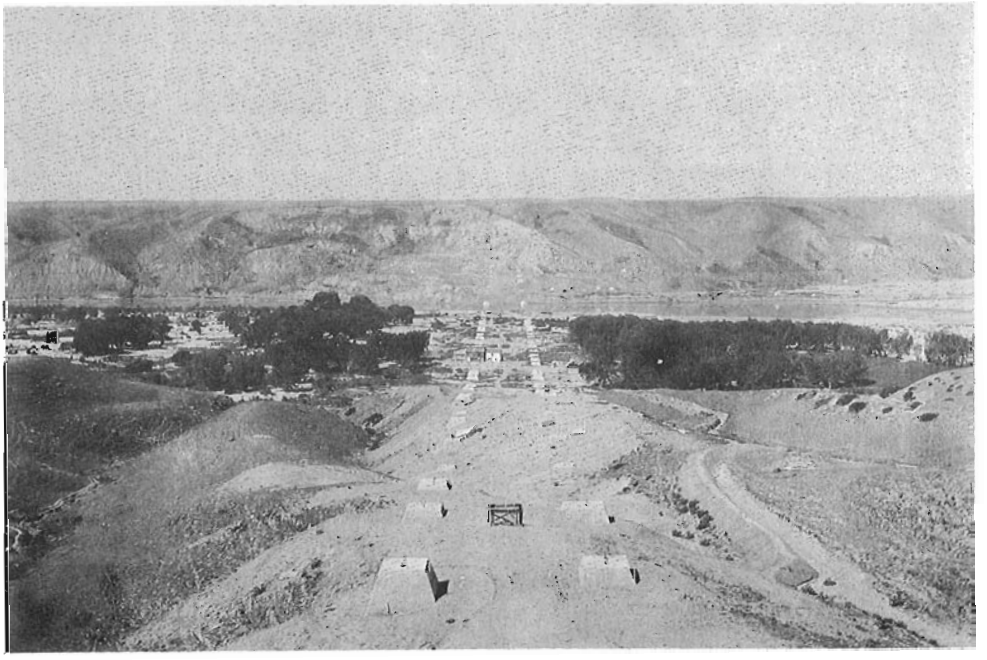


cluded the installation of a large assembly plant at the bridge site. To facilitate the transfer of materials from the storage yard to the bridge site, the Canadian Pacific provided the contractor with a locomotive and ten flat cars.

The traveller-crane for erection of the steelwork was a truly gigantic creation for that era, dwarfing all who worked upon it or under it. It was built entirely of steel, with the exception of the engineroom floor, enginehouse and various platforms.

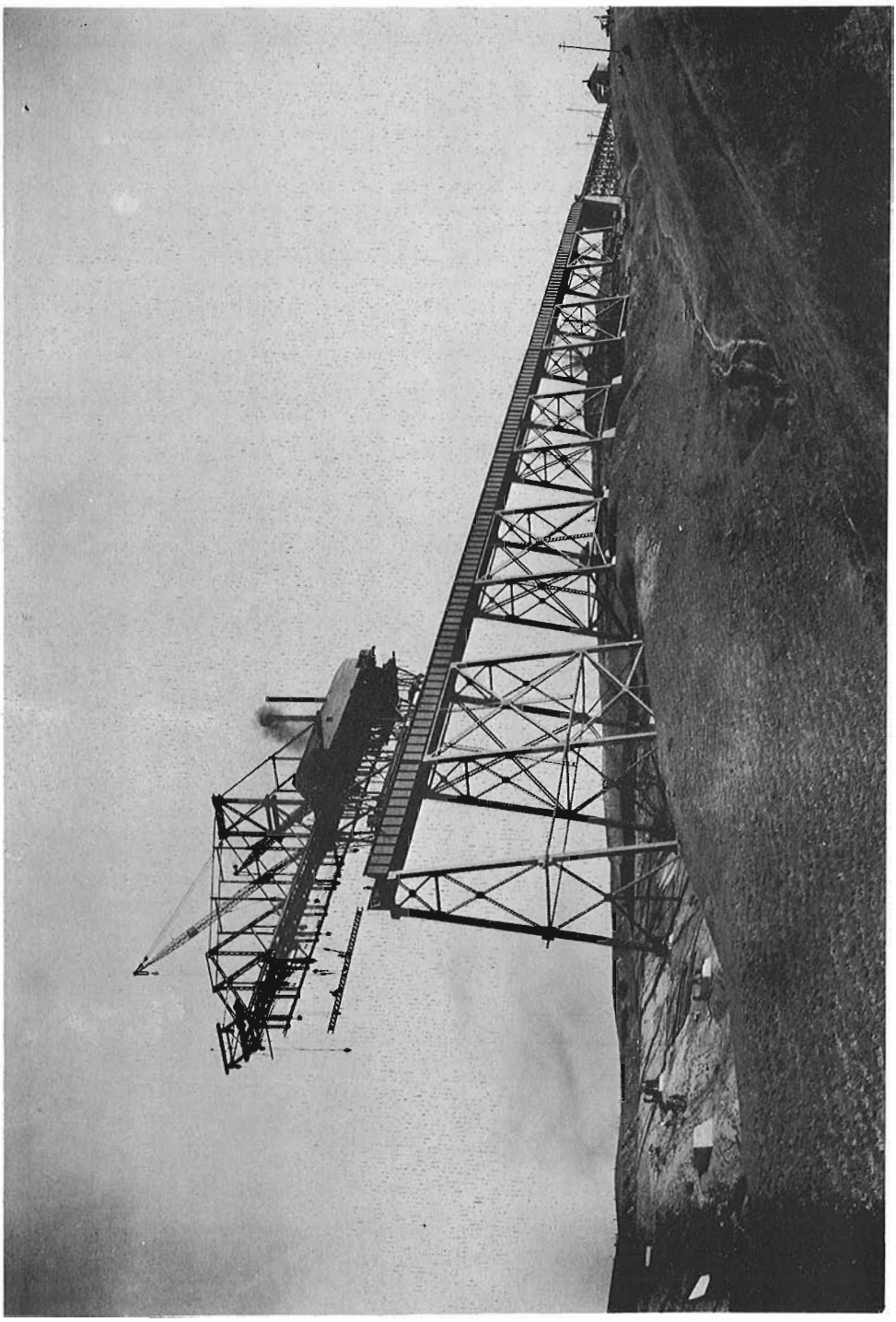
Employees of the Canadian Bridge Company arrived at Lethbridge in April 1908 and commenced assembly of the giant travelling crane, as well as another, smaller traveller, for handling material in the storage yard. The first steel member was raised into position on the viaduct on August 15, 1908 and the steelwork was completed, with the last span being lifted into position at the west end of the viaduct, on June 22, 1909.

The project was not without its share of work stoppages and labour dissention and it is reported that two week's work was lost in February, 1909, "due to a strike". The longest period of uninterrupted progress on the structure occurred in March 1909, when tower bents 37 through 46 were erected. The towers were, of course, numbered in the direction of construction, east to west.

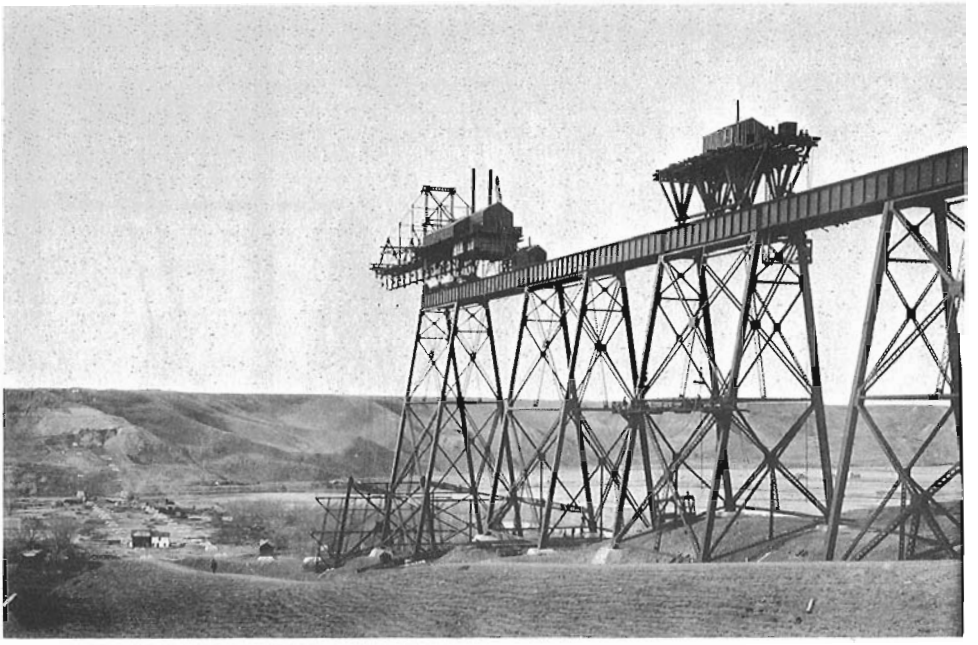


A GENERAL VIEW OF THE CONCRETE PEDESTALS FOR THE VIADUCT TAKEN FROM the east side of the-then Belly River valley, about July/August, 1908.

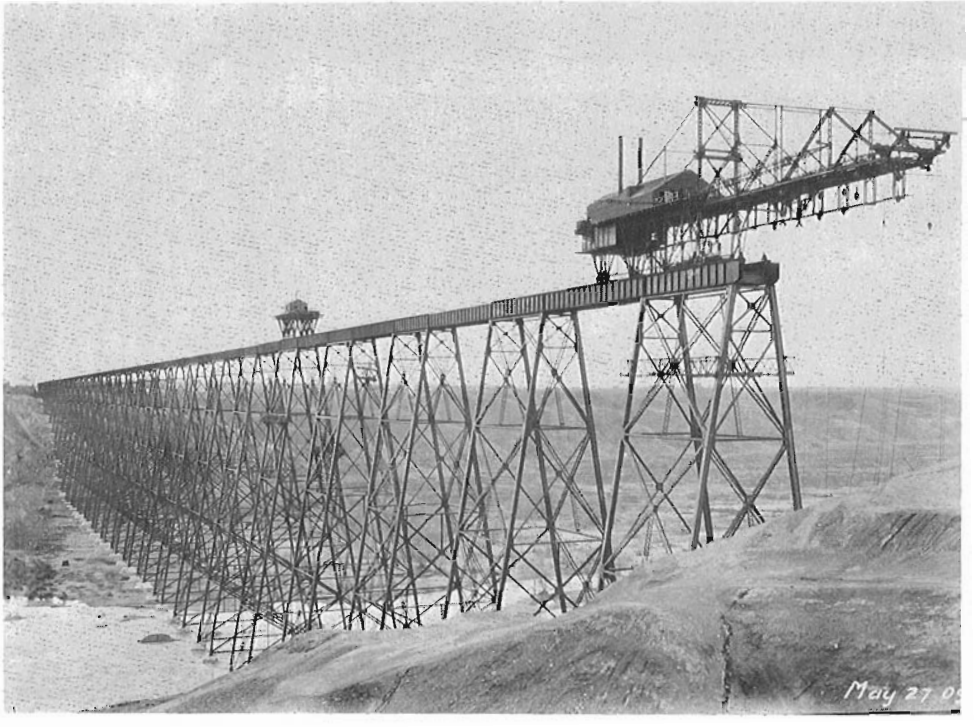
THE FIRST HALF OF THE FIRST THROUGH GIRDER SPAN BEING RAISED INTO position on the east end of the viaduct on August 15, 1908.



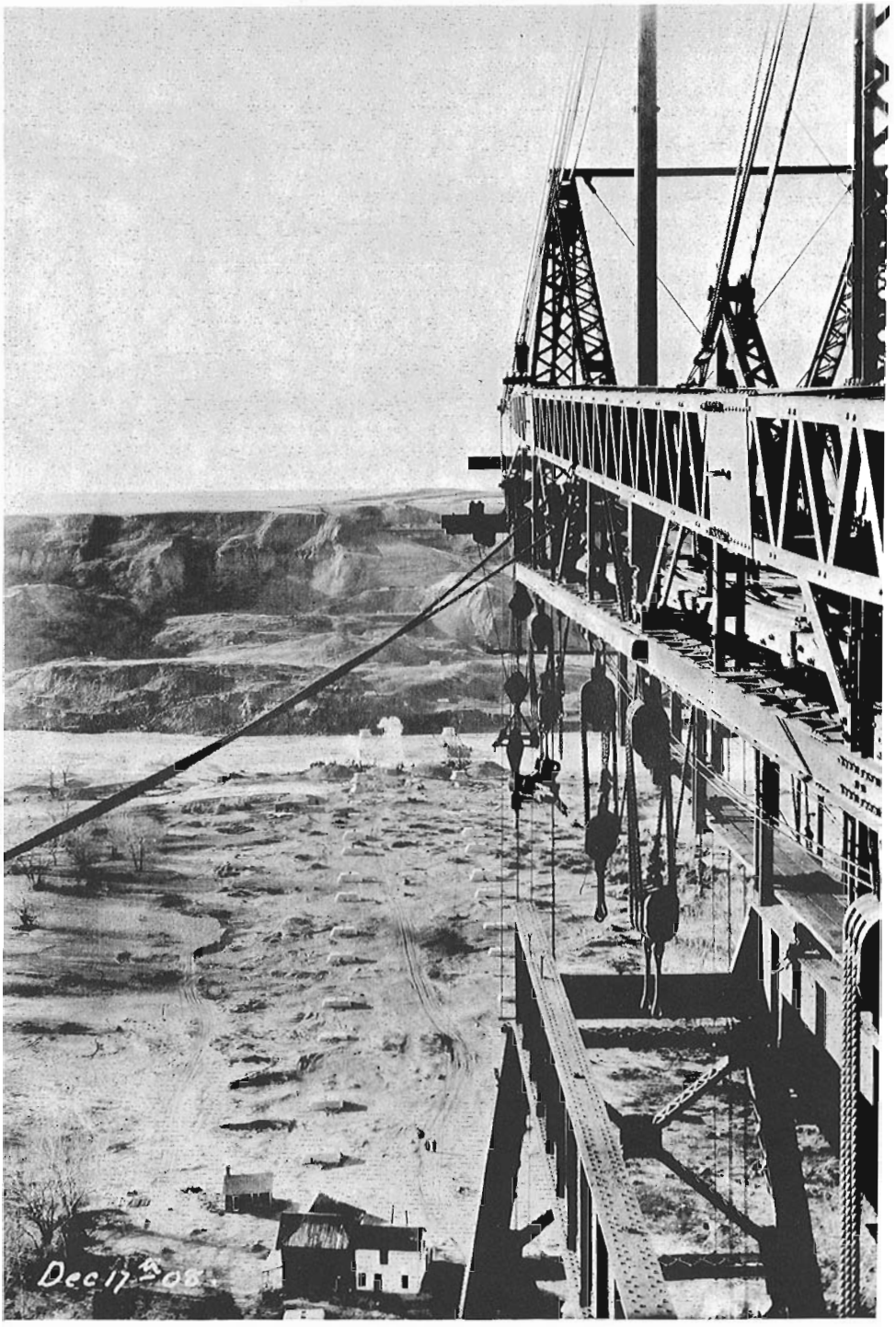
THE GIANT TRAVELLER-CRANE CREEPS OUT OVER THE COMPLETED SPANS OF THE viaduct to the eastern edge of the river valley. The enginehouse has been constructed atop the crane at this point and eleven girders have been assembled. It is now the autumn of 1908.



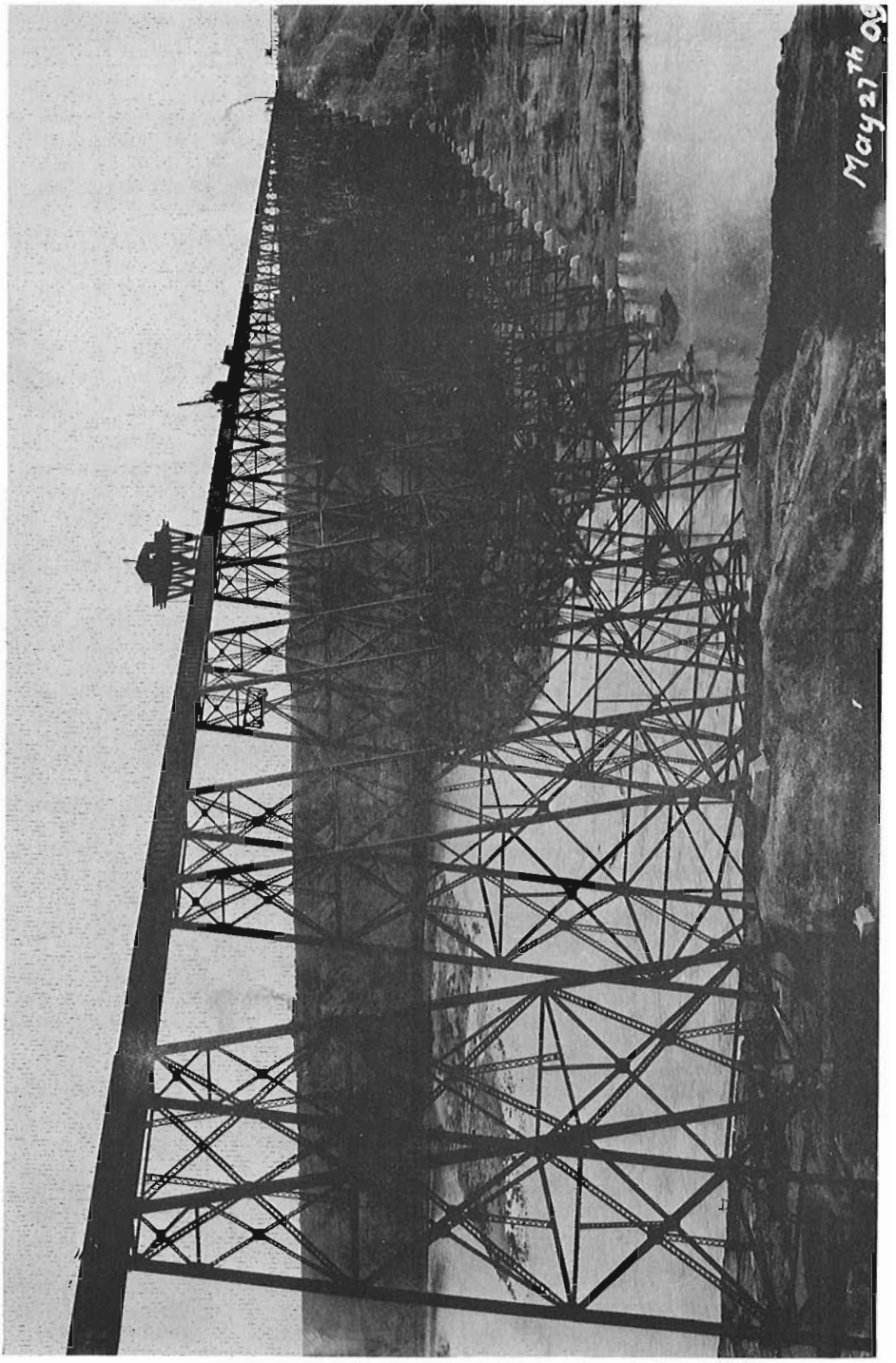
WITH THE PILE-DRIVER HARD AT WORK ON THE RIVER BANK, THE TRAVELLER-crane carefully lowers the steel members for another steel tower into place, on the edge of the valley. It is now December, 1908.



THE VIADUCT HAS NOW REACHED THE WEST SIDE OF THE VALLEY AND THE END of the mammoth task is now in sight. The date is May 27, 1909.



ON THE SOUTH SIDE OF THE TRAVELLER-CRANE, LOOKING DOWN INTO THE VALley, the old Galt coal-mine workings are visible, as is the steam-driven pile-driver at work at the river crossing. The date is December 17, 1908.



FROM THE WEST SIDE OF THE VALLEY OF THE-THEN BELLY RIVER, THE SMOKE from the boiler in the assembly yard is visible on the horizon. The configuration of the river valley which favoured construction of the viaduct at this point is plainly visible. The date is May 27, 1909.

The true merit of the decision to adopt the through type of girder span for the bridge deck was fully and startlingly realized during construction. One of the derrick cars owned by the Canadian Bridge Company, accidentally overturned on the bridge, but it was prevented from falling to the valley floor by the side girders of the span.

An idea of the quantity of materials used during construction of the viaduct can be obtained from the following summary, quoted from the engineering paper prepared by Mr. Monsarrat, referred to in detail at the conclusion of this article:

"Dry excavation..... 18,110 cu. yds.
Wet excavation..... 4,870 cu. yds.
Concrete..... 17,090 cu. yds.
Concrete piling..... 1,676 piles
Riprap..... 339 cu. yds.
Steel..... 12,200 tons."

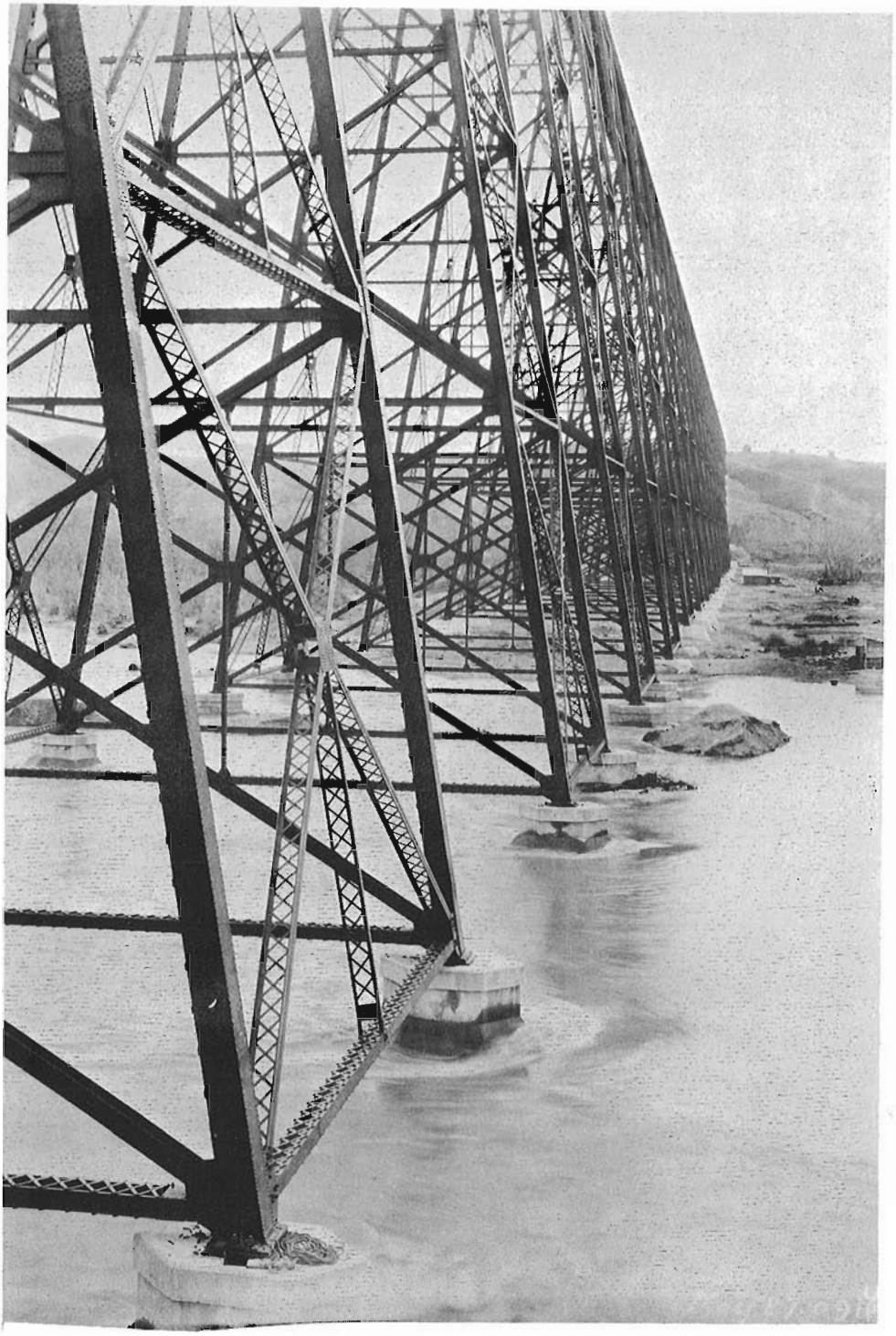
Another interesting construction statistic resides in the fact that it required a total of 645 railway cars to transport the steel used in the project to the bridge site at Lethbridge. The reported total cost of the Lethbridge Viaduct was $ 1,334, 507.09 It is noted that the original 1905 estimate was $ 1,065,000 .

A project of this magnitude could not be expected to be completed without its tragedies and so it is not surprising to learn that four fatalities marred the construction period. Two of these deaths, which could be classified as accidental, were a direct result of an accumulation of poisonous gases in the old coal-mine workings. Reports of the period describe how an exploratory shaft had been sunk at Pier Number 23, to facilitate an inspection of the old underground workings by the contractor, John Gunn & Sons. Apparently, a small boy got into the shaft, despite warnings to the contrary and, in the rescue operations which ensued, two of the workmen were suffocated by the poisonous gases. The third fatality occurred when an employee of the Canadian Bridge Company lost his footing and fell from the top of bridge tower Number 47. The fourth death involved a "stranger",as described in official records, who, when attempting to walk across the uncompleted bridge deck, fell through an opening in the bridge floor.

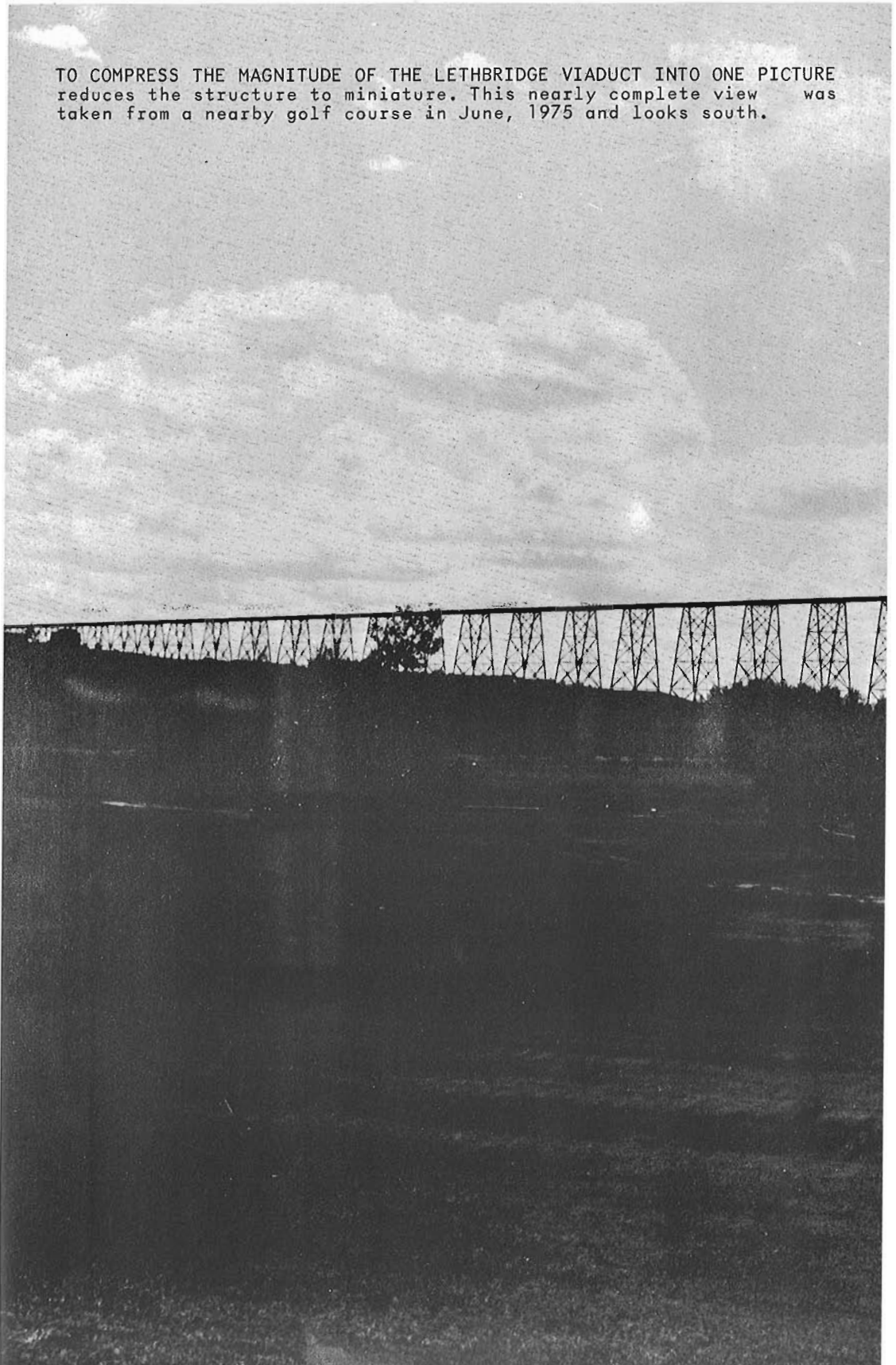
The simplicity and symmetry of design of the viaduct are to the credit of Mr. C. N. Monsarrat, Engineer of Bridges, Canadian Pacific Railway Company, Montréal, while the substructure was designed and built under the direction of Mr. J.E. Schwitzer, Assistant Chief Engineer of the Canadian Pacific Railway at Winnipeg. The consulting engineer for the project was Mr. C.C.Schneider of Philadelphia, Pa., U.S.A.

The Lethbridge Viaduct was officially opened for traffic on November 3, 1909 and has served the railway faithfully for 66 years. The original portion of the Crows Nest line, from Lethbridge Junction to Macleod was abandoned with the opening to traffic of the viaduct.

The unique photographs, some of which were used to illustrate this article, were discovered and processed by Mr. Barry Russell. They were taken by a person obviously an expert in photography, who unfortunately remains unknown at this point in time. His work, filed in the dark depths of corporate cupboards for decades, together with the views of the viaduct as it appears today, provide a remarkable glimpse of a structure well known to students of Canada's railways and to Canadians in general. It was, and still is, the longest, highest railway bridge of its kind in North America.



THIS VIEW OF THE VIADUCT PIERS IN THE BED OF THE-THEN BELLY RIVER taken on May 27, 1909, illustrate clearly what must have occurred in June 1902 and again in June 1908.



TO COMPRESS THE MAGNITUDE OF THE LETHBRIDGE VIADUCT INTO ONE PICTURE reduces the structure to miniature. This nearly complete view was taken from a nearby golf course in June, 1975 and looks south.

TIME TABLE No. 15, JUNE 2nd 1907.

WESTBOUND TRAINS INFERIOR DIRECTION							LETHBRIDGE SECTION		EASTBOUND TRAINS SUPERIOR DIRECTION			
THIRD CLASS	SECOND CLASS	FIRST CLASS		Miles from Dunmore Jct.	Telegraph Offices.		STATIONS.	Telegraph Calls.	FIRST CLASS		SECOND CLASS	THIRD CLASS
81 FREIGHT *l* Daily	113 MIXED *l* Daily ex Sunday	7 Soo-Spokane Passenger *l* Daily	5 PSG'R *l* Daily						6 PSG'R *a* Daily	8 Soo-Spokane Passenger *a* Daily	114 MIXED *a* Daily ex Sunday	82 FREIGHT *a* Daily
14.00		1.15	21.30	.0	D N	.. **Dunmore Jct.** W		D U	s 5.25	s9.00		s 8.45
						7.8						
14.25		1.30	f21.50	7.8	.	.... **Bull's Head**....		..	f 5.10	8.45		8.25
						7.9						
14.50		1.44	f22.10	15.7	D	. **Seven Persons** W		R O	f 4.55	8.30		7.55
						7.6						
15.30		2.01	f22.30	23.3	..	.....**Whitla**.....		..	f 4.40	8.15		7.30
						7.5						
16.00		2.13	f22.45	30.8	D N	.....**Winnifred**		F	f 4.23	7.59		7.00
						8.5						
16.28		2.29	f23.02	39.3	..	.... **Bow Island** ..W		B O	f 4.03	7.41		6.20
						6.8						
16.50		2.41	f23.18	46.1	..	.... .**Burdett**.....			f 3.47	7.28		5.55
						8.0						
17.17		2.55	f23.35	54.1	D N	...**Grassy Lake**....		R A	f 3.30	7.13		5.30
				59.0		Burdett Jct 6.6						
				60.7	..	.....Doolan Pit....W		..				
						2.4						
17.49		3.10	f23.52	63.1	..	..**Purple Springs**..		..	f 3.10	6.57		5.00
						8.0						
18.16		3.28	f24.08	71.1	..	.....**Wetmore**		.	f 2.52	6.42		4.30
				72.3		Reference Coal 3.7 Co.						
18.30		3.35	s24.20	74.8	D N	.....**Taber**.....W		B A	s 2.42	6.34		4.10
						5.1						
18.49		3.44	f24.33	79.9	..	.... **Woodpecker**....		..	f 2.28	6.24		3.44
						8.5						
19.19		3.57	f24.52	88.4	..	..... **Chin**.....		..	f 2.10	6.09		3.05
						8.1						
19.50		4.10	f 1.10	96.5	..	..... **Coaldale**....W		..	f 1.52	5.54		2.35
						8.0						
20.25		4.26	1.30	104.5	..	**Lethb'ge St'k Yds.**		..	1.34	5.39		2.08
						0.5						
20.26		4.27	1.32	105.0		....**Montana Jct.**...			1.32	5.38		2.06
						..Jct. with A. R. & I. Co...		.				
						0.3						
20.30		4.28	1.33	105.3	D N	.....Lethbridge Jct.....		K N	1.31	5.37		2.05
						1.5						
	s 6.15	s4.33	s1.45	106.8	D N	.... **Lethbridge** ..W		B	s1.23	s 5.32	s16.50	6 1.55 5s 1.10
						1.5						
20.30	6.20	4.38	1.55	105.3	D N	.....Lethbridge Jct.....		K N	1.11	5.27	16.40	24.50
						0.5						
20.31	6.21	4.39	1.57	105.8	..	.....**Dranoel**.....		..	1.10	5.26	16.35	24.45
						5.9						
20.50	f 6.40	4.48	f 2.15	110.8	..	.....**Whoopup**.....		..	f24.55	5.14	f16.15	24.20
						4.9						
21.10	f 7.00	5.00	f 2.33	115.7	D N	.... **St. Mary's**.... W		R Y	f24.40	5.00	f15.50	23.50
						9.6						
21.50	f 7.35	5.20	f 3.08	125.3	..	.....**Kipp**.....			f24.15	4.43	f15.20	23.10
						9.0						
22.25	f 8.00	5.35	f 3.31	134.3	N	.....**Pearce**.....		P R	f23.50	4.28	f14.45	22.25
						8.5						
s23.00	s 8.20	s5.50	s 3.55	142.8	D N	..... **Macleod** .... W		M C	23.30	4.15	14.25	22.00
a Daily 81	*a* Daily ex Sunday 113	*a* Daily 7	*a* Daily 5	MOUNTAIN TIME					*l* Daily 6	*l* Daily 8	*l* Daily ex Sunday 114	*l* Daily 82

Registering Points: MacLeod, Lethbridge, Dunmore Jct.
Bulletin Points: Dunmore Jct. and MacLeod.
Comparison Clock: Macleod.
The position of the switch at the Junction of the Lethbridge Section with the Medicine Hat Section at Dunmore Junction is normal when set for the Medicine Hat Section.
Main Line Lethbridge Section at Dunmore Jct. is the West leg of Wye. Switches set accordingly
Lethbridge yard limit extends to Lethbridge Stock Yards.
The position of the switch at Lethbridge Junction is normal when set for Lethbridge.
Conductors and Engineers of third class and extra trains must have a copy of A. R. & I. Co.'s current time table, and keep clear of A. R. & I Co.'s regular trains in Lethbridge Yard.
The A. R. and I. Co's regular trains will register at Lethbridge Junction.
All first class trains will approach and run through Macleod yard, yard limits between Lethbridge Jct. and Lethbridge, and Dunmore Jct. yard expecting to find main track occupied or switches set against them, and be prepared to stop at once.

This page from Canadian Pacific Railway Employee Time Table No. 15, dated June 2, 1907, during the period of construction of the viaduct, shows the original location of the line between Lethbridge Junction and Macleod, which was then a part of the Lethbridge Section.

CPR Employee Time Table Number 5, dated October 31, 1909 - just prior to the opening of the Lethbridge Viaduct for traffic on November 3, 1909 - shows the location of the new line from Lethbridge to Macleod, a distance of 31.7 miles as compared to 37.5 miles by the old way. Note the increased number of scheduled trains as compared to the June 2, 1907 time table.

TIME TABLE No. 5, OCTOBER 31st, 1909.

WESTBOUND TRAINS — Inferior Direction

Third Class	Second Class.	First Class					Miles from Lethbridge	Telegraph Offices	CROWS NEST SECTION — STATIONS	Telegraph Calls
89 Merchandise FREIGHT L Daily	75 Soo-Spokane FREIGHT L Daily	239 PSG'R L Daily Ex. Sun.	237 PSG'R L Daily Ex. Sun.	235 PSG'R L Daily Ex. Sun.	7 PSG'R L Daily	213 PSG'R L Daily				
	20.40			13.45	5.15	4.00	0.0	D N	LETHBRIDGE W	B
	21.05			s 14.03	5.30	s 4.15	7.7	D	X. KIPP clerg	K D
	21.35			s **14.26**	5.45	s 4.30	15.2	D N	X MONARCH clerg	R A
	22.05			s 14.40	6.01	4.46	23.0	D	X PEARCE clerg	P R
19.00	21¢ **22.40** 82 **23.05**	15.15	7.00	s **14.55** **15.00**	s 6.20	s 5.05 5.20	31.7	D N	MACLEOD ..W	M C
19.15	23.15	15.20	7.06	15.05	6.30	5.25	33.7		X Macleod Junction .... Jct. with Macleod Br.	
	24.13			f 15.20	6.50	5.45	41.7	D N	PEIGAN	P N
	24.32			f 15.31	7.00	5.58	46.9		CHOKIO	
	24.55			s 15.43	7.10	6.11	52.2	D	BROCKET ...W	R K
	1.35			s 16.04	7.32	s 6.35	61.2	D N	PINCHER	D E
	2.10			s 16.21	7.47	s 6.52	68.2	D N	COWLEY	C O
	2.30			s 16.32	**7.59**	s 7.03	72.6	D N	LUNDBRECK .W	U N
	3.00			f 16.47	8.13	**7.18**	79.2	D N	BURMIS	B I
							81.8		Passburg	
							84.1		Bellevue	
	3.35			f 17.00	8.24	7.35	84.6	D	HILLCREST	D O
	3.50			s 17.07	s 8.32	s 7.45	86.5	D N	FRANK ....W Jct. with Grassy Mt. R.	F K
	4.10			s 17.15	8.40	s 7.53	88.3	D	BLAIRMORE	S B
	4.25			s 17.25	f 8.48	s 8.02	91.9	D N	COLEMAN	M A
	4.45			f 17.40	9.00	8.16	95.9		SENTINEL	
	5.15			s **18.00**	s 9.15	s 8.35	101.2	D N	CROW'S NEST W	B U
a Daily	a Daily	a Daily Ex. Sun.	a Daily Ex. Sun.	a Daily Ex. Sun	a Daily	a Daily			MOUNTAIN TIME.	
89	75	239	237	235	7	213				

EASTBOUND TRAINS — Superior Direction

First Class					Third Class.				Telegraph Calls
236 PSG'R a Daily Ex. Sun.	214 PSG'R a Daily	8 PSG'R a Daily	238 PSG'R a Daily Ex. Sun.	240 PSG'R a Daily Ex. Sun.	84 Freight a Daily	74 Soo-Spokane FREIGHT a Daily	82 FREIGHT a Daily	90 Merchandise FREIGHT a Daily	
s 15.00	s 24.25	s 1.40			12.15	16.25	24.10		
s 14.45	s 24.10	1.25			11.55	16.00	23.40		
s **14.26**	s 23.55	1.10			11.35	15.35	23.20		
s 14.11	23.40	24.55			11.15	15.20	23.00		
13.55 s 13.50	**23.20** s **23.05**	s 24.35	13.40	22.00	10.35	**14.55**	**22.40**	8.00	
13.45	23.00	24.30	13.34	21.54	10.20	14.35	22.15	7.45	
f 13.25	22.41	**24.13**			9.50	14.10	21.55		
f 13.12	22.29	24.02			9.35	13.50	21.40		
s 13.00	s 22.16	23.52			9.15	13.35	21.22		
s 12.41	s 21.56	23.35			8.45	13.05	20.50		
s 12.26	s 21.36	23.20			8.20	12.46	20.25		
s **12.15**	s 21.23	23.10			**7.59**	**12.15**	20.10		
f 12.00	21.08	22.56			**7.18**	11.44	19.50		
f 11.48	f 20.56	22.46			6.50	11.15	19.25		
s 11.42	s 20.50	s 22.42			6.40	11.10	19.10		
s 11.31	s 20.38	22.34			6.15	11.00	18.45		
s 11.23	s 20.30	f 22.28			6.00	10.45	18.30		
f 11.13	20.18	22.18			5.35	10.20	18.17		
11.00	20.05	22.05			**5.15**	10.00	**18.00**		
L Daily Ex. Sun	L Daily	L Daily	L Daily Ex. Sun	L Daily Ex. Sun.	L Daily	L Daily	L Daily	a Daily	
236	214	8	238	240	84	74	82	90	

Macleod Branch Train

Macleod Branch Train

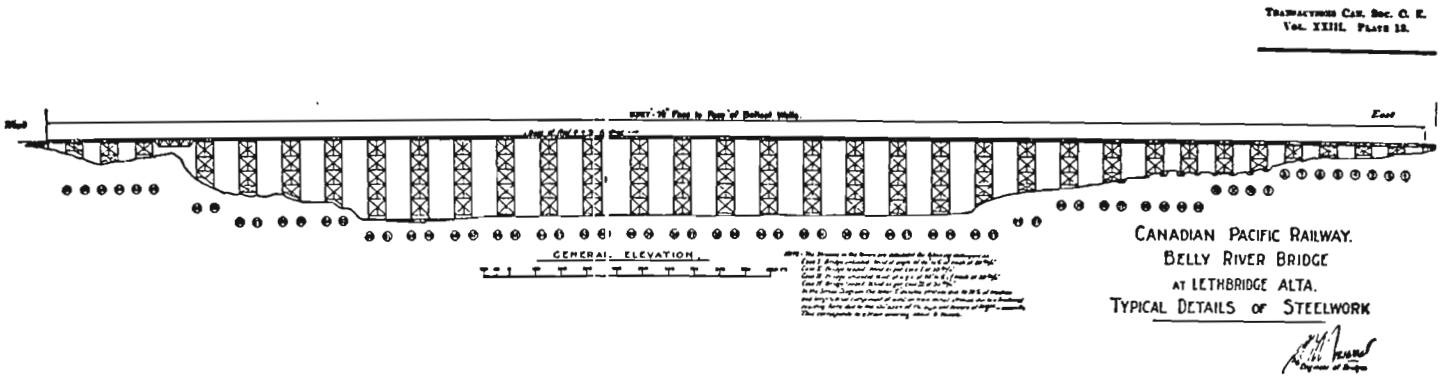
Macleod Branch Train

Macleod Branch Train

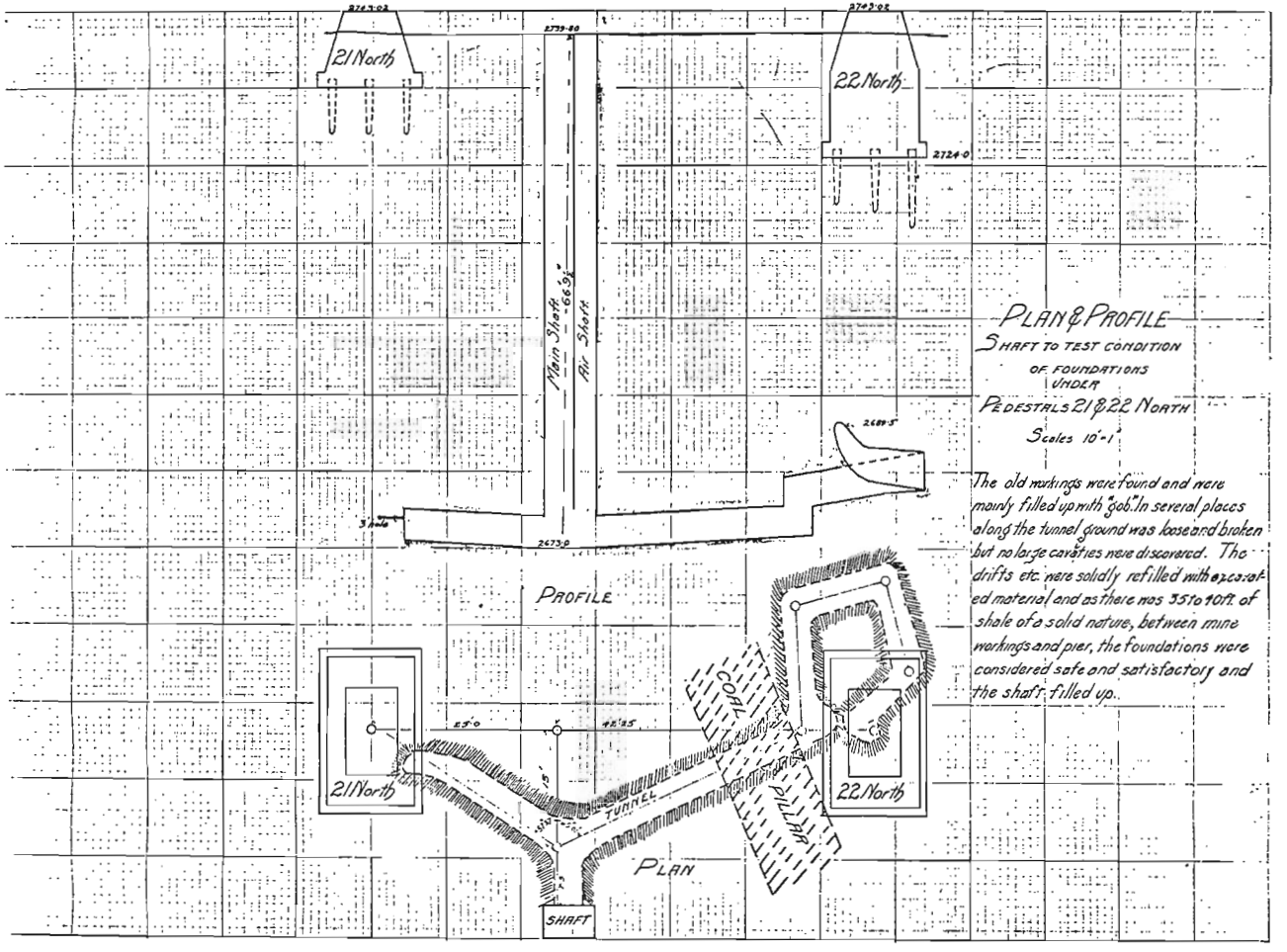
RETURN TO ASSISTANT CHIEF ENGINEER'S DRAFTING OFFICE

Registering Points: Lethbridge, Macleod, Burmis, Frank and Crow's Nest.
Operators at Burmis and Frank will register first-class trains.
Bulletin Points: Crow's Nest and Lethbridge.
Comparison Clock: Lethbridge (Telegraph Office, Engine House); Crow's Nest (Telegraph Office, Engine House).
First class trains will approach and pass through Lethbridge, Macleod, Burmis, Frank and Crow's Nest yards, expecting to find main track occupied or switches set against them.

Permanent slow post: South Fork Bridge, mileage 70.5.
East End Crow's Nest Yard protected by permanent Slow Board which will govern all trains.
Macleod Yard Limits extend to limit board 700 yards west of Macleod Junction.
Semaphore located 1,650 feet west of Macleod Junction Switch.
Spurs at: Maple Leaf, mileage 83.5; Knights, mileage 87.5; Rowan, mileage, 87.6; McLaren's mileage 89.6; McGillivray Creek Coal & Coke Co., mileage 93.1; Hazel, mileage 99.5.



Partial reproduction of Plate 13, Vol. XXIII Transactions of the Canadian Society of Civil Engineers (1909), reprinted with permission of The Engineering Institute of Canada.

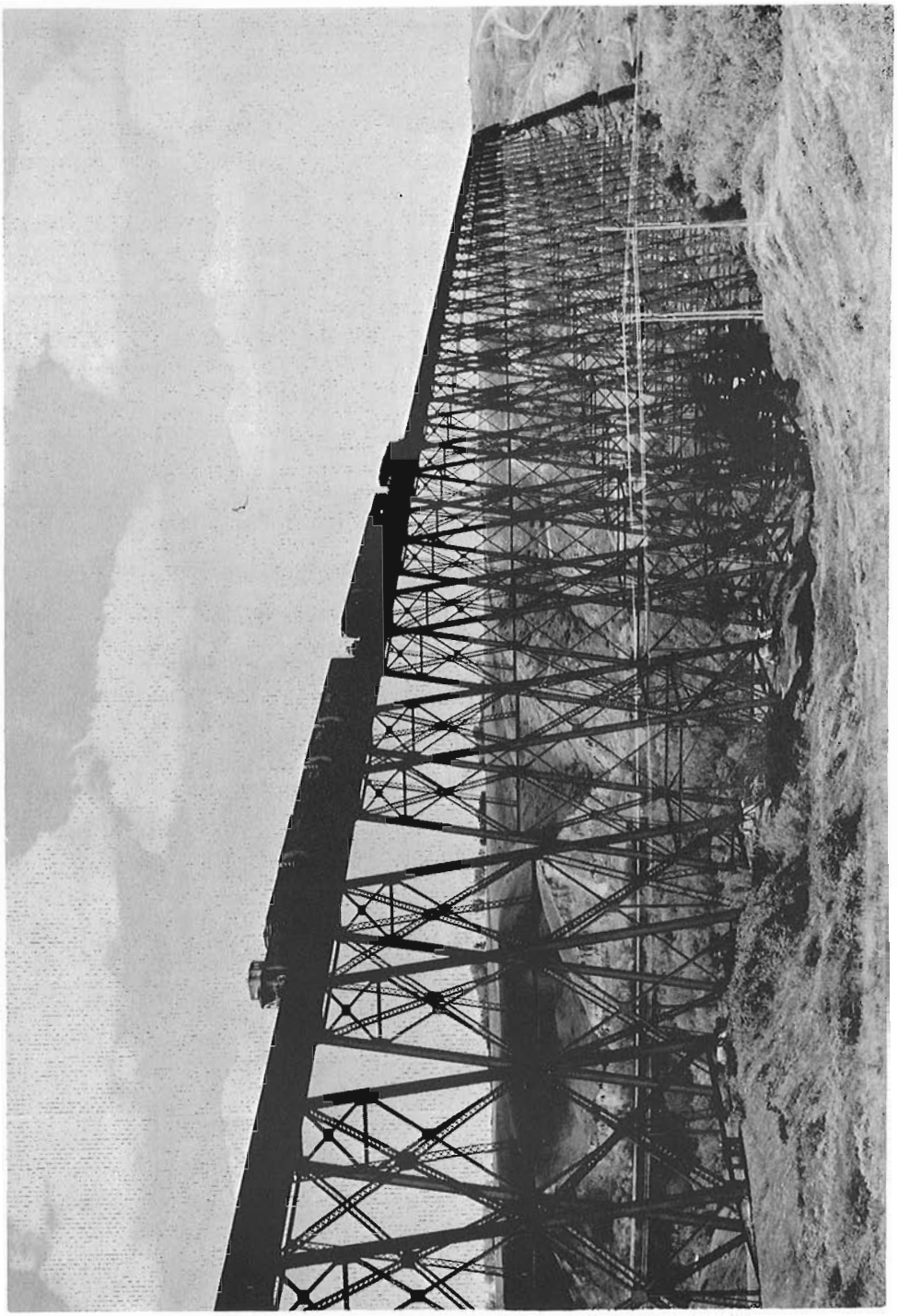


PLAN & PROFILE

SHAFT TO TEST CONDITION OF FOUNDATIONS UNDER PEDESTALS 21 & 22 NORTH

Scales 10'-1"

The old workings were found and were mainly filled up with "gob". In several places along the tunnel ground was loose and broken but no large cavities were discovered. The drifts etc. were solidly refilled with excavated material and as there was 35 to 40 ft. of shale of a solid nature, between mine workings and pier, the foundations were considered safe and satisfactory and the shaft filled up.



TIME SEEMS TO STAND STILL, ALTHOUGH GRASS AND TREES HAVE TAKEN THE place of eroded clay and a different kind of motive power has replaced the steam locomotive. This contemporary view looks west and was taken in June, 1975.

Acknowledgements.

The photographs of the Lethbridge Viaduct during the period of its construction were the sole inspiration for the preparation of this article and credit for the discovery and preparation of them is due solely to Mr. Barry Russell. He spent considerable time trying to improve the clarity of the copies of the original photographs and also endured the frustrations associated with matching the descriptions of the various views with those given in old, hand-written company records. He also took the time to travel to Lethbridge to take the pictures necessary for comparison with, and evaluation of, the original pictures of the construction period. Although it is possible that similar photographs exist elsewhere, Mr. Russell must be commended for his initiative in preserving these pictures. While it may be assumed that these pictures were taken at the request of the Canadian Pacific Railway Company, it is unfortunate that the identity of the photographer has apparently been lost.

The sincere thanks of the Author are also extended to Mr. W. A. Dill, Manager of Technical Services, The Engineering Institute of Canada, for his kind permission to make use of a professional engineering paper prepared by Mr. C.N.Monsarrat, detailing construction of the Lethbridge Viaduct and published in Transactions, the-then official journal of the Canadian Society of Civil Engineers. Specific reference is made to Volume XXIII, Part II, October to December, 1909. The detail reproduced in my article could not have been presented without the assistance of this most comprehensive report by the late Mr. Monsarrat.

Mr. Dill very kindly provided me with some background on Mr. Monsarrat and a brief biographical sketch is presented herewith. He was born in Montréal, Québec on July 2, 1871 and first entered the service of the Canadian Pacific in November 1889, when he worked as a draughtsman until February 1895. He then held various engineering positions with the Dominion Bridge Company, the Tilsonburg, Lake Erie and Pacific Railway Company and the Royal Electric Company. He returned to the Canadian Pacific as Engineer of Bridges in 1903 and was in charge of all bridgework across the system when the Lethbridge Viaduct was built. He was awarded the Gzowski Medal of the Engineering Institute of Canada in 1910 for his paper on the Lethbridge Viaduct. He was elected President of the Engineering Institute in 1917.

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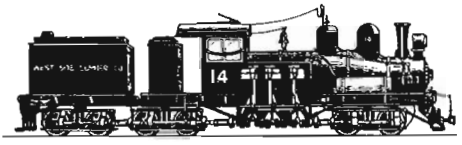


John D. Welsh.

The remarkable alliance

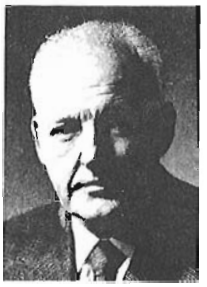
the first joint Canadian National-CP RAIL system timetable: October 31, 1976 to April 23, 1977.

The fine, fat, flamboyant folder which bears Number 219 in the Canadian National Railways' series is indeed a remarkable and quite unanticipated effort by Canada's two major railways. An introductory message, describing this fall-winter edition of the VIA 1976-1977 public folder as " a symbol of closer co-ordination and co-operation between our two companies", is signed by Garth C. Campbell, Vice-President, Passenger Marketing, VIA CN and A.R.Campbell, General Manager, Passenger Services, VIA CP RAIL.

Inside the colourful cover, a combined station index shows fewer than forty centres served by both railways. The first four pages of schedules provide condensed tables, two for each railway. With transcontinental schedules on facing pages - CN printed blue on white and CP RAIL printed red on white - making for easy comparison, the deterioration of the "Super Continental" service is obvious. And it's still faster to travel from Edmonton and Calgary to Vancouver by CP RAIL than by the direct Edmonton-Vancouver service of CN. However, this is not true in the eastward direction.

G. C. Campbell
Vice-President
Passenger Marketing
VIA CN

Vice-président
Marketing voyageurs
VIA CN



A. R. Campbell
General Manager
Passenger Services
VIA CP Rail

Directeur général
Services voyageurs
VIA CP Rail

A three-colour, stylized map, basically the same as the one in the previous CN folder, but with CP RAIL lines superimposed in red, shows CN service from Montréal to Trois-Rivières and Québec paralelling that of CP RAIL: that is, on the north shore of the St. Lawrence.

In Newfoundland, the Clarenville-Bonavista flyer now runs Wednesdays only instead of tri-weekly. The Badger-Deer Lake service continues to operate daily over the 128 miles of the main line of the former Newfoundland Railway.

Canadian National's Montréal-Ottawa services are generally slower in the new timetable. All four RAPIDOs are allowed from two to ten minutes more than in the previous schedule. The eastbound " Super Continental" is five minutes faster between these two points.

On the Montréal-Toronto "corridor" run, the afternoon RAPIDOs and TURBOs have switched places (no pun intended), with these TURBOs now running non-stop Dorval-Guildwood in both directions. So, the RAPIDOs have been given another five minutes for the Kingston stop and the TURBOs have been accelerated by the same amount. The Belleville-Kingston bus feeder to and from the morning TURBOs has been dropped; this is not surprising. The Montréal-Brockville shuttle train, connecting with the Ottawa-Toronto "Capital" and "L'Exec" is now operating with conventional equipment instead of RDC "Railiner" cars and is on a faster timing for three of the four runs. In addition, these trains have been christened "Lakeshore" and "Bonaventure", which names were used when the trains operated in the Montréal-Toronto service.

A flat two hours is allowed for the 125.6 miles, Brockville to Montréal; for Train 56 (the Montréal portion), for example, this results in a Cornwall-Dorval dash at 80.3 mph, with a hood unit (Number 4104 on several runs), a steam-generator car, two or more coaches and a head-end car. The diesel and the steam-generator car are "standard equipment" for this service, while some of the coaches and the baggage car are switched to or from the Ottawa-Toronto trains (Trains 43, 44, 45 and 46) at Brockville, as required.

By the way, depending on which table you consult on the same page (30), the distance between Montréal and Dorval VIA CN is either

eleven miles or twelve miles!

CN's Ottawa-Toronto service is improved by highway bus links to and from Kingston from and to Ottawa, to connect with the morning TURBOs (Toronto-Montréal). Best Toronto-Ottawa time is now eastbound in four hours and thirty-five minutes. Weekdays, five runs in each direction are now offered, with three on Saturdays and four on Sundays.

Toronto-London-Windsor/Sarnia services are basically unchanged, except for the addition of a non-stop TEMPO Special, Toronto to London, on Fridays and Sundays, in one hour and fifty-five minutes for the 185 km (115 mi.).

With the closure of Québec's Palais Station at the end of August 1976, CN's Montréal-Québec schedules reflect the use of Ste-Foy in its place, except for one train, noted below. For the Ste-Foy to Clermont run along the north shore of the St. Lawrence east of Québec, thirty minutes have been added in both directions, with forty minutes allowed for the Ste-Foy to Limoilou stretch of twelve miles. Mileage Ste-Foy to Clermont is shown as 114, compared to 92 previously. Cap Rouge is now served only by Trains 174 and 175, Ste-Foy to Cochrane, Ontario, via the old National Transcontinental main line. For Chicoutimi, weekenders use Ste-Foy and bypass Limoilou, leaving Saturday and returning Monday. There is now a Limoilou-Rivière à Pierre run, outwards on Tuesday and Thursday and back on Wednesday and Friday. Mileage Limoilou to Loretteville is shown as eighteen, as compared with the previous seven miles. On the bright side, Train 275, Tuesday and Thursday, Limoilou to Rivière à Pierre, is allowed eighteen minutes for the eighteen miles from Limoilou to Loretteville!

CP RAIL Montréal-Québec services, using the new St-Sacrement station some three miles west of the majestic Gare du Palais, are now ten minutes faster on all runs, with frequency of service remaining unchanged. The direction of travel of this service is now Québec-Montréal (east to west in the corridor); a similar rearrangement has been made on CP RAIL's Maritime page, now Saint John-Montréal instead of Montréal-Saint John.

Canadian National's Montréal-Chicoutimi service, Train 171, is now 45 minutes faster for some inexplicable reason, delivering the sleepy passenger in the heart of Chicoutimi at 05 50, daily except Sunday. On Sunday, arrival time is 06 50. There is no assurance that sleeping car passengers may delay disembarkation.

CN's Toronto-North Bay schedule page (38) repeats its upside-down map, showing Toronto north of Washago; it was printed correctly in the 1975 folder. RDC "Railiner" service, Toronto to North Bay, previously Saturday and Sunday, is now Sunday only. It will probably be reduced further when Ontario Northland's train-sets arrive from Switzerland in 1977.

The Algoma Central Railway makes the new VIA joint timetable on page 37, where the northbound Friday, Saturday and Sunday train from Sault St. Marie to Hearst is shown, with its counterpart returning Saturday, Sunday and Monday, southbound.

CP RAIL's RDC "Dayliner" Trains 417 and 418, Sudbury to White River, Ontario, now run thrice weekly instead of daily except Tuesday (!). The Havelock-Peterboro-Toronto table shows Train 381 originating at Havelock, mile 93.7 on the S/D of the same name, instead of Norwood (mile 99.8), as printed in the previous folder. In the Montréal-Mont Laurier table, station altitudes are no longer shown but distances are given in both miles and kilometers. Calgary-

South Edmonton schedules have been altered to provide passengers with more time to feed the vending machines in Red Deer station. This stop has been lengthened from three minutes to 16 minutes northbound and 11 minutes southbound, with the time being made up on the Red Deer-Calgary stretch, so that the overall time is unchanged and meets occur at Red Deer station rather than a few miles down the line.

CP RAIL pages in the new joint VIA folder no longer carry advertisements for CP HOTELS in various cities across Canada. At the bottom of the Saint John-Montréal schedule, we find a stylized trans-Canada map, matching a similar Canadian National map on the facing page and showing major cities served, including a place named "Hudson Bay" on the CP RAIL map, somewhere between Sudbury and Winnipeg.

At various places in the new combined VIA folder, mileages are shown in metric units only, for example, for rail services in Newfoundland and for the CN's Saskatoon-Melfort-The Pas service (Table 50). It might be reasoned that the CN rail service in Newfoundland was always different enough from that in the rest of Canada, but there is no readily apparent explanation for metric distances to Melfort, Crooked River and Porcupine Plain!

Separate pages showing fares on CN/CP RAIL invite comparisons. Here are a few examples of what the rail passenger in Canada can get for his/her money in 1976/77:

	CP RAIL	CN-red day	CN-blue day
Montréal-Vancouver (coach)	$ 139.00	$ 90.00	$ 124.00
Montréal-Vancouver (roomette)	99.00	80.00	80.00
Montréal-Halifax (coach)	58.55	33.00	46.00
Montréal-Québec (coach)	15.10	9.00	12.50
Montréal-Ottawa (coach)	9.75	6.00	8.50
Montréal-Sherbrooke (coach)	8.60	5.75	8.00

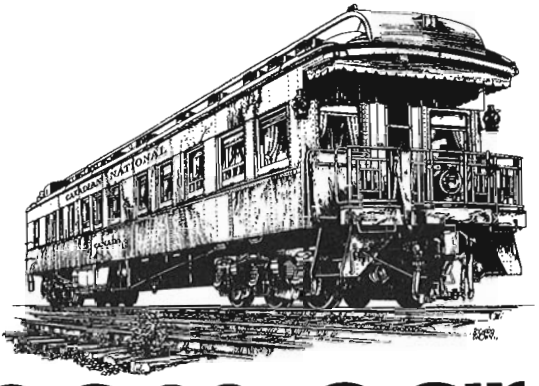
CN has made some modifications in its "Red, White and Blue" fare structure but, in general, "Red" days are off-peak, off-season days, when travel is cheapest. Conversely, "Blue" days are peak, in-season travel times. often in holiday periods. Good planning can save the railway passenger money, as the above table shows.

In a gesture of good fellowship, AMTRAK schedules to and from points in Canada appear on two pages of the new VIA folder. First mention of ConRail appears in CP RAIL's Table 32 for the Welland-Buffalo portion of the Toronto-Hamilton-Buffalo daily service. On the same page, a stylized map of "Corridor" shows the New York-Albany-Buffalo "water-level" route terminating at Hamilton, Ontario!

In AMTRAK Table 78, page 45, Detroit-Windsor-Albany-New York, no mention is made of the stops at St. Thomas and Fort Erie, although these appear in AMTRAK's own national public timetable of October 31, 1976, as they did in the AMTRAK folder of June 15, 1976.

And, if the reader becomes stifled with schedules, he can always turn to the solid half-page of reference symbols or the solid two-and-a-half pages of reference marks and notes. Here he will find all kinds of esoteric information, such as the fact that train tickets (CN) are not good on ONR buses; taxi service is provided between Vernon and Armstrong, B.C., and that, after April 23, 1977, Biggar and Unity, Saskatchewan will observe Mountain Daylight Time.

Copies of this fascinating new joint VIA public folder may be obtained at your local CN or CP RAIL station, or from Passenger Marketing, VIA CN, Montréal H3C 3N4 or Passenger Services, VIA CP RAIL, Montréal H3C 3E4. It will provide the arm-chair traveller with many hours of interesting reading.



The business car

HALF-WAY THROUGH 1976, THE FINANCIAL RECESSION IN CANADA MIGHT HAVE been estimated by the number of diesel-electric units in storage at various points across Canada.

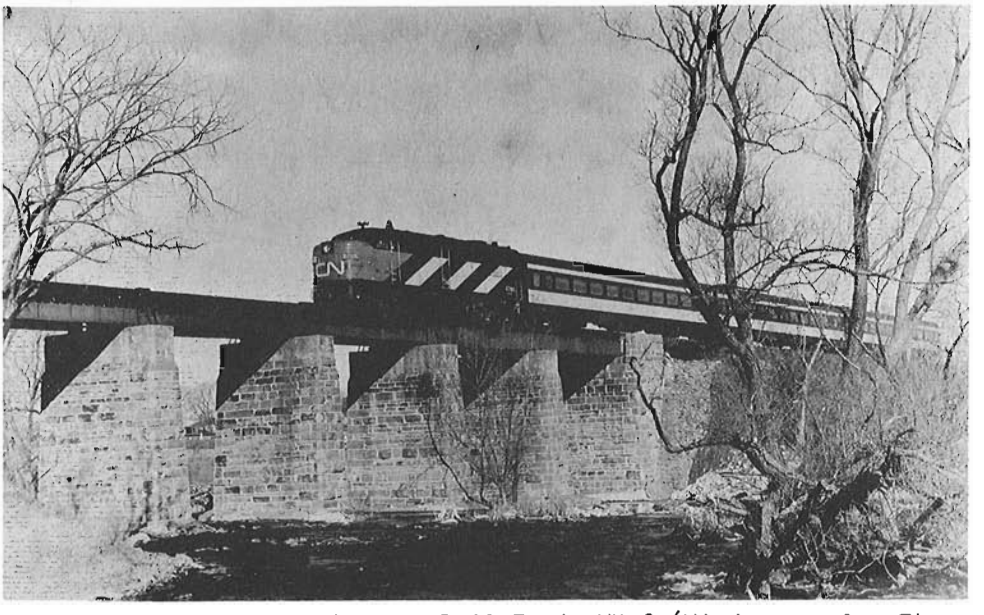
For example, on 27 June 1976, Stephen Wray reported that there were 79 units stored serviceable at CP RAIL's St-Luc Yard, Montréal. Curiously enough, all of these units were MLW Industries made and were all equipped with 244-series prime movers, except for the S-3 and S-11 units, which have 539-type diesel engines.

Here are the numbers and classes:

Road numbers	class	MLW model
6500, 6501	DS-6a	S-3
6523, 6529	DS-6d	S-3
6622	DS-6m	S-11
4016, 4019, 4025	DFA-15b	FA-1
4050	DFA-16a	FA-2
4082, 4084, 4085, 4086 4087, 4088, 4089, 4090 4091, 4092, 4093, 4094	DFA-16e	
4095	DFA-16f	
4404, 4405, 4406, 4407 4408, 4409, 4410, 4416	DFB-15b	FB-1
4463, 4464, 4465, 4466 4468, 4469, 4470	DFB-16c	FB-2
8407	DRS-15b	RS-2
8428, 8429, 8430, 8431 8432, 8433, 8436, 8437 8438, 8439, 8440, 8441 8442, 8444, 8446, 8447	DRS-16a	RS-3
8448, 8449, 8451, 8457 8459, 8460	DRS-16b	RS-3
8466, 8467, 8468, 8476 8481	DRS-16c	RS-10
8561, 8562	DRS-16e	
8570, 8573, 8575, 8576	DRS-16f	
8582, 8583, 8588, 8590 8591, 8593, 8598, 8599	DRS-16g	

KEN GANSEL'S PERAMBULATIONS IN 1975 TOOK HIM FROM CANADA'S MARITIME provinces to southern Ontario, in which locations he was able to photograph trains of Canada's railways, large and small. Ken's first photo recorded CP RAIL's Train 42, the "Atlantic Limited", at McAdam, New Brunswick, on a snowy 10 March 1975. On the point was one of CP RAIL's remaining two E 8 units, Number 1802.

Later on, on 28 April 1975, Dominion Atlantic Railway's Train 2, in fact RDC "Dayliner" Number 9062, scurried over the Moose River bridge en route to Halifax.



On a summer day, ConRail Train WX-2 (Windsor to St. Thomas, Ontario) rattled by the attractive stone station at Essex, Ontario. Ken noted that this station is now leased by the Windsor-Essex Division of the CRHA. ConRail unit Number 7436 was painted blue and is a GP 9, built by Diesel Division, General Motors of Canada Limited.

The last photograph, taken on 15 November 1975, shows Canadian National Railways' Train 41, the Ottawa-Brockville connection for the CN's Montréal-Toronto train, crossing the Rideau River and Canal at Smith Falls, Ontario, on CP RAIL trackage.

THE INTERIM REPORT FOR THE NINE MONTHS ENDED SEPTEMBER 30, 1976 FROM SPAR Aerospace Products Limited to its stockholders noted that the first gearboxes for the Toronto Transit Commission's Canadian Light Rail Vehicle were delivered on schedule in October, while work commenced on the linear induction motor (LIM) propulsion system for the Intermediate Capacity Transit System vehicles being developed by the Government of Ontario's Urban Transportation Development Corporation. SPAR was also awarded a $ 100,000 contract by the Government of Canada's Transportation Development Agency to carry out a study of an alternating-current motor propulsion system.

WITH THE ADVENT OF CONRAIL IN THE EASTERN UNITED STATES, THE INFANT freight rail transportation system found itself with a serious shortage of motive power. To satisfy motive power requirements until additional units can be purchased, ConRail has leased 100 units from Canadian National Railways. These units are available because of the diminution of traffic on CN as a result of the economic recession in 1976.

The models and numbers of the leased units are as follows, according to SRS NEWS of the Scotian Railroad Society of Halifax, N. S.:

MLW M636	2305/07/08/09/13-17/19/20/22-28/32-39;
MLW C424	3201-11/14-18/25-28/30/33-34/36-37/39-40;
GP 35	4000-01 (CN's only GP 35 units);
GP 40	4002-15;
GP 40-2L	9488-9518.

THE CALL BOARD, Mohawk & Hudson Chapter, NRHS, says that all EMD's (sic) will be maintained at Collinwood and MLW's at DeWitt. The Editor then queries,"One wonders what CN is using to power its own trains with in the meantime". Perhaps someone will write and tell him!

SPAR AEROSPACE PRODUCTS LIMITED OF TORONTO HAVE BEEN AWARDED A CONtract by Canada's federal government (Transportation Development Agency) for $ 99,458, to undertake a market evaluation and development program definition for an AC (alternating current) Motor Propulsion System for transit applications.

Spar was responsible for the technical aspects of the study and, as prime contractor, was also to direct and coordinate the work of the two subcontractors, N.D.Lea & Associates, Oakville and the Urban Transportation Development Corporation of Toronto.

N.D.Lea & Associates, transportation consultants, were to take the lead in areas concerned with markets and applications; UTDC, an Ontario crown corporation, were to lead in the demonstration and evaluation aspects of the study.

The primary objective of the study was to determine if the application of the latest research would enable AC drives to be technically and economically attractive to the transit market. A further objective was to estimate the size of that market and then to define an appropriate demonstration and evaluation program.

CANADIAN NATIONAL RAILWAYS' SLOPED-TENDER SWITCHER, 0-6-0 NUMBER 7308, was photographed by Association member Mr. A.W.Leggett of St. Lambert, Québec, at the east end of Pointe-St-Charles Yard, Montréal, in the summer of 1950. The then-electrified line from Central Station to the electric shop at the Pointe is visible on the extreme right.

Canadian Rail

ISSN 0008-4875

is published monthly by the

Canadian Railroad Historical Association

P.O. Box 22, Station B, Montreal, Quebec, Canada/H3B 3J5

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